ODISHA STATE BOARD OF PHARMACY 08/09/2023

D. Pharm Part - I **E. R. 1991** **2022 Special examination**

DO NOT WRITE ANYTHING ON YOUR QUESTION PAPER EXCEPT YOUR ROLL NO.
QUESTION PAPER CONTAINING ANYTHING WOULD BE TREATED AS MALPRACTICE

Answer the questions serially and continuously

Subject: HEALTH EDUCATION & COMMUNITY PHARMACY (Theory)

Full Mark -80 **Time -3 Hrs.**

(Answer any five questions including question No. 1)

1. **(A) Define the followings :** **(1x10)**

i) Incubation Period ii) Antiseptics iii) Rickets
iv) Bitot's spot v) Marasmus vi) Cataract
vii) Negative Staining viii) Pandemic ix) Epidemiological Triad
x) Eukaryotic

(B) Define the following abbreviations **(1x10)**

i) ICDS ii) MDMP iii) CHD iv) WHO v) IDDM
vi) AIDS vii) FSH viii) ESR ix) DNA x) STD

2. a) Define demography and elaborate various stages of demographics cycle. **(2+5+8)**
b) Discuss permanent methods of contraception

3. a) Explain water pollution. What are various sources of water pollution ? How water pollution can be prevented. **(2+4+4+5)**
b) Write briefly on solid waste disposal and control.

4. What do you mean by determinants of Health ? Explain various determinants. **(3+12)**

5. a) What is epidemiology ? Write the indications and the procedure of Cardio-pulmonary Resuscitation (CPR). **(2+8)**
b) Describe the first aid treatment for shock. **(5)**

6. What is disinfection and what are its types ? Give disinfection procedure for **(2+5+8)**
a) Faeces b) Sputum c) Room d) Dead bodies

7. Write short notes **(any three)** **(3x5)**
a) Snake bite poisoning b) First aid in fracture
c) Diabetes Mellitus d) Immunity

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ODISHA STATE BOARD OF PHARMACY 05/09/2023

D. Pharm Part - I **E. R. 1991** **2022 Special examination**

DO NOT WRITE ANYTHING ON YOUR QUESTION PAPER EXCEPT YOUR ROLL NO.
QUESTION PAPER CONTAINING ANYTHING WOULD BE TREATED AS MALPRACTICE

Answer the question serially and continuously

Subject: HUMAN ANATOMY & PHYSIOLOGY (Theory)

Full Mark -80 **Time -3 hrs.**

(Answer any five questions including question No. 1)

1. **(A) Write the functions of followings :** **(1x10)**
   i) Heart ii) Joint iii) Kidney iv) Alveoli v) Platelets
   vi) Nucleus vii) Mitochondria viii) Oxytocin ix) TSH x) Muscular tissue

   (B) Differentiate between: **(2x5)**
   i) Cell & Tissue ii) Adduction & Abduction iii) Pronation & Supination
   iv) RBC & WBC v) Heart Rate & Stroke Volume

2. Define Cell. Draw neatly labelled diagram of Human cell. Write the various parts of cellular components with their functions. **(2+3+10)**

3. Describe the different parts of respiratory system with a neat labelled diagram, Briefly write down the physiology of respiration. **(7+8)**

4. Classify nervous system. What are the branches of A.N.S ? Write briefly functions of different parts of brain. **(3+4+8)**

5. Describe different parts of eye with diagram. Discuss the physiology of vision. **(10+5)**

6. What do you mean by endocrine glands ? Classify them. Briefly discuss about the formation, function and disorders of thyroid hormones. **(2+4+9)**

7. Write short notes on **any three** of the followings : **(3x5)**
   i) Digestion and absorption of carbohydrates.
   ii) Human ear
   iii) ECG
   iv) Lymph
   v) Blood grouping

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ODISHA STATE BOARD OF PHARMACY 12/09/2023

D. Pharm Part - I **E. R. 1991** **2022 Special examination**

DO NOT WRITE ANYTHING ON YOUR QUESTION PAPER EXCEPT YOUR ROLL NO.
QUESTION PAPER CONTAINING ANYTHING WOULD BE TREATED AS MALPRACTICE
Answer the questions serially and continuously

Subject: BIO-CHEMISTRY & CLINICAL PATHOLOGY (Theory)

Full Mark -80 **Time -3 Hrs.**

(Answer any five questions including question No. 1)

1. **(A) Define the following terms:** **(1x20)**

a) Haematuria b) Anaemia c)ESR
d) Gluconeogenesis e) Lymphoma f) Iodine number
g) Zwitterion h) Metabolism i) Hypervitaminosis-A
j) LDL k) lymphocyte l) Osteomalacia
m) Agranulocytosis n) Saponification value o) Hypernatremia
p) Isoenzyme q) Oligopeptide r) Rickets
s) Kwashiorkor t) Maltose

2. Describe TCA cycle and calculate total number of ATPs formed in it. **(8+4+3)**
Write about abnormalities of carbohydrate metabolism.

3. Define proteins & Amino acids ? Classify Amino acids with examples. **(2+6+7)**
Explain the Urea formation cycle.

4. Answer any **THREE** (3x5)

a) Describe the difference between T&B Lymphocytes.
b) What is the role of Blood platelets in health & diseases?
c) Short note on Sickle Cell anaemia
d) Short note on functions of BLOOD

5. Define and classify vitamins. Give an account of sources, chemistry and **(3+12)**
Physiological function and deficiency diseases of the followings.

a) Vitamin B_1 b) Vitamin B_2 c) Vitamin C d) Vitamin E

6. What is enzyme inhibition? Explain types of inhibition with examples. **(4+8+3)**
Write uses of enzymes.

7. Write short notes on any **THREE** of the following: **(3x5)**

i) Ring structure of Glucose ii) Briefly describe disorders of fat metabolism.
iii) Co-enzyme Q iv) Vitamin H

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ODISHA STATE BOARD OF PHARMACY 02/09/2023

D. Pharm Part - I **E. R. 1991** **2022 Special examination**

DO NOT WRITE ANYTHING ON YOUR QUESTION PAPER EXCEPT YOUR ROLL NO.
QUESTION PAPER CONTAINING ANYTHING WOULD BE TREATED AS MALPRACTICE

Answer the questions serially and continuously

Subject: PHARMACOGNOSY (Theory)

Full Mark -80 **Time -3 hrs.**

(Answer any five questions including question No.1)

1. **(A) Write the important chemical constituents of the following crude drugs.** **(1x10)**

i) Ginger	ii) Catechu	iii) Ephedra	iv) Curcuma
v) Papaya	vi) Ashwaganda	vii) Pterocarpus	viii) Tulsi
ix) Ergot	x) Garlic		

(B) Write the important uses of following crude drugs **(1x10)**

i) Cinnamon	ii) Arjuna	iii) Shark liver oil	iv) Ipecacuanha
v) Ephedra	vi) Ergot	vii) Guggul	viii) Amla
x) Punarnava	xi) Benzoin		

2. Write notes on **any three** : **(5x3)**

i) Peppermint oil ii) Gymnema iii) Vinca iv) Clove

3. Write notes on **any two :** **($7^1/_2$x2)**

i) Perfumes & flavouring agents ii) Secondary metabolites iii) Extraction & isolation

4. Write the Biological Source, Chemical Constituents & uses of following Drugs **(any five)** : **(3x5)**

i) Senna ii) Digitalis iii) Gokhru iv) Honey v) Nux-vomica vi) Opium

5. Define the term drug evaluation, classify it. Discuss the Physical & Pharmacological evaluation in details with examples. **(1+2+12)**

6. Write notes on **(any three) :** **(5x3)**

i) Identification test of Alkaloids ii) Identification test of Tannins
iii) Pharmaceutical aids iv) Isolation of volatile oils

7. Answer **any two :** **($7^1/_2$x2)**

i) Chemo-taxonomical classification of crude drugs with example.
ii) Gross anatomical studies of Datura
iii) Write source, preparation, identification & uses of Regenerated fibres.
iv) Lycopodium spore method.

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ODISHA STATE BOARD OF PHARMACY 31/08/2023

D. Pharm Part - I **E. R. 1991** **2022 Special examination**

DO NOT WRITE ANYTHING ON YOUR QUESTION PAPER EXCEPT YOUR ROLL NO.
QUESTION PAPER CONTAINING ANYTHING WOULD BE TREATED AS MALPRACTICE

Answer the questions serially and continuously

Subject: PHARMACHEMISTRY-I (Theory)

Full Mark -80 **Time -3 hrs**

(Answer any five questions including question No.1)

1. **(A) Write the chemical formula and use of the following** **(1x10)**

i) Sodium Thiosulphate ii) Sodium Nitrite
iii) Aluminum Phosphate iv) Magnesium Carbonate
v) Magnesium Sulphate vi) Titanium Dioxide
vii) Alum viii) Sodium Meta phosphate
ix) Ammonium Carbonate x) Ammonium Chloride

(B) Define the following terms : **(1x10)**

i) Buffers ii) Emetics iii) Astringent iv) Deodorant
v) Molarity vi) Hygroscopic vii) Oxidation viii) Acid
ix) Hydrolysis x) Base

2. a) What are the various sources of impurities in pharmaceutical substances ? **(6+9)**
b) Explain the Guitzet test for arsenic ? Give detail procedure for carrying out this test.

3. a) Explain Lewis acids and bases. Why aluminium chloride acts as Lewis acid. **(5x3)**
b) What are antacids ? Classify them. Write down method of preparation and uses of potassium sodium tartrate.
c) Differentiate between antiseptic and disinfectant. Write down method of preparation and use of potassium permanganate.

4. a) Define intracellular fluids and extra cellular fluids. Write a short note on electrolyte combination therapy. **($7^1/_2$x2)**
b) Define antidote. Classify various types of antidotes with examples. Write down the method of preparation and storage conditions of compound used in cyanide poisoning.

5. **Write note on any three :** **(5x3)**
a) Nitrous oxide
b) Radio opaque contrast media
c) Anti carries agents
d) Anti-oxidant

6. Explain Radioisotopes. Write the classification, properties, applications with their Storage condition and handling. **(3+2+3+4+3)**

7. Write short notes on (any three) **(5x3)**

i) Principle of limit test for sulphate ii) Geiger-muller counter
iii) Saline cathartics iv) Haematinics

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ODISHA STATE BOARD OF PHARMACY 28/08/2023

D. Pharm Part - I **E. R. 1991** **2022 Special examination**

DO NOT WRITE ANYTHING ON YOUR QUESTION PAPER EXCEPT YOUR ROLL NO.
QUESTION PAPER CONTAINING ANYTHING WOULD BE TREATED AS MALPRACTICE

ANSWER THE QUESTION SERIALLY AND CONTINUOUSLY

Subject: PHARMACEUTICS-I (Theory)

Full Mark -80 **Time -3 hrs**

(Answer any five questions including question No. 1)

1. (A) Define the followings: **(1x10)**

i) Enteric coated tablet ii) Comminution iii) Isotonic solution
iv) Filter aid v) Slug vi) Lozenges
vii) Pessaries viii) Soxhlet extraction ix) Steam distillation
x) Wetting agent.

(B) Differentiate between the followings: **(2x5)**

i) Percolation & Infusion ii) Purified water & water for injection
iii) Fine powder & Granules iv) Vaccines & toxoids
v) Evaporation & drying

2. Define tablet ? Write about different methods of preparation of tablet ? **(2+13)**

3. Define filtration ? Explain the factors affecting the rate of filtration ? Briefly discuss about the filter aid ? **(2+7+6)**

4. Write short notes on **any two** of the followings: **($7^1/_2$x2)**
i) Indian pharmacopoeia
ii) Fluidized bed dryer
iii) Cyclone separator

5. Define drying. Discuss the theory, construction and working of fluidized bed dryer with its application in pharmacy. **(2+10+3)**

6. Define aerosols with its advantages and disadvantages. Explain various parts of aerosol container with diagram and process of filling of aerosol products. **(5+10)**

7. **Write notes on :** **(5x3)**
i) Human normal immunoglobulin
ii) Rabies vaccine
iii) Tuberculin test

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ODISHA STATE BOARD OF PHARMACY

D.Pharm Part-I **E.R.1991** **2022 SPECIAL EXAMINATION**

MODAL ANSWER

Subject: **HEALTH EDUCATION & COMMUNITY PHARMACY** (Theory)

Full Mark -80 Time-3Hr

Answer any five Question including question No. 1

1. **(A) Define the Followings**: (1 X 10)

(i)**Incubation Period**: Incubation period (also known as the latent period or latency period) is the time elapsed between exposure to a pathogenic organism, a chemical, or radiation, and when symptoms and signs are first apparent. The incubation period is the number of days between when you're infected with something and when you might see symptoms.

(ii)**Antiseptics:** An antiseptic is a chemical agent that slows or stops the growth of microorganisms on external surfaces of the body and helps to prevent infection. Antiseptics, or skin disinfectants, are chemicals for cleaning the skin and wounds. They can kill or prevent the growth of microorganisms. There are various types of antiseptics, some are suitable for home use, while others are only suitable for use in a clinical setting.
Example: Dettol, Savlon, etc.

(iii)**Rickets:** Rickets is a condition that affects bone development in children. It causes bone pain, poor growth and soft, weak bones that can lead to bone deformities. Adults can experience a similar condition, which is known as osteomalacia or soft bones.
Literally this the condition arises due to **vitamin-D**

(iv)**Bitots spot**: **Bitot's spots** (also called Bitot or **Bitôt spots**) are triangular deposits that can form on the whites of the eyes. **Bitot's spots** are the buildup of keratin located superficially in the conjunctiva of human's eyes. They can be oval, triangular or irregular in shape.

(v)**Marasmus:** Marasmus is a severe form of protein-energy malnutrition that results when a person does not consume enough protein and calories. Without these vital nutrients, energy levels become dangerously low and vital functions begin to stop.

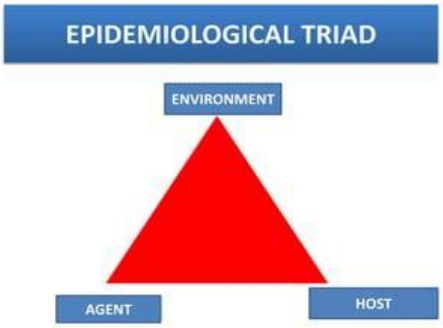
MODAL ANSWER

(vi)**Cataract**: A cataract is a cloudy area in the lens of your eye (the clear part of the eye that helps to focus light). Cataracts are very common as you get older. In fact, more than half of all Americans age 80 or older either have cataracts or have had surgery to get rid of cataracts. A **cataract** occurs when the lens of your eye becomes cloudy. A cataract is a clouding of the lens of the eye, which is typically clear. For people who have cataracts, seeing through cloudy lenses is like looking through a frosty or fogged-up window. Clouded vision caused by cataracts can make it more difficult to read, drive a car at night or see the expression on a friend's face.

(vii) **Negative Staining:** A Method Of Demonstrating The Form Of Small Objects (As Bacteria) By Surrounding Them With A Stain That They Do Not Take Up So That They Appear As Sharply Outlined Unstained Bright Bodies On A Colored Ground

(viii)**Pandemic:** A Disease That Spreads Over A Whole Country Or The Whole World. A pandemic is a kind of epidemic: one which has spread across a wider geographic range than an epidemic, and which has affected a significant portion of the population. E.g. - Corona virus Disease.

(ix) **Epidemiological Triad:** The epidemiological triad or epidemiological triangle is a traditional model to explain how infectious diseases are caused and transmitted. The model is very simple and represents a high-concept, bird's-eye view of infectious diseases. It consist of Environment, Host, Agent



(x) **Eukaryotic:** Any cell or organism that possesses a clearly defined nucleus. The eukaryotic cell has a nuclear membrane that surrounds the nucleus, in which the well-defined chromosomes (bodies containing the hereditary material) are located. Eukaryotic cells also contain organelles, including mitochondria (cellular energy exchangers), a Golgi apparatus (secretory device), an endoplasmic reticulum (a canal-like system of membranes within the cell), and lysosomes (digestive apparatus within many cell types). There are several exceptions to this, however; for example, the absence of mitochondria and a nucleus in red blood cells and the lack of mitochondria in the oxymonad *Monocercomonoides* species.

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MODAL ANSWER

(B)**Definition of the following** : (1 X 10)

(i)**ICDS**: Integrated Child Development Service or Integrated Child Development Scheme-**Integrated Child Development Services** (**ICDS**) is a government program in India which provides nutritional meals, preschool education, primary healthcare, immunization, health check-up and referral services to children under 6 years of age and their mothers. The scheme was launched in 1975, discontinued in 1978 and then relaunched by the Tenth Five Year Plan.

(ii)**MDMP**: Mid day meal program-The **Mid Day Meal Scheme** is a school meal programme in India designed to better the nutritional standing of school-age children nationwide. It is also known as School Lunch program. It is functioning through out the country since 1961. It aims at improving both literacy and nutrition

(iii)**CHD:** Coronary heart Disease-Coronary heart disease is the term that describes what happens when your heart's blood supply is blocked or interrupted by a build-up of fatty substances in the coronary arteries. Over time, the walls of your arteries can become furred up with fatty deposits.

E.g- Angina Pectoris, Myocardial Infraction, Cardiac failure, Sudden Death, Arrythmias.

(iv)**WHO:** World Health Organisation -The **World Health Organization** (**WHO**) is a specialized agency of the United Nations responsible for international public health. It is headquartered in Geneva, Switzerland and has six regional offices and 150 field offices worldwide.

(v)**IDDM:** Insulin Dependent Diabetes Mellitus- It is a Type-1 Diabetes Mellitus is a metabolic disorder characterized by clinically, metabolically and endochrinologically heterogenous chronic hyperglycemiadue to irreversible destruction of the insulin-producing beta cells of the pancreas resulting in dysregulation of insulin secretion or activity. It is usually starts before 15 years of age, but can occur in adults also. Diabetes involves the pancreas gland, which is located behind the stomach. The special cells (beta cells) of the pancreas produce a hormone called insulin.

(vi)**AIDS**: Acquired immune Deficiency Syndrome-AIDS is the late stage of HIV infection that occurs when the body's immune system is badly damaged because of the virus.

(vii)**FSH:** Follicle-stimulating hormone (FSH) is a hormone produced by the anterior pituitary in response to gonadotropin-releasing hormone (GnRH) from the hypothalamus. FSH plays a role in sexual development and reproduction in both males and females.

MODAL ANSWER

(viii)**ESR:** Erythrocytic Sedimentation Rate-An erythrocyte sedimentation rate (ESR) is a blood test that that can show if you have inflammation in your body. Inflammation is your immune system's response to injury, infection, and many types of conditions, including immune system disorders, certain cancers, and blood disorders.

Erythrocytes are red blood cells. To do an ESR test, a sample of your blood is sent to a lab. A health care professional places the sample in a tall, thin test tube and measures how quickly the red blood cells settle or sink to the bottom of the tube. Normally, red blood cells sink slowly. But inflammation makes red blood cells stick together in clumps. These clumps of cells are heavier than single cells, so they sink faster.If an ESR test shows that your red blood cells sink faster than normal, it may mean you have a medical condition causing inflammation. The speed of your test result is a sign of how much inflammation you have. Faster ESR rates mean higher levels of inflammation.

(ix)DNA: Deoxy Ribo Nucleic Acid- Deoxyribonucleic acid (abbreviated DNA) is the molecule that carries genetic information for the development and functioning of an organism. DNA is made of two linked strands that wind around each other to resemble a twisted ladder — a shape known as a double helix.

(x)STD: Sexually Transmitted Disease-Sexually transmitted diseases (STDs) are caused by sexually transmitted infections (STIs). They are spread mainly by sexual contact. STIs are caused by bacteria, viruses or parasites. A sexually transmitted infection may pass from person to person in blood, semen, or vaginal and other bodily fluids.

ODISHA STATE BOARD OF PHARMACY

D.Pharm Part-I **E.R.1991** **2022 SPECIAL EXAMINATION**

MODAL ANSWER

Q.2 a) **Define demography and elaborate various stages of demographic cycle** . (2+5+8)

Ans :- Demography may be the science which deals with the study of all aspects of population progress , welfare, death in a family , birth, age and number of children,number of school going children, their educational qualification; sickness , deformities in the family and sanitation, etc.

Demography is the statistical study of human populations. Demography examines the size, structure, and movements of populations over space and time. It uses methods from history, economics, anthropology, sociology, and other fields.

Various Stages of Demographic cycle:

1. First stage (High Stationary): It is characterized by high birth rate and high death rate which cancel each other. So the population remains stationary. India was in this stage till 1920.

2. Second stage (Early Expanding): There is a decline in death rate while the birth rate remains unchanged. So the population expands. Many developing countries of Asia and Africa are in this stage.

3. Third stage (Late Expanding): Death rate declines further and birth rate begins to fall. Yet there is an increase in population since birth exceeds deaths. India appears to have entered this stage.

4. Fourth stage (Low Stationary):Low birth rate and low death rate. So the population becomes stationary. Sweden, Belgium, Denmark and Switzerland are in this stage.

5. Fifth stage (Declining): Population begins to decline as birth rate is lower than death rate. East European countries like Germany and Hungary are now in this stage.

2b) **Permanent methods of Contraceptives:**

A) Vasectomy :

It is done in males.
It is a simple operation.
Does not need any hospitalization.
Requires hardly 15 to 20 mins
Operation done under local anaesthesia.
It involves a small cut equal to the size of grain of wheat on the both sides of the man's scrotum.
On each side of the two tubes (vas deferens) which carry the seeds (sperms of the testes).
The cut ends are tied up which prevents the flow of the male seeds into the semen.
Thus meeting of male seeds with the women egg is stopped. Hence no pregnancy can takes place.
The operated person can go home but still remain under observation atleast for two days.

Advice:

He should not spoil the dressing with urine or faeces.
He should not scratch the operated area
Should not be washed with water
Should go to the hospital on the 5th day of the operation for check up

Advantage:

Very simple and effective method
Does not require hospitalization

Dis advantages:

Irreversible method
This may not be always success ful.

B) **Tubectomy**:

Permanent method done in females.
Done when both couples don't want for any more children .
Operation is done under general or spinal anaeshtesia.
Small piece of of each fallopian tube is removed.
The cut ends arew tied to block the flow of the passage of the egg cell.
No meeting of sperm with egg cell .
Hospitalization is required for 5 to 7 days
Advice: Light house hold works Can be done by a women
Advantage:
No action required for further contraception since it is a permanent method.
The operation can be done immediately after delivery.
No side effects if operated a by a competent person.Cash or kind incentives are given by the Govt.

Dis advantages:

Woman has to stay in the hospital for at least about 7 days.
Irreversible method

C) Laproscopy:

Laparoscopic tubal ligation is a surgical sterilization procedure in which a woman's fallopian tubes are either clamped and blocked or severed and sealed. Both methods prevent eggs from being fertilized. Tubal ligation is a permanent method of sterilization.

Advantages:

Less injury due to small incision.

Post operative infections are minimum due to small opening

Internal organs are not damaged.

Overall time for one day so no more time will be wasted.

Dis Advantages:

Instrument is very codstly .

In some cases the operation may take longer time.

D) Medical termination of pregnancy:

Abortion:

Abortion is defined as the expulsion or removal of an embryo or foetus from the womb at a stage of of pregnancy when it is incapable of independent survival (I,e. any time between conception and 28^{th} week of pregnancy.

It was done under the Medical termibnastion of preganancyAct 1971

This type of method was considered as legal which can be done by a qualified doctor.

It shoud not be cocidered as method of family planning.

It should be done as early as possible with suitable facilities in the hospital

Conditions under which a pregnancy can be terminated:

To save the life of the women if the life is in danger due to pregnancy.

To prevent grave injury to the physical or Mental injury of the mother.

If pregnancy occurred due to rape.

If the child to be born will suffer from disabilities (substantial reason).

3a) Explain water pollution. What are the various of water pollution? How water pollution can be prevented? (2+4+4+5)

Ans :-

Water pollution is the contamination of water sources by substances which make the water unusable for drinking, cooking, cleaning, swimming, and other activities. Pollutants include chemicals, trash, bacteria, and parasites.

Generally water contain both dissolve d and suspended impurituies.
Disso;ved impurities-Hydrogen sulphide , Carbon dioxide, nitrogen and ammonia and mineral salts.
Suspended impurities- sand , mud clay, plants, bacteria.
With increase in the urbanization the pollution of normal water is increasing to an alarming proportion.The sewage system of town water or cities water to a stream of river has caused a serious problem of water pollution.

MODAL ANSWER

Sources of water pollution:

The most significant sources of water pollution are :

- **Sewage (Waste Water):**The sewage water carries pathogens, a typical water pollutant, other harmful bacterias, and chemicals that can cause serious health problems and thereby diseases.
- **Agricultural Pollution:** Chemical fertilizers and pesticides are used by farmers to protect crops from insects and bacterias. However, when these chemicals are mixed up with water, they produce harmful pollutants for plants and animals.
- **Oil Pollution:** Oil spill poses a huge threat to marine life when a large amount of oil spills into the sea and does not dissolve in water. It causes problems for local marine wildlife, including fish, birds, and sea otters.
- **Industrial Waste:** Industries produce a tremendous amount of waste, which contains toxic chemicals and pollutants, causing air pollution and damage to our environment and us.
- **The burning of fossil fuels:** Fossil fuels like coal and oil, when burnt, produce a substantial amount of ash in the atmosphere. The particles which contain toxic chemicals when mixed with water vapour result in acid rain.
- **River dumping and Marine Dumping:** The garbage produced by households in the form of paper, plastic, food, aluminium, rubber, glass, is collected and dumped into the rivers and seas., they not only cause water pollution but also harm aquatic animals.

Prevention of water pollution:

- **Proper waste disposal:** All waste should be properly disposed of in designated locations. Hazardous waste should be taken to special facilities for disposal. People should be responsible and should not throw garbage except in properly designated places.

- **Reduce the use of chemicals:** Reducing the use of chemicals such as fertilizers, pesticides, and industrial chemicals can help to reduce water pollution. Agriculture practices should be promoted where minimum to minimum use of chemicals should be used. Organic farming should be promoted. Using environmentally friendly products such as biodegradable soaps and detergents can help to reduce water pollution. Heavy paints and other products which contain heavy metals should be properly disposed of.

- **Improved sewage treatment:** Proper sewage treatment plants should be set up to clean the water and make it safer and reusable for human consumption. Sewage should also be treated before being discharged into water bodies. This can help to remove harmful microorganisms and other pollutants from the water like metals and carcinogenic particles.

- **Awareness and education:** Most important of all, people should be educated about the consequences of water pollution as at lower levels individuals too cause water pollution. Education and awareness campaigns can help to educate people on the dangers of water pollution and how they can help to prevent it. In addition to these measures, governments can also enact laws and regulations to control water pollution. Such laws can help to regulate the discharge of pollutants into water bodies and provide penalties for those who violate the regulations.

MODAL ANSWER

3b) Write briefly on solid waste disposal and control.

Ans:-

Solid waste disposal: Solid wastes are unwanted or discarded materials.
They may contain dust, ash, paper, packings and also purifiable matters such as fruits and vegetables.
They may be the products from houses or from industrial, commercial and agricultural operations.
They are called litter in country and refuse in cities.

Health hazards:
They attract flies and rats
They may pollute rain water seeps through them.
They may pollute air by spontaneous and accidental combustion.

Solid waste disposal control:-

Collection of refuse:
Refuse is solid waste from cities.
Collected frommarket, streers, industries, houses.etc.
Store in paper or dust bins.
They are dumped in public bins.
The bins are kept on concrete platform raised 2 to 3 inches above the ground level .
This prevents flood water entering into the bins.
The refuse is collected from the houses and from public bins in carts or vans.

Disposal of refuse:
Methods:
1. Dumping :- Dumping or Land Filling is an old way of disposing off wastes. It is an easy method of disposal of dry refuse. In this process, solid wastes are dumped in a low lying area and as a result of bacterial action, refuse decreases considerably in volume and are converted gradually into humus.
Dumping and its type

Open dumping: In this method, waste materials are dumped in open low lands far away from the city. This method is not environment friendly.
Sanitary landfill: In this method, the waste is packed and dumped daily at the site and is covered with earth to prevent insects or rodents from entering into the landfill. The waste then is subjected to bacterial decomposition.

2. Incineration :

Waste incineration is the use of high temperature furnaces to combust waste and reduce its volume by 95% and mass by 80-85%. Remember though, that the mass isn't actually lost, it's just moved into the atmosphere as water vapor and other flue gasses including dioxins.

Not useful method

1. Dust and ash must be separated behore incineration
2. Expensive
3. Deprives of manure required for the community.

3.Composting: Night soil heaped in trenches .
Heat over 60 degree centigrade kill pathogens
Organic matter is broken down.
End product is called as compost.

4.Burial:-
useful for small camps.
Each day refuse is dumped in strench and covered.
Each trench filled one after another .
The contents in the trench shall be taken out after 4 to 6 months.
And then can be used as a manure.

4. What do you mean by determinants of health? Explain various determinants . (3+12)

Ans :-

Determinants of Health:

Determinants of health are a range of factors that influence the health status of individuals or populations. At every stage of life, health is determined by complex interactions between social and economic factors, the physical environment and individual behaviour. They do not exist in isolation from each other.

Many factors combine together to affect the health of individuals and communities. Whether people are healthy or not, is determined by their circumstances and environment. To a large extent, factors such as where we live, the state of our environment, genetics, our income and education level, and our relationships with friends and family all have considerable impacts on health, whereas the more commonly considered factors such as access and use of health care services often have less of an impact.

While studying Determinants of health all its aspect like mental, physical , social and spiritual must be borne in mind. All those factors that affect the various aspects of health should be considered as determinants of health.

MODAL ANSWER

Various Determinants:-

Individual factors

(i) Heredity:

The state of health of an individual to some extent depends on his genetic makeup.
The genetic makeup of an individual is unique and it cannot be changed.
A number of diseases are of genetic origin.
Genetic defects can also lead to uncommon adverse drug reactions.
eg. Mental retardation, Diabetes, haemophilia etc.

(ii) Lifestyle:

It is the way people live.
It reflects the social values, attitudes and activities of an individual.
An individual learns lifestyle through parents, friends, school etc.
It is composed of cultural and behavioural patterns and lifelong personal habits like smoking, alcoholism, drug addiction, poor hygiene, lack of cleanliness, improper food etc.
Health requires healthy lifestyles (balanced diet, enough sleep, and sufficient physical activity) Many diseases are associated with lifestyles. e.g. Obesity, heart diseases, diabetes.

Environmental or surrounding factors:

Socio Economic Factors:

Income: Rich people are more prone to diseases in comparision to poor people because they are more sedentary and inactive . But the rich people can make their health safe.

Education: It helps us to maintain the cleanliness of the environment and maintaining good health

Nutrition: Starvation has an adverse effect. Good nutrition is essential for good health and also improves the resistance against the infectious diseases.

Occupation: Employment provides income. Employed people enjoy good health . Due to lack of income unemployed people donot have access to health care.

Political will:

The political determinants of health create the social drivers - including poor environmental conditions, inadequate transportation, unsafe neighborhoods, and lack of healthy food options - that affect all other dynamics of health. By understanding these determinants, their origins, and their impact on the equitable distribution of opportunities and resources, we can be better equipped to develop and implement actionable solutions to close the health gap. SHLI will continue to be at the forefront of research of the political determinants of health dissemination.

MODAL ANSWER

The poor people never get preventive and curative measures.

But if political reframing occurs and policies can be made for providing facilities like fresh water, pacca houses, pacca roads, electricity, educational and medical facilities.

They may make these available as free or reduced reasonable cost

Availability of health care services.

According to the fundamental rights of all individual countries it is th responsibility of state and central gove to provide and to work on health care facilities.

According to W.H.O the health care oprovide must have alertness to provide better health care facilities near by health care centres.

4. Adequate supply of safe drinking water
5. Adequate supply of nutritious food
6. Proper hygienic conditions and medical facilities.
7. Facilities for disposal of excreta and other wastes.
8. Preventive measures against disease.

5. a) **what is epidemiology? Write the indications and the procedures of CPR**. (2+8)

Describe the First aid treatment for Shock. (5)

Ans:- Scientific study of distribution and determinants of disease and disability in the society

Epidemiology is the study of the determinants, occurrence, and distribution of health and disease in a defined population. Infection is the replication of organisms in host tissue, which may cause disease. A carrier is an individual with no overt disease who harbors infectious organisms.

This study covers sources and modes of transmission of infection occurring endemically or erupting as an epidemic in the community.

It covers the social, economic and environmental factors.

Indications of CPR:

- Ventricular fibrillation.
- Pulseless ventricular tachycardia.
- Pulseless electrical activity.
- Asystole.
- Pulseless bradycardia

CPR:-

MODAL ANSWER

Cardiopulmonary resuscitation (CPR) combines rescue breathing (mouth-to-mouth) and chest compressions to temporarily pump enough blood to the brain until specialised treatment is available. Chest compressions are the priority in CPR.

Procdure:-

Performed under the following

a) Clearance of air ways
b) Artificial Breathing

- Mouth to mouth breathing
- Mouth to nose respiration
- Arm lift Back Pressure(Holger Nielsen) Method
- Arm lift chest pressure (Silvester) method

c) **Cardiac Massage**:
Place the victim horizontally on the ground
Kneel on the side of the chest of the victim
Place the right hand two fingers above the lower end of the sternum
Place the left hand over the right hand .
At this place press the breast bone down towards the spine for about 4 cm in the adult.
Heel of the hand should be used on the chest.
Leave the victim for compression and relaxation after applying pressure
Recycle the cycle for about 60 to 70 times.

5.b) **First Aid treatment for shock:**

Shock is a serious, life-threatening condition that happens when your body doesn't get enough blood flow. Lack of blood flow to your organs means they won't get enough oxygen, which can cause them to fail. Shock may also lead to a lack of oxygen in your body's tissues (hypoxia) and can cause your heart to stop (Cardiac arrest).

Types:

- Haemmorhagic shock
- Neurogenic shock
- Anaphylactic shock
- Toxic shock

First Aid Treatment:

- Remove the patient to a well ventilated area.
- Remove the Crowd tactfully so as to provide proper ventilation and relief of fear and anxiety to the patient.
- Keeo the patient quiet in lying down flat position with head lowered and turned to a side.

- Raise the legs slightly upward by keeping a pillow under the legs so as to improve blood circulation
- If there is any difficultyin breathing , raise the head and chest of the patient.
- Loosen the clothings but do not remove them.
- Keep the patient warm with a blanket
- Do not give either hot or cold drink to the patient because he may require an emergency operation by the doctor
- Immediately arrange to shift the patient to the hospital.

6. **What is disinfection & What are its types? Give disinfection procedure for** (2+5+8)

a) Faeces b)Sputum c) Room d)Dead Bodies

Ans:- **Disinfection:-** Disinfection is the process of removing micro-organisms, including potentially pathogenic ones, from the surfaces of inanimate objects.

Types of Disinfection:

1. Concurrent Disinfection- It means immediste destruction of infectious material excreted by the patients like faeces, urine, sputum and vomiting. Bedsheets , clothes, dressings are to be soiled with discharges of the patient.
2. Terminal Disinfection- It refers to the disinfection when the patient is discharged or dies where all his/her beddings, utensils,furnitureand room is disinfected so as to prevent the transmission of infection to other patients.
3. Prophylactic Disinfection:- washing of hands with soaps and water , boiling of water, pasteurization of milk and treatment with tap water with chlorine are some of the examples of prophylactic disinfection.

Procedure for the disinfection of :

a) Faeces :-

- Faeces should be collected in an impervious container to which an equal volume of 8% bleaching powder, 5% cresol or 10% phenol ,10% formalin is added.
- Disinfectant allowed to remain in contact at least for two hours.
- After disinfection the container is drained.
- Boiling water is put in the container and allowed to remain in contact till it cool down.
- Alternatively the stools are emptied in a drain or buried and covered with lime.

b) Sputum:-

- In small scale the sputum is collected in paper container or hand kerchief and burnt immediately.

- When the sputum excreted is large as in the case of T.B. then it is collected in the disposable paper cups half filled with cresol solution . The patient should spit in these cups and when full they are allowed to stand for two hours and then disposed of.
- Alternatively a large amount of sputum can be disinfected by boiling or autoclaving for 20mins at 20lb pressure and then disposed of.

c) Room:-

- Hospital rooms and O.T are painted with washable paints.
- Floors can be easily washed with water.
- The sunlight entering areas and rooms need not to disinfect, if need arises then it is to be washed with soaps and detergents with good flow of water .
- Chemical disinfection by using 2 to 3 % cresol , 5% phenol, 10 % formalinsolution or a concentrated solution of bleaching powder.
- Cemical should remain in contact for 4 to 6 hrs and then washed with flow of water.
- Fr O.Ts Fumigatin of gaseous formaldehyde . 500 ml of formalin mixed with one lit of water, the solution is boiled and he fumes are generated. The room so treated is kept closed for 12 hrs and then it can be used.

d) Dead bodies:-

- Burning –to kill the microorganisms and another process that can be done by electrtic furnance by which the body will turn into ash with in half an hour.
- Burying – Buried under the deep earth
- Floating the body in water –floated near by river, stream , sea etc.

7 Write short notes on : (3X5)

a)Short notes on:

Snake Bite Poisoning:

Severe pain and tenderness at the site of the bite. Nausea, vomiting, or diarrhea. Labored breathing (in extreme cases, breathing may stop altogether) Rapid heart rate, weak pulse, low blood pressure.

Different species carry different types of venom. The major categories include:

MODAL ANSWER

Cytotoxins: Cause swelling and tissue damage wherever you've been bitten.

Haemorrhagins: Disrupt the blood vessels.

Anti-clotting agents: Prevent the blood from clotting.

Neurotoxins: Cause paralysis or other damage to the nervous system.

Myotoxins: Break down muscles.

Types of bites:

Dry bites: These occur when a snake doesn't release any venom with its bite. As you'd expect, these are mostly seen with non-venomous snakes.

Venomous bites: These are much more dangerous. They occur when a snake transmits venom during a bite..

First Aid treatment:

9. Tourniquet
10. Cleaning
11. Local incision
12. Assurance
13. No sleep

Symptoms:

Nausea	Rapid pulse	paralysis
Vomiting	Dimmed vision	Convulsion
Mild swelling	Rapid swelling	Blurred vision
And pain at the site of wound	Numbness	
Shortness of breathing	shock	

Medical treatment :

-Specific antivenoum or polyvalent antivenin

-Antidot.

MODAL ANSWER

7b)**First AID in Fracture**:

A fracture is a break, usually in a bone. If the broken bone punctures the skin, it is called an open or compound fracture. Fractures commonly happen because of car accidents, falls, or sports injuries. Other causes are low bone density and osteoporosis, which cause weakening of the bones.

Dislocation and displace can occur of a bone from its original place.

Types :

Simple Fracture (closed fracture)

Compound Fracture(open fracture)

Complicated Fracture

Sign and Symptoms:

- swelling
- Pain at the site of the fracture
- bruising
- discolored skin around the affected area
- protrusion of the affected area at an unusual angle
- inability to put weight on the injured area
- inability to move the affected area
- a grating sensation in the affected bone or joint
- bleeding if it is an open fracture

In more severe cases, a person may experience:

- dizziness
- faintness or lightheadedness
- nausea

First aid treatment:

- Stop the bleeding if the fracture has a laceration of the skin by applying pressure on the wound using a sterile bandage or a clean piece of cloth.
- The affected area should not be moved; Because moving it can lead to severe complications, especially if the fracture is in the neck or spine.
- The affected area should be cooled by placing ice cubes with a clean cloth and then placed on the affected area in order to reduce swelling and pain.

- Keep the patient warm.
- Treat the shock if necessary
- Analgesics in case of pain.
- When the patient feels faint or is breathing short and rapid breaths, the injured person should be placed in a suitable position so that his head is slightly lower than the torso. If possible, his legs can be raised in order to overcome the symptoms of shock.
- Call an ambulance to request help and transfer the injured person to the emergency department to take the necessary measures, such as examinations and treatment.

7c) **Diabetes Mellitus:**

Diabetes mellitus (DM) is a disease of inadequate control of blood levels of glucose. It has many subclassifications, including type 1, type 2, maturity-onset diabetes of the young (MODY), gestational diabetes, neonatal diabetes, and steroid-induced diabete

Diabetes is a common condition that affects people of all ages.

There are several forms of diabetes.

Type –I Insulin dependant diabetes mellitus

Type –II Non insulin dependant diabetes mellitus

Type 2 is the most common.

A combination of treatment strategies can help you manage the condition to live a healthy life and prevent complications.

Sign and symptoms:

Frequent urination. General Weakness Increased appetite
Pain in the legs Increased Thirst
Lack of concentration. Loss of weight
Irritability Delayed wound healing

Complications

Long-term complications of diabetes develop gradually. The longer you have diabetes — and the less controlled your blood sugar — the higher the risk of complications. Eventually, diabetes complications may be disabling or even life-threatening. In fact, prediabetes can lead to type 2 diabetes. Possible complications include:

- **Heart and blood vessel (cardiovascular) disease.** Diabetes majorly increases the risk of many heart problems. These can include coronary artery disease with chest pain (angina), heart attack, stroke and

narrowing of arteries (atherosclerosis). If you have diabetes, you're more likely to have heart disease or stroke.

- **Nerve damage from diabetes (diabetic neuropathy).** Too much sugar can injure the walls of the tiny blood vessels (capillaries) that nourish the nerves, especially in the legs. This can cause tingling, numbness, burning or pain that usually begins at the tips of the toes or fingers and gradually spreads upward.

  Damage to the nerves related to digestion can cause problems with nausea, vomiting, diarrhea or constipation. For men, it may lead to erectile dysfunction.

- **Kidney damage from diabetes (diabetic nephropathy).** The kidneys hold millions of tiny blood vessel clusters (glomeruli) that filter waste from the blood. Diabetes can damage this delicate filtering system.
- **Eye damage from diabetes (diabetic retinopathy).** Diabetes can damage the blood vessels of the eye. This could lead to blindness.
- **Foot damage.** Nerve damage in the feet or poor blood flow to the feet increases the risk of many foot complications.
- **Skin and mouth conditions.** Diabetes may leave you more prone to skin problems, including bacterial and fungal infections.
- **Hearing impairment.** Hearing problems are more common in people with diabetes.
- **Alzheimer's disease.** Type 2 diabetes may increase the risk of dementia, such as Alzheimer's disease.
- **Depression related to diabetes.** Depression symptoms are common in people with type 1 and type 2 diabetes.

Prevention

Type 1 diabetes can't be prevented. But the healthy lifestyle choices that help treat prediabetes, type 2 diabetes and gestational diabetes can also help prevent them:

- **Eat healthy foods.** Choose foods lower in fat and calories and higher in fiber. Focus on fruits, vegetables and whole grains. Eat a variety to keep from feeling bored.
- **Get more physical activity.** Try to get about 30 minutes of moderate aerobic activity on most days of the week. Or aim to get at least 150 minutes of moderate aerobic activity a week. For example, take a brisk daily walk. If you can't fit in a long workout, break it up into smaller sessions throughout the day.
- **Lose excess pounds.** If you're overweight, losing even 7% of your body weight can lower the risk of diabetes. For example, if you weigh 200 pounds (90.7 kilograms), losing 14 pounds (6.4 kilograms) can lower the risk of diabetes.

  But don't try to lose weight during pregnancy. Talk to your provider about how much weight is healthy for you to gain during pregnancy.

To keep your weight in a healthy range, work on long-term changes to your eating and exercise habits. Remember the benefits of losing weight, such as a healthier heart, more energy and higher self-esteem.

Sometimes drugs are an option. Oral diabetes drugs such as metformin (Glumetza, Fortamet, others) may lower the risk of type 2 diabetes. But healthy lifestyle choices are important. If you have prediabetes, have your blood sugar checked at least once a year to make sure you haven't developed type 2 diabetes.

Treatment:

Moderate diet

Physical Exercise

Treatment should be done under the supervision of qualified diabetelogist.

Sulfonylurea derivatives.

Medicaton

7d) Immunity:

Immunity is the ability of the body to defend itself against disease-causing organisms. Everyday our body comes in contact with several pathogens.

Immunity refers to the body's ability to prevent the invasion of pathogens. Pathogens are foreign disease-causing substances, such as bacteria and viruses, and people are exposed to them every day. Antigens are attached to the surface of pathogens and stimulate an immune response in the body. An immune response is the body's defense system to fight against antigens and protect the body.

Immunity process can be occur through mechanisms 1. Cell immune mediated and 2. Humoral

Phagocytosis and antibody formation are responsible for the immunity.

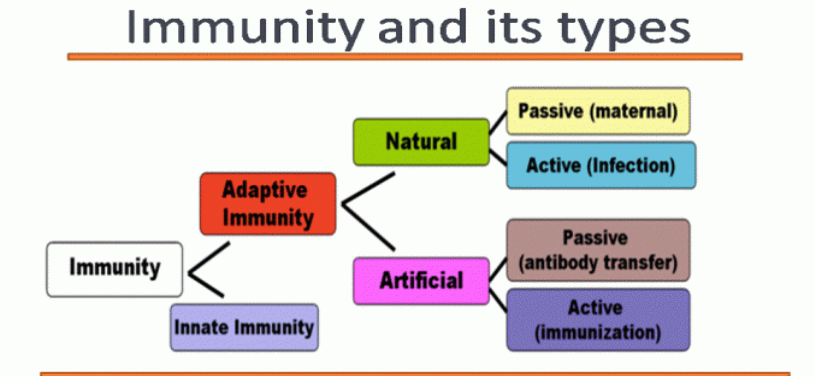
Phagocytosis:

It may be defined as the ingestion of micro organisms by certain cells of the body whereby they are rendered harmless. When microorganisms enter the body more and more WBCs collect at the site of infection and starts the cell eating process.

Anti body production: Antibodies are produced when the pathogenic microorganisms invade into the bodies to kill them or their toxins.

MODAL ANSWER

Classification:



MODEL ANSWER

ODISHA STATE BOARD OF PHARMACY

D. Pharm Part – I E. R. 1991 2022 Special examination

Subject: HUMAN ANATOMY & PHYSIOLOGY (Theory)

Full Mark -80 Time -3 hrs.

1. (A) Write the functions of followings : (1x10)

i) **Heart-** It's the muscle at the center of your circulatory system. It pumps blood around your body as the heart beats. This blood sends oxygen and nutrients to all parts of the body and carries away unwanted carbon dioxide and waste products.

ii) **Joint-** Joints are the points of the body where two bones meet. There is often movement between them but sometimes there is not. A joint has two main functions: to allow mobility of the skeletal system and to provide a protective enclosure for vital organs.

iii) **Kidney-** The main job of the kidneys is to remove waste from the blood and return the cleaned blood back to the body. Each minute about one liter of blood – one-fifth of all the blood pumped by the heart – enters the kidneys through the renal arteries.

iv) **Alveoli-** The alveoli are an important part of the respiratory system. They are responsible for moving oxygen into, and CO2 out of, the bloodstream.

v) **Platelets-** Their primary function is to prevent and stop bleeding. If a blood vessel is damaged, the body sends signals to platelets which cause them to travel to the injured area. Once the platelets arrive at the site, they clump together to form a clot that helps stop bleeding.

vi) **Nucleus-**

- control of the genetical information of the cell and thus the heredity characteristics of an organism, control of the protein and enzyme synthesis.
- control of cell division and cell growth.
- storage of DNA, RNA and ribosome.

vii) **Mitochondria-** Mitochondria's primary function is to produce energy through the process of oxidative phosphorylation. Besides this, it is responsible for regulating the metabolic activity of the cell. It also promotes cell multiplication and cell growth.

viii) **Oxytocin -** The two main functions of oxytocin are to stimulate uterine contractions in Labour and childbirth and to stimulate contractions of breast tissue to aid in lactation after childbirth.

ix) **TSH-** TSH is a hormone your pituitary gland makes. It stimulates your thyroid gland to produce T4 and T3 (triiodothyronine) hormones. A TSH test is the best way to initially assess thyroid function.

x) **Muscular tissue**- One of the most predominant characteristics of skeletal muscle tissue is its contractility and nearly all movement in the body is the result of muscle contraction. Four functions of muscle contraction are movement, posture, joint stability, and heat production.

(B) Differentiate between: (2x5)

i) **Cell & Tissue**- Cells are defined as the smallest, structural, and functional unit of an organism, which is characteristically microscopic. Tissues are defined as the distinct types of material consisting of specialized cells and their products.

ii) **Adduction & Abduction**- Abduction is a movement away from the midline – just as abducting someone is to take them away. For example, abduction of the shoulder

raises the arms out to the sides of the body. Adduction is a movement towards the midline. Adduction of the hip squeezes the legs together.

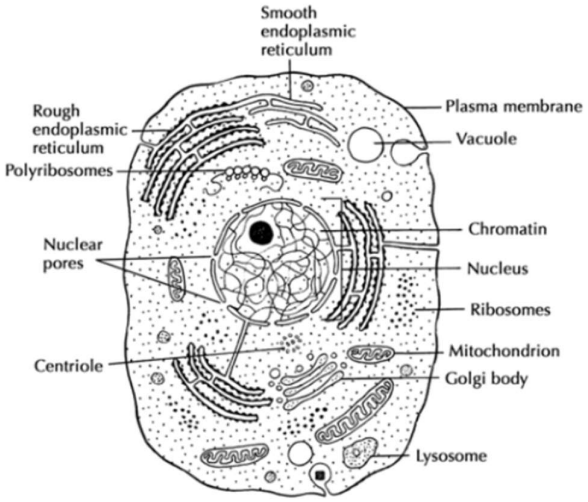
iii) **Pronation & Supination**- Supination and pronation are terms used to describe the up or down orientation of your hand, arm, or foot. When your palm or forearm faces up, it's supinated. When your palm or forearm faces down, it's pronated.

iv) **RBC & WBC**- The main difference between RBCs and WBCs is their function. RBCs carry oxygen throughout the body, while WBCs fight off infection. RBCs are also smaller and have a concave shape, while WBCs are larger and have different shapes. Finally, RBCs contain haemoglobin, while WBCs do not.

v) **Heart Rate & Stroke Volume**- Cardiac output is the product of heart rate (HR) and stroke volume (SV) and is measured in liters per minute. HR is most commonly defined as the number of times the heart beats in one minute. SV is the volume of blood ejected during ventricular contraction or for each stroke of the heart.

2. Define Cell. Draw neatly labelled diagram of Human cell. Write the various parts of cellular components with their functions. (2+3+10)

Ans. **Defination**: A cell is defined as the smallest, basic unit of life that is responsible for all of life's processes.



- **Nucleus**
  Known as the cell's "command center," the nucleus is a large organelle that stores the cell's DNA (deoxyribonucleic acid). The nucleus controls all of the cell's activities, such as growth and metabolism, using the DNA's genetic information. Within the nucleus is a smaller structure called the nucleolus, which houses the RNA (ribonucleic acid). RNA helps convey the DNA's orders to the rest of the cell and serves as a template for protein synthesis.
- **Ribosomes**
  Ribosomes are the protein factories of the cell. Composed of two subunits, they can be found floating freely in the cell's cytoplasm or embedded within the endoplasmic reticulum. Using the templates and instructions provided by two different types of RNA, ribosomes synthesize a variety of proteins that are essential to the survival of the cell.
- **Lysosomes**

- Lysosomes are one type of secretory vesicle with membranous walls, which formed by the Golgi apparatus. They contains a variety of enzymes involved in breaking down fragments of organelles and large molecules(e.g. RNA,DNA,cabohydrates,proteins) inside the cell. Lysosomes in white blood cells contain enzymes that digest foreign material such as microbes.
- **Endoplasmic reticulum**
  The endoplasmic reticulum (ER) is a membranous organelle that shares part of its membrane with that of the nucleus. Some portions of the ER, known as the rough ER, are studded with ribosomes and are involved with protein manufacture. The rest of the organelle is referred to as the smooth ER and serves to produce vital lipids (fats).
- **Golgi apparatus**
  If the proteins from the rough ER require further modification, they are transported to the Golgi apparatus (or Golgi complex). Like the ER, the Golgi apparatus is composed of folded membranes. It searches the protein's amino acid sequences for specialized "codes" and modifies them accordingly. These processed proteins are then stored in the Golgi or packed in vesicles to be shipped elsewhere in the cell.
- **Mitochondria**
  The "powerhouses" of the cell, mitochondria are oval-shaped organelles found in most eukaryotic cells. As the site of cellular respiration, mitochondria serve to transform molecules such as glucose into an energy molecule known as ATP (adenosine triphosphate). ATP fuels cellular processes by breaking its high-energy chemical bonds. Mitochondria are most plentiful in cells that require significant amounts of energy to function, such as liver and muscle cells.

3. Describe the different parts of respiratory system with a neat labelled diagram, Briefly write down the physiology of respiration. **(7+8)**

Respiratory System:

A respiratory system is a system of organs functioning in respiration and in humans comprising the nose, nasal passages, pharynx, larynx, trachea, bronchi, and lungs. The respiratory system is the network of organs and tissues that help with breathing.

Oral cavity:

1. The mouth, or oral cavity, is the first part of the digestive system. The lips, cheeks, and palate form the boundaries.
2. It is adapted to receive food by ingestion, breaking it into smaller particles by chewing, and mixing it with saliva.

Nasal cavity

1. The nasal cavity is on top of the bone that forms the roof of the mouth and curves back to connect with the throat.
2. It helps to keep your nose moist by making mucus.

Larynx

1. The larynx is located within the front of the neck, in front of the lower part of the pharynx, and superior to the trachea.
2. It helps in breathing, voice production, and swallowing food.

Pharynx

1. The pharynx is a hollow tube that starts at the back of the nose, runs down the neck, and ends at the top of the trachea and esophagus.
2. It performs both respiratory and digestive functions.

Trachea

1. The trachea is a tube-like structure within the neck and upper chest.
2. The main function of the trachea is to provide a clear airway for air to enter and

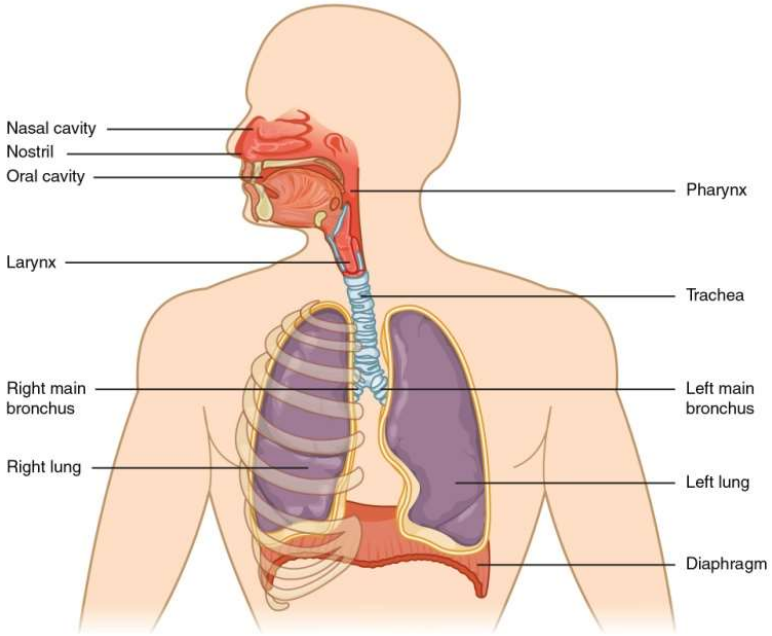
exit the lungs.

Bronchi

1. The bronchi are large tubes that connect to the trachea (windpipe).
2. The bronchi function to carry the inhaled air through the functional tissues of the lungs, called alveoli.

Lungs

1. The lungs are located in the chest cavity on either side of the breastbone and are divided into five main sections (lobes).
2. The main role of the lungs is to transfer life-sustaining oxygen to the blood supply.
3. The alveoli are the site of the lung where the exchange of oxygen and carbon dioxide takes place between blood and alveoli during the process of breathing in and breathing out.
4. This process of breathing maintains the respiratory gasses.



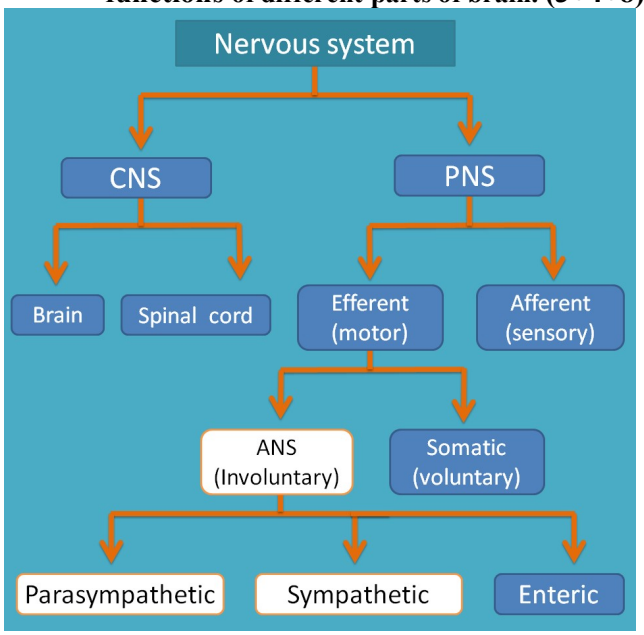
Mechanism of respiration

1. In humans, respiration takes place in two phases, i.e. inspiration and expiration.
2. The process of inhaling air into the lungs is an inspiration.
3. At the time of inspiration, the contraction of diaphragm muscles takes place and the diaphragm moves downward.
4. This leads to an increase in the volume of the chest cavity and the pressure of air within the chest cavity reduces.
5. The oxygenated air present external to the body is at a high-pressure flow briskly into the lungs.
6. The oxygenated air in the lungs reaches the alveoli.
7. The passing of oxygen takes place via the walls of the alveoli into the blood found in the blood capillaries.
8. The oxygen is then innervated to all the body tissues.
9. From the tissues, the waste components like carbon dioxide are captivated by the

blood and are carried to the lungs' alveoli for expiration.

10. The process of exhaling air from the lungs is expiration.
11. At the time of expiration, the diaphragm muscles relax and the diaphragm moves upward.
12. This leads to a decline in the chest cavity volume.
13. The air pressure within the chest cavity enhances, which pushes the carbon dioxide out from the body.

4. Classify nervous system. What are the branches of A.N.S? Write briefly functions of different parts of brain. (3+4+8)



Division of ANS: The two divisions of the autonomic nervous system are the **sympathetic division and the parasympathetic division.** The sympathetic system is associated with the fight-or-flight response, and parasympathetic activity is referred to by the epithet of rest and digest. Homeostasis is the balance between the two systems.

Functions of different parts of brain:

Cerebrum

The cerebrum is the largest part of the brain. It's divided into two halves, called hemispheres. The two hemispheres are separated by a groove called the great longitudinal fissure. The corpus callosum connects the two hemispheres, thus allowing the brain to deliver messages from one side to the other.

Each hemisphere of the cerebrum is divided into broad regions called lobes. Each lobe is associated with different functions:

- **Frontal lobes.** The frontal lobes are the largest of the lobes. As indicated by their name, they're located in the front part of the brain. They coordinates high-level behaviors, such as motor skills, problem-solving, judgment, planning, and attention. The frontal lobes also manage emotions, personality, and temper.
- **Parietal lobes.** The parietal lobes are located behind the frontal lobes. They're involved in organizing and interpreting sensory information from other parts of the brain.
- **Temporal lobes.** The temporal lobes house the auditory cortex. They are located on either side of the head on the same level as the ears. They coordinate specific functions, including hearing, visual memory (such as facial recognition), verbal memory (such as understanding language), and interpreting the emotions and reactions of others.

- **Occipital lobes.** The occipital lobes are located in the back of the brain. They're heavily involved in the ability to read and recognize colors and shapes.

Cerebellum

The cerebellum is located in the back of the brain, just below the occipital lobes. It's involved with fine motor skills, which refers to the coordination of smaller, or finer, movements, especially those involving the hands and feet.

The cerebellum also helps the body maintain its posture, equilibrium, and balance.

Diencephalon

The diencephalon is located at the base of the brain. It contains the:

- thalamus
- subthalamus
- epithalamus
- hypothalamus

The thalamus acts as a kind of relay station for signals coming into the brain. It's also involved in alertness, pain sensations, and attention.

The epithalamus serves as a connection between the limbic system and other parts of the brain. The limbic system is a part of the brain that's involved with emotion.

The hypothalamus processes information that comes from the autonomic nervous system. Its role includes controlling eating, sleeping, and sexual behavior. Some specific actions the hypothalamus is responsible for include:

- maintaining daily physiological cycles, such as the sleep-wake cycle
- controlling appetite
- regulating body temperature
- controlling the production and release of hormones

Brain stem

The brain stem is located in front of the cerebellum and connects to the spinal cord. It's responsible for passing messages to various parts of the body and the cerebral cortex. It consists of three major parts:

- **Midbrain.** The midbrain helps control eye movement, processes visual and auditory information, regulates motor movements, and is involved in arousal and wakefulness.
- **Pons.** This is the largest part of the brain stem. It's located below the midbrain. It's a group of nerves that help connect different parts of the brain. The pons also contains the start of some of the cranial nerves. These nerves are involved in facial movements and transmitting sensory information, as well as breathing.
- **Medulla oblongata.** The medulla oblongata is the lowest part of the brain. It acts as the connection between the brain stem and spinal cord. It also acts as the control center for the function of the heart and lungs. It helps regulate many important functions, including motor and sensory functions, breathing, sneezing, and swallowing.

5. Describe different parts of eye with diagram. Discuss the physiology of vision. (10+5)

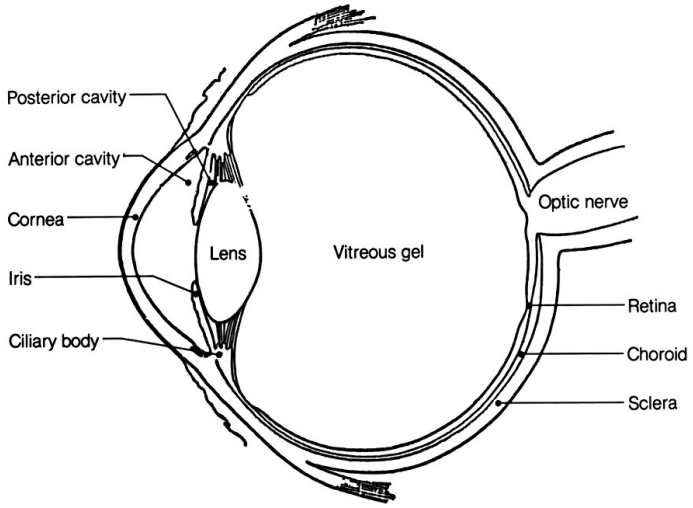
Parts of the Human Eye

- **Pupil**: The pupil is a small opening in the iris. The iris controls the size of the pupil. The pupil's function is to adjust the amount of light entering the eye.
- **Sclera**: The outer covering of the eye is called the sclera. It is a protective tough white layer (white part of the eye).
- **Cornea**: The transparent part in front of the sclera is called the cornea. Light enters the eye through the cornea.
- **Iris**: It is a dark, muscular tissue and ring-like structure present behind the cornea. The colour of the eye is due to the colour of the iris. The iris regulates the amount and intensity of light entering the eyes by adjusting the size of the iris.
- **Retina**: It is the light-sensitive layer that consists of nerve cells. Its function is to

convert the images formed by the lens into electrical impulses. These electrical impulses are then transmitted through optic nerves to the brain.

- **Lens**: The transparent portion situated behind the pupil is called the lens. The lens alters the shape to focus light on the retina, with the help of ciliary muscles. It becomes small to focus on objects at a distance and becomes big to focus on nearby objects.
- **Optic Nerves:** You can find two types of optic nerves, which are cones and rods.

1. **Cones**: Cones are the nerve cells that are more sensitive to bright light. Cones help in central and colour vision.
2. **Rods**: Rods are the nerve cells that are more sensitive to dim lights. Rodes help in peripheral vision.



Physiology of vision:

1. **RETINAL IMAGE FORMATION**:

This requires four basic processes,

- Refraction of light rays.
- Accomodation of the lens.
- Constriction of pupil.
- Convergence of eyes.

Light rays entering the eye from the air are refracted at the anterior surface of the cornea, posterior surface of the cornea, anterior surface of the lens and posterior surface of the lens. The degree of refraction that takes place at each surface is very precise and such that rays fall at the fovea centralis.

The lens of the eye is Biconvex. Furthermore, it has the unique ability to change the focusing power of the eye by becoming moderately curved at one moment and greatly curved the next. This change in curvature of lens is known as accommodation. In far vision, the ciliary muscle contracts pulling the ciliary process and choroid forward towards the lens. This causes shortening, thickening and bulging of the lens and thereby increasing the curvatures.

Constriction of pupil occurs in response to light reflex involving automonic nervous system and it is purely the function of smooth muscles of iris i.e. constrictor or circular muscles of iris.

2. CONVERGENCE IN PHYSIOLOGY OF VISION:

Human eyes are such that they focus on only one set of the object (single binocular vision). This type of vision is possible due to the phenomenon called Convergence. Convergence refers to the medial movement of the two eye-balls so that they are directed towards the object being viewed.

Convergence is the function of the voluntary muscles attached to the outside of the eye-ball called extrinsic eye muscles. These are superior rectus, inferior rectus, medial rectus, lateral rectus, superior oblique and inferior oblique.

3. STIMULATION OF PHOTORECEPTORS:

After the formation of image on the retina, it is converted into nerve impulses. The steps involved in the generation of nerve potentials are activation of rhodopsin and/or iodopsin of rods and cones respectively.

Hyperpolarization occurs as a result of activation of these pigments in response to light. These impulses are then passed through optic nerve to the thalamus. Here the fibres synapse with other neurons whose axons pass to the visual areas of the cerebral cortex located in the occipital lobe.

6. **What do you mean by endocrine glands? Classify them. Briefly discuss about the formation, function and disorders of thyroid hormones. (2+4+9)**

Endocrine glands

Endocrine glands are ductless glands of the endocrine system that secrete their products, hormones, directly into the blood.

Endocrine gland	Secretion/Hormone
• Pituitary gland	Growth hormone, Thyroid stimulating hormone, Luteinizing hormone, Follicle stimulating hormones, Prolactin, Adenocorticoid trophin hormone, Antidiuretic hormone, Oxytocin
• Hypothalamus	Growth hormone Releasing hormone, Growth hormone inhibitory hormone, Thyrotropin releasing hormone, Corticotropin releasing hormone, Gonadotropin releasing hormone,
• Pineal gland	Melatonin
• Thymus	Thymosin
• Parathyroid	Parathyroid hormone
• Thyroid	Thyroxine
• Pancreas	Insulin, Glucagon
• Adrenal	Adrenaline, Noradrenaline, Cortisone, Aldosterone
• Testis	Testosterone
• Ovary	Estrogen, Progestrone

Thyroid gland

The thyroid hormones are secreted by the thyroid gland, which is located in front of the neck. These hormones are integral in the regulation of many functions and aspects of the human body, such as temperature regulation, energy levels, weight, hair, nail growth and more.

What are the Thyroid hormones?

The thyroid gland produces two hormones:

- Triiodothyronine (T3)
- Thyroxine (T4)

Triiodothyronine (T3)

T3 is produced by the thyroid gland as well as in other tissues, via the removal of iodine from Thyroxine (T4).

Thyroxine (T4)

T4 is also produced by the thyroid gland under the regulation of the pituitary gland and the hypothalamus. It is secreted into the bloodstream and travels to organs such as the kidneys and liver. Here, thyroxine is converted into its active form – triiodothyronine.

What are the Functions of the Thyroid Hormones?

- Thyroid hormones help with brain development and function
- It also helps with muscle control as well as bone health
- Regulates the metabolic rate of the body
- Also regulates the metabolism of fat, proteins and carbohydrates
- Thyroid hormones also help with protein synthesis
- Increases the body's sensitivity to catecholamines
- Essential for the development and differentiation of cells

Thyroid Hormone Disorders

A hormone is a chemical messenger that regulates various functions in the body. Hence, if there is an imbalance, it can lead to drastic health repercussions.

- Thyrotoxicosis is a condition where there is excess triiodothyronine in the bloodstream
- Inflammation of the thyroid or a benign tumour can result in conditions such as Hyperthyroidism
- Hypothyroidism is a condition where the thyroid gland does not produce enough thyroid hormone
- Tumours in the pituitary gland can also cause hypothyroidism
- Most cases of hypothyroidism are hereditary and are common among women
- Common symptoms of hypothyroidism include weight gain, depression, constipation and tiredness.

7. **Write short notes on any three of the followings: (3x5)**

i) Digestion and absorption of carbohydrates.

Digestion of Carbohydrates

Before the body can use the food that is eaten, it must be "digested" (i.e. broken down) into its basic nutrient components. The digestive system works like a giant food processor. During digestion, starches and sugars are broken down both mechanically (e.g. through chewing) and chemically (e.g. by enzymes) into the single units glucose, fructose, and/or galactose, which are absorbed into the blood stream and transported for use as energy throughout the body. Digestion of starches into glucose molecules starts in the mouth, but primarily takes place in the small intestine by the action of specific enzymes secreted from the pancreas (e.g. α-amylase and α-glucosidase). Similarly, the disaccharides sucrose, lactose, and maltose are also broken down into single units by specific enzymes.

Absorption of Carbohydrates

The end products of sugars and starches digestion are the monosaccharides glucose, fructose, and galactose. Glucose, fructose, and galactose are absorbed across the membrane of the small intestine and transported to the liver where they are either used by the liver, or further distributed to the rest of the body

ii) Human ear

Ans. **Structure of Ear:**

The human ear consists of three parts:

- External ear
- Middle ear
- Internal ear

Human Ear Parts

The human ear parts are explained below:

External Ear

The external ear is further divided into the following parts:

Auricle (Pinna)

The auricle comprises a thin plate of elastic cartilage covered by a layer of skin. It consists of funnel-like curves that collect sound waves and transmits them to the middle ear. The lobule consists of adipose and fibrous tissues supplied with blood capillaries.

External Auditory Meatus

It is a slightly curved canal supported by bone in its interior part and cartilage in the exterior part. The meatus or the canal is lined with stratified epithelium and wax glands.

Tympanic Membrane

This membrane separates the middle ear and the external ear. This part receives and amplifies the sound waves. Its central part is known as the umbo.

Middle Ear

The middle ear comprises the following parts:

Tympanic Cavity

It is a narrow air-filled cavity separated from the external ear by tympanic membrane and from inner ear by the bony wall. The tympanic cavity has an auditory tube known as the eustachian tube in its anterior wall.

Eustachian Tube

The eustachian tube is a 4cm long tube that equalizes air pressure on either side of the tympanic membrane. It connects the tympanic cavity with the nasopharynx.

Ear Ossicles

These are responsible for transmitting sound waves from the eardrum to the middle ear. There are three ear ossicles in the human ear:

- **Malleus:** A hammer-shaped part that is attached to the tympanic membrane through the handle and incus through the head. It is the largest ear ossicle.
- **Incus:** An anvil-shaped ear ossicle connected with the stapes.
- **Stapes:** It is the smallest ossicle and also the smallest bone in the human body.

Inner Ear

It comprises two parts:

- Bony labyrinth
- Membranous labyrinth

The mechanism of hearing involves the following steps:

- The sound waves pass through the auditory canal and reach the eardrum.
- The vibrations produced pass through the tympanic membrane to the tympanic cavity.
- The ear ossicles in the tympanic cavity receive the vibrations and the stapes pushes the oval window in and out.
- This action is passed on to the organ of corti, the receptor of hearing, that contains tiny hair cells that translate the vibrations into an electrical impulse that are transmitted to the brain by sensory nerves.

iii) ECG

Ans. An electrocardiograph or ECG is a test used to measure the electrical activity of the heart. The test takes only about a few minutes and is devoid of any pain.

Explanation of the Electrocardiograph

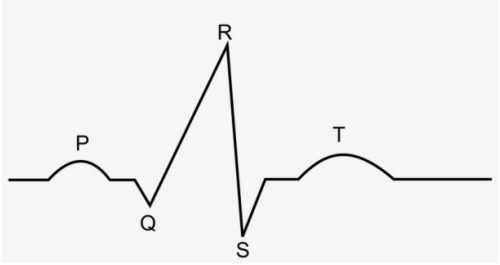
P to T in the graph represents a specific activity of the heart. Let's break it down.

- The P wave is the electrical excitation of the atria, or depolarization, initiating atrial contraction.
- The QRS complex is the depolarization of ventricles, initiating ventricular contraction. Marking the beginning of the systole.
- T wave means the return of ventricles to the normal state (repolarization). Marking the end of the systole.

By counting the number of QRS complexes we can evaluate the heartbeat rate of the patient. Any deviations in this shape results in heart diseases or an abnormal heart rhythm which can either be slow, irregular or very fast heartbeats. Hence it is essential equipment in the field of medicine.

The main goal of electrocardiography is to obtain information regarding the heart's electrical impulses. This means it can find evidence of past heart attacks or even any undiagnosed heart disease. The medical uses of such information are very valuable and grant a deeper insight into conditions like :

- Seizures
- Fainting
- Pulmonary embolism
- Cardiac dysrhythmias
- Myocardial infarction or heart attack
- Arrhythmia
- Deep vein thrombosis
- Ventricular hypertrophy



Why is an ECG done?

An electrocardiograph is done for the following reasons:

- To check the heart health in case of other diseases such as diabetes, high blood pressure, high cholesterol, etc.
- To check the thickness of the chambers of the heart wall.
- To monitor if the medicines are causing any side-effects.
- To check if the mechanical devices implanted in the heart are working properly or not.

iv) Lymph

Ans. Lymph is the fluid that circulates throughout the lymphatic system. The lymph is formed when the interstitial fluid (the fluid which lies in the interstices of all body tissues)is collected through lymph capillaries. It is then transported through larger lymphatic vessels to lymph nodes, where it is cleaned by lymphocytes, before emptying ultimately into the right or the left subclavian vein, where it mixes back with the blood.

Lymph consists of the following components:

1. Carbohydrates
2. Lymphocytes
3. Creatinine
4. Water – 94%
5. Urea
6. Chlorides
7. Enzymes
8. Very low amount of fat
9. Proteins – Albumin, globulin, and fibrinogen

The functions of the lymph are as follows:

1. It is used to supply nutrients to the body.
2. It is used to remove the metabolic wastes from the tissue cells.

3. It is used to maintain the composition of tissue fluid.
4. It is used to absorb the fats from the small intestine through lymphatic vessels.
5. It is used to act against the pathogenic infections of microbes.

v) Blood grouping

1. There are some proteins in the blood called antibodies and antigens which differ from person to person.
2. Antibodies are found in plasma and antigens are found on the surface of RBCs.
3. There are two types of antigens and antibodies.
4. The two antigens are A and B and two types of antibodies are also named A and B.
5. On the basis of antigens and antibodies there are four types of blood groups:
    - Blood group A consists of antigen A and antibody B.
    - Blood group B consists of antigen B and antibody A.
    - Blood group AB contains antigens A and B but lacks antibodies.
    - Blood group O lacks both antigens but contains antibodies A and B

D.PHARM PART-I **E.R. 1991** **2022 SPECIAL EXAMINATION**

SUBJECT: BIO-CHEMISTRY & CLINICAL PATHOLOGY(THEORY)

FULL MARK: 80 **TIME: 3hr**

(Answer any five questions including question no. 1)

Q1. (A) Define the following terms: **[1x20]**

a) Haematuria: Excretion of blood in urine is called Haematuria. It indicates haemorrhage in the urinary tract. It is caused due to injury to kidney or urinary tract, infection of urinary tract, tumours in urinary tract, excess intake of drugs like salicylates and anticoagulants, etc.

b) Anaemia: It is a decrease in no. of Red Blood Cells (RBCs) or less than the normal quantity of haemoglobin in the blood.

c) ESR (Erythrocyte Sedimentation Rate): It is the rate at which RBCs sink to the bottom (when placed in a vertical column after adding an anticoagulant). ESR can be determined by two methods i.e. Westergreen method and the Wintrobe method. The normal values of ESR are,

5-15 mm in 1 hour for men

5-20 mm in 1 hour for women.

d) Gluconeogenesis: It is the formation of glucose from non-carbohydrate sources like amino acid, lactic acid, and glycerol. It mainly occurs in the liver and kidney.

e) Lymphoma: They are malignancies of lymphocytes. They manifest in the form of tumours of lymphoid tissues anywhere in the body, especially in the lymph nodes. Lymphomas are mainly classified into two types i.e., Hodgkin's Lymphoma and Non-Hodgkin's Lymphoma.

f) Iodine number: It is the number of grams of Iodine absorbed by 100 grams of fat. It is the measurement of the degree of unsaturation of Fat.

g) Zwitter ion: A zwitter ion is an ion with functional groups, of which at least one has a positive and one has a negative electrical charge. The net charge of the entire molecule is zero & it exists in isoelectric pH It carries equal number of positive & Negative charges. For example, amino acids.

h) Metabolism: Metabolism is defined as biochemical changes occurring in a living system which facilitate energy changes or transfer of biomolecules. It involves two opposite processes like Catabolism & Anabolism.

i) Hypervitaminosis-A: It is a disorder in which there is too much vitamin-A present in the body. Excess of vitamin-A can produce joint pain, thickening of bones and loss of hair.

j) LDL (Low-Density Lipoprotein): LDL is neither synthesized by the liver nor by the intestine, but it is derived from the metabolism of VLDL. As compared to VLDL, LDL has more density. LDL is composed of 80% lipids and 20% proteins. LDL is rich in cholesterol and serves to transport cholesterol from liver to extrahepatic tissue. Normal range:100-129 mg/dl.

k) Lymphocyte: Lymphocytes are non-granular leucocytes. They are small round cells. They are present not only in the blood but also in lymph, lymphoid organs and many other tissues. Lymphocytes constitute 20-25% of the leucocytes. Mainly lymphocytes are involved in the immunological reactions. Lymphocytes contain T cells and B cells.

l) Osteomalacia: The dietary deficiency of vitamin D causes Osteomalacia. It is also called as adult rickets. In osteomalacia, demineralization of bones occur which makes them weak and susceptible to fractures.

m) Agranulocytosis: It is a condition in which the absolute neutrophil count is less than 100 neutrophils per microlitre of blood.

n) Saponification Value: It is the number of milligrams of KOH required to saponify 1 gram of fat or oil.

o) Hypernatremia: It is an increase in plasma sodium concentration. It occurs in dehydration, diabetes insipidus, Excessive I.V administration of Saline and administration of steroid hormones.

p) Isoenzyme: These are the enzymes obtained from different sources and have different physical and chemical characteristics. But they catalyse the same chemical reaction. For example, LDH exists in five different forms i.e. LDH_1, LDH_2, LDH_3, LDH_4, and LDH_5.

q) Oligopeptide: A short chain of amino acids / peptide sequences ranging from 2 to 20 amino acids are known as an oligopeptide. For example, dipeptides, tripeptides, tetrapeptides and pentapeptides.

r) Rickets: It occurs in children due to the deficiency of calcium. Also, it occurs in deficiency of vitamin D.

s) Kwashiorkor: It is a disease of protein energy malnutrition. It occurs in children when they change from breast feeding to a diet low in protein. The features are, retarded growth, and skin changes like pigmentation, ulceration, hair is thin, vomiting and diarrhoea.

t) Maltose: It is composed of two molecules of glucose. It is a reducing sugar.

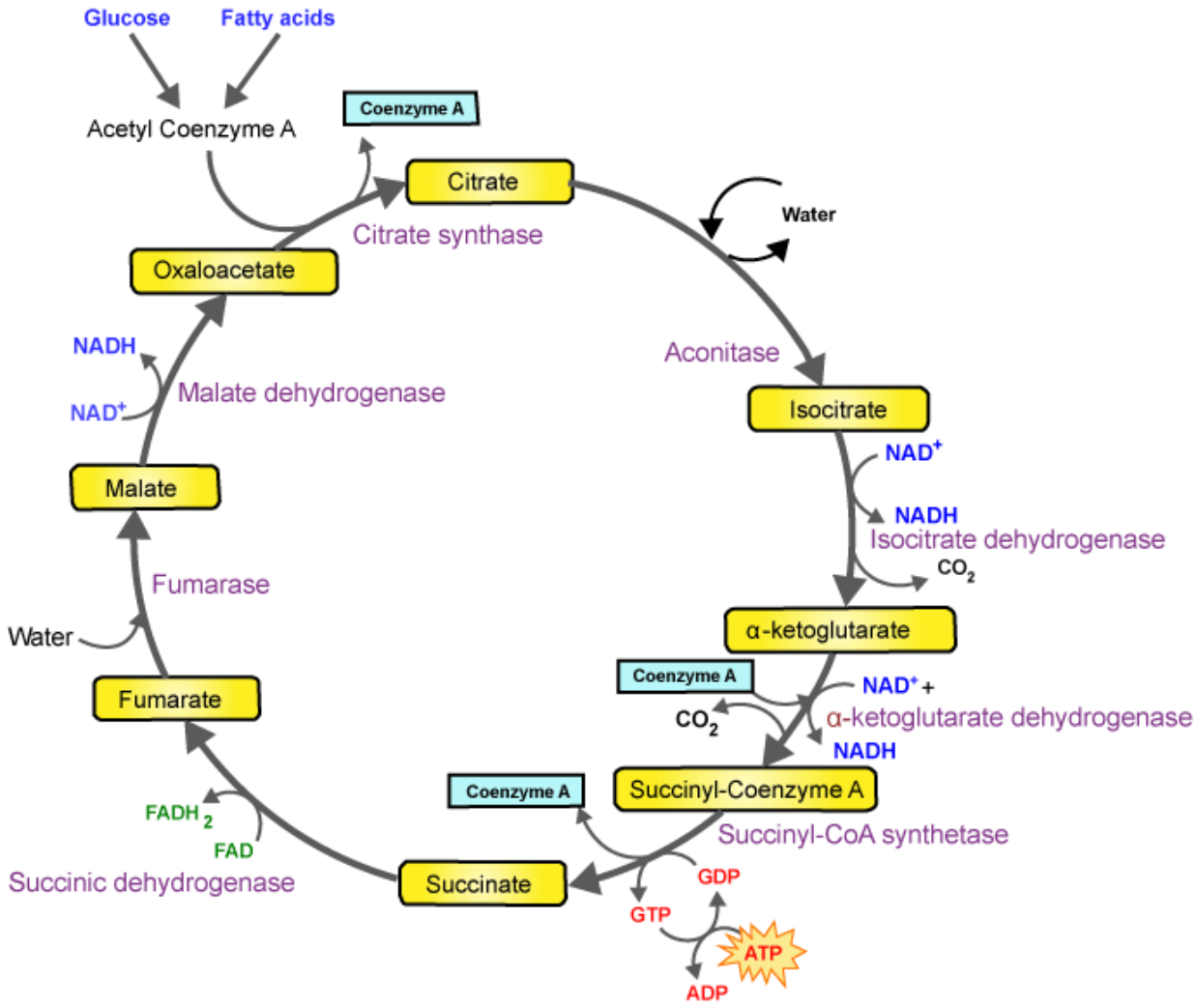
Q2. Describe TCA cycle and calculate total number of ATPs formed in it. Write about abnormalities of carbohydrate metabolism. [8+4+3]

TCA CYCLE

- It is also called as citric acid cycle or Kreb's cycle.
- In the anaerobic pathway of glycolysis, glucose is oxidised to pyruvate. Later, pyruvate is metabolised to acetyl CoA.
- Further metabolism of acetyl CoA to CO_2 and occurs in the citric acid cycle. It is an aerobic pathway. The reactions of the citric acid cycle occur in mitochondria.
- The reactions of the citric acid cycle are as follows**,**
  1. **Acetyl CoA to citrate:** Acetyl CoA combines with Oxaloacetate to form citrate. This reaction is catalysed by the enzyme citrate synthetase.
  2. **Citrate to isocitrate:** The two steps of this reaction are i) citrate is dehydrated to aconitate. ii) aconitate is rehydrated to form isocitrate. This reaction is catalysed by the enzyme aconitase.
  3. **Isocitrate to Oxalosuccinate:** Dehydrogenation of iso-citrate produces oxalosuccinate. It is catalysed by the enzyme isocitrate dehydrogenase**.**
  4. **Oxalosuccinate to a ketoglutarate:** Oxalosuccinate is decarboxylated to form a-ketoglutarate. It is catalysed by the enzyme isocitrate dehydrogenase.

5. **α -ketoglutarate to succinyl COA :** Oxidative decarboxylation of α -ketoglutarate forms succinyl CoA. It is catalysed by α-ketoglutarate dehydrogenase complex. requires the coenzymes TPP, lipoate, NAD, FAD" and CoA.
6. **Succinyl CoA to succinate:** In the next reaction succinyl CoA is converted to succinate. It is catalysed by the enzyme succinate thiokinase. This reaction requires GDP or IDP which is converted to GTP or ITP.
7. **Succinate to fumarate:** Dehydrogenation of succinate produces fumarate. It is catalysed by the enzyme Succinate dehydrogenase.
8. **Fumarate to malate:** In the next reaction fumarate is converted to malate. It is catalysed by the enzyme fumarase**.**
9. **Malate to oxaloacetate:** The molecule with which the citric acid cycle started is oxaloacetate. It is regenerated in this last reaction in which malate is converted to Oxaloacetate. This reaction is catalysed by the enzyme malate dehydrogenase.

The schematic flow sheet of TCA cycle,



Calculate ATP formed in TCA cycle:

Energetics of Citric acid cycle: The following is the calculation for the number of molecules of ATP synthesized in citric acid cycle.

Acetyl CoA	→ Pyruvate	= 3 ATP
Isocitrate	→ Oxalosuccinate	= 3 ATP
α-Ketoglutarate	→ Succinyl CoA	= 3 ATP
Succinyl CoA	→ Succinate	= 1 ATP
Succinate	→ Fumarate	= 2 ATP
Malate	→ Oxaloacetate	= 3 ATP

The total number of ATP synthesized from the TCA cycle is 15.

In glycolysis, one molecule of glucose gives two molecules of pyruvate. These two molecules of pyruvate are converted to acetyl CoA which enter into the citric acid cycle. So the total number of ATP formed in the citric acid cycle is 2x 15 = 30 ATP

Total number of ATP formed from the aerobic oxidation of glucose is 38. It is calculated as follows:

ATP formed from glycolysis= 8 ATP

ATP formed from TCA Cycle= 30 ATP

Total ATP produced = 8 + 30 = 38 ATP

Abnormalities of carbohydrate metabolism

The abnormalities are,

i) **Hyperglycaemia:** It is an increase in blood sugar level above normal. It occurs in diabetes mellitus. It is a disease of insulin deficiency.
ii) **Hypoglycaemia:** It is a decrease in blood sugar level below normal. It occurs most commonly with an overdose of insulin (which is used to treat diabetes mellitus).
iii) **Glycosuria:** The excretion of detectable amount of a sugar in urine is called as glycosuria. Normal urine does not contain sugar. Glycosuria occurs in diabetes mellitus.
iv) **Diabetes mellitus:** It is a disease of carbohydrate metabolism. It occurs due to the deficiency of insulin. As a result, there is an increase in blood glucose level. Also, there is increased excretion of glucose in urine (glycosuria).

Q3. Define proteins and amino acids. Classify amino acids with suitable examples, Explain the Urea formation cycle. [2+6+7]

Proteins : Proteins are high molecular weight polypeptides containing α-amino acid joined together by peptide linkage.

Amino acids : Amino acids are the simplest units(monomers) of proteins. An amino acid consists of a free amino group (NH_2) and a free carboxyl group (-C00H).

Classification of Amino acids with suitable examples

Amino acids can be classified:

a) On the basis of carbon chain present.
b) On the basis of nutritional requirement.
c) On the basis of polarity

- **On the Basis of Carbon Chain Present: It is of 3 types.**

  - ✓ **Aliphatic Amino Acids:**

    Neutral (Mono-amino-Monocarboxylic Acids): For example, glycine, alanine, serine, threonine, valine, leucine, and isoleucine.

    Acidic (Mono-amino-Dicarboxylic Acids): For example, aspartic acid, asparagine, glutamic acid, and glutamine.

    Basic: For example, arginine, lysine, and hydroxylysine.

    Sulphur Containing Amino Acids: For example, cysteine, cystine and methionine.
  - ✓ **Aromatic Amino Acids:** For example, phenylalanine, tyrosine, and thyroxine.
  - ✓ **Heterocyclic Amino Acids:** For example, proline, hydroxy proline, tryptophan, and histidine.

- **On the Basis of Nutritional Requirement: It is of 2 types**
  1) **Essential Amino Acids:** These amino acids are also termed indispensable amino acids. They are not synthesised in the body and are obtained from dietary sources. Examples of such amino acids are valine, isoleucine, tryptophan, methionine, leucine, phenylalanine, threonine, and lysine. Exceptionally, histidine and arginine are indicated as semi-essential amino acids as a little amount of them are synthesised in the body. Deficiency of these amino acids may give adverse effects like retarded growth, weak immunity, early ageing, etc.
  2) **Non-Essential Amino Acids:** These amino acids are also termed as dispensable amino acids, and are synthesised in the body. Examples of these amino acids are glycine, serine, threonine, glutamate, glutamine, aspartate, asparagine, cysteine, and proline.

- **On the Basis of Polarity: It is of 4 types**
  - ❖ **Non-Polar Amino Acids:** These amino acids (e.g., alanine, valine, leucine, isoleucine, phenylalanine, glycine, tryptophan, methionine, and proline) are neutral molecules having equal number of amino and carboxyl groups. The nature of these amino acids is hydrophobic and the 'R side chain does not have any charges.
  - ❖ **Polar Amino Acids with No Charge:** These amino acids do not bear charge on the side chain R', (e.g, serine, threonine, tyrosine, cysteine glutamine, and asparagine), They are involved in hydrogen bonding of protein structure.
  - ❖ **Polar Amino Acids with Positive Charge:** These amino acids, (e.g. lysine, arginine, and histidine) carry more number of amino groups, thus, are basic in nature. The 'R side chain of these amino acids bears a positive charge.
  - ❖ **Polar Amino Acids with Negative Charge:** These amino acids are (e.g, aspartic acid and glutamic acid) acidic in nature because they carry more number of

carboxyl groups. The R' group of these amino acids bears a negative charge. These amino acids are also termed as dicarboxylic mono amino acids.

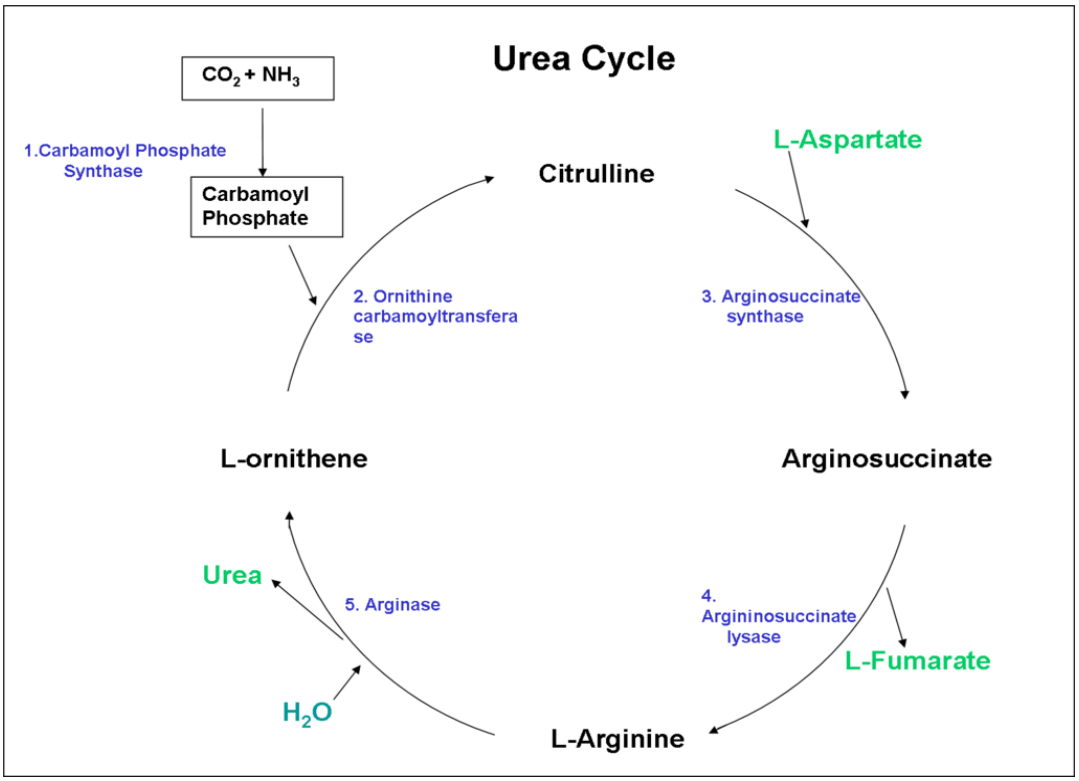
EXPLAIN UREA FORMATION CYCLE

Also called as KREBS - HENSELEIT CYCLE. Ammonia is formed in the various biochemical transformations of amino acids. Ammonia is highly toxic. Urea cycle is a defence mechanism. It converts ammonia into harmless, non-toxic. water soluble urea. Urea cycle occurs in the liver.

Reactions of urea cycle: The 5 steps of urea cycle are as follows,

1) **Formation of Carbamyl phosphate:** Ammonia combines with $C0_2$ (derived from decarboxylation reaction) to form carbamyl phosphate. It is catalysed by the enzyme carbamyl phosphate synthetase. It requires biotin and N-acetyl glutamic acid (AGA) as cofactors. Two molecules of ATP are used in this reaction.
2) **Carbamyl phosphate to Citrulline:** Carbamyl phosphate combines with ornithine to form citrulline. It is catalysed by the enzyme ornithine transcarbamylase.
3) **Citrulline to Arginosuccinate:** Citrulline combines with aspartate to form arginosuccinate. It is catalysed by arginosuccinate synthetase. One molecule of ATP is used in this reaction.
4) **Arginosuccinate to Arginine:** Arginosuccinate is cleaved to form arginine and fumarate. It is catalysed by arginosuccinate lyase.
5) **Arginine to Urea:** Arginine is hydrolysed to urea and ornithine. It is catalysed by the enzyme arginase. Ornithine liberated again combines with carbamoyl phosphate. (1st step in urea cycle). Thus, urea Cycle is repeated. One molecule of urea is synthesised in urea cycle from one molecule of NH_3 and CO_2, 3 molecules of ATP are utilised in this cycle for the synthesis of one molecule of urea.

The schematic flow chart of urea cycle is given below



Q4. Answer any three. **[3x5]**

a) Describe the difference between T and B lymphocytes

T-lymphocytes	B-lymphocytes
T cells are called thymus cells produced by bone marrow but they travel through bloodstream to the thymus gland and mature there.	B cells are called bone marrow cells, produced and matured also in bone marrow.
80% of blood lymphocytes are T cells.	20% of blood lymphocytes are B cells.
Play an important role in cell mediate immunity.	Play an important role in humoral immunity.
It has 3 types i.e., helper T cells, Cytotoxic T cells and Suppressor T cells	It has 2 types i.e., plasma cells and memory cells.
It has a longer life span.	It has shorter lifespan.
Mature cells occur inside lymph nodes.	Mature cells occur outside lymph nodes.
The T cells act against tumour cells or transplants.	The B cells do not act against tumour cells or transplants.
T cells lack the surface antigen recognised outside the infected cells.	B cells recognise the surface antigen of bacteria and virus.

b) What is the role of Blood platelets in health and diseases?

Ans. PLATELETS (Thrombocytes):

- They are round or oval shaped cells with biconcave surface.
- They are roughly one fourth of the size of a RBC.
- They have a diameter of 2 to 4 microns.
- Platelets do not have a nucleus. But cytoplasm contains distinct granules.
- Platelets are synthesized by megakaryocytes (giant cells) of bone marrow.
- They have an average life span of 5 to 10 days and are destroyed in the spleen.
- The normal platelet count is 2 to 5 lakhs per cu.mm of blood.

Role of platelets in health:

1. Thromboplastin liberated from platelets is essential for clotting.
2. They close minute leaks in the walls of blood vessels.
3. They help in body's defence mechanism against bacteria.
4. They contain histamine and serotonin.
5. They contain some antigenic substances also.

Role of platelets in diseases:

The following are disorders of platelets and associated diseases,

1. Thrombocytosis
2. Idiopathic thrombocythemia
3. Thrombocytopenia
4. idiopathic thrombocytopenic purpura

Thrmbocytosis: -

- It is an increase in platelet count above the normal value of 4.5 lakhs per cu.mm of blood.
- It occurs in: Hemorrhage and Hodgkin's disease.

Idiopathic thrombocythemia: -

- It is also called as primary, essential or haemorrhagic thrombocythemia.
- It is characterized by repeated, excessive bleeding especially from mucous membranes.
- The platelet count is extremely high (1000 x 10°per ml of blood).
- It occurs mostly in middle age or old age.

Thrombocytopenia:-

- It is a reduction in the platelet count below 1.5 lakh per cu. mm of blood.
- Bleeding is common.
- The following are the diseases associated with thrombocytopenia: Leukemia, Aplastic anemia, Infections like HIV, Liver diseases, Alcoholism etc.

Idiopathic thrombocytopenic purpura (ITP):-

- It is a disease involving immunologically mediated destruction of platelets.
- It is also called immune thrombocytopenic purpura.
- It is classified into acute and chronic types. In both types, there is bleeding which may be spontaneous or after injury.
- Bleeding occurs in the skin and mucous membranes.
- Bleeding beneath the skin produces characteristic lesions.

c) Short note on Sickle cell Anaemia

Ans:- Sickle cell anaemia is a genetic blood disorder.

Cause: -

- Due to the presence of an abnormal haemoglobin called HbS, produce de-oxygenation & convert RBC into crescent shape. These abnormal RBCs can not pass through small blood capillaries. So, they block these capillaries. This result in loss of blood supply to vital organs and their damage.

Symptoms: -

- In this disease, the red blood cells distort in the shape of a sickle. They are not healthy developments and the cells die early, causing a shortage of healthy red blood cells. Low red blood cells can block blood flow causing pain.
- It can also cause infections, pain and fatigue.
- Patients suffering from sickle cell anaemia can suffer from episodes of pain known as vaso-occlusive crises, which vary in intensity and can last from a few days to weeks.
- The pain crisis can be triggered by illness, over-activity, stress, or lack of hydration at high altitudes. Recurrent episodes of pain can lead to permanent damage to organs like the liver, lungs, kidneys, brain, and bones.

Prevalence: -

- ✓ Research has found that the occurrence of the blood disorder disease is more prevalent in tribal populations compared to non-tribal populations in India.
- ✓ Studies have also shown that sickle cell anaemia is widespread in areas where malaria is endemic.
- ✓ During the 1940s, another relation between these diseases was found according to which people having sickle red blood cells have more chances of surviving malaria.
- ✓ **Indian scenario:** In India, tribal populations have the most malaria caseload. India stood as the 2nd most affected country for cases of predicted births with sickle cell anaemia.

Treatment: -

- For certain children or teenagers, stem cell transplants can be undertaken to treat the condition.
- Sickle cell anaemia is a genetic disorder**.** So completely eliminating it is a challenge. More research and scientific breakthroughs are needed.
- The available treatment is very costly and stem cell transplants or gene therapy is used.
- Blood transfusion from healthy donors is also used.

d)**Short note on function of blood**

Ans Blood is a specialized connective tissue & it is fluid in nature.

- ✓ It circulates in a closed system of vessels.
- ✓ The total volume of blood in the body is about 6 litres.
- ✓ Blood is slightly alkaline with pH of about 7.4.
- ✓ The specific gravity of blood is about 1.055.

Function of blood: -

1) **Transport of Nutrients:** The important nutrients are absorbed by the walls of the small intestine from the digested food and passed into the blood circulation which distributes them to all parts of the body. At the same time, it transports the waste materials to the organs of excretion.
2) **Transport of Excretory Products:** The metabolic activities of the various parts of the body continuously produce harmful substances out of which products like carbon dioxide and urea are highly toxic for the tissue. Blood helps to collect and transport them to the place of their excretion such as kidneys, skin and lungs.
3) **Transport of Respiratory Gases:** The oxygen reaches the lungs during breathing from where it is the blood which carries it to all parts of the body. While returning from the tissue it transports the carbon dioxide up to the lungs for expulsion during the breathing process.
4) **Transport of Hormones:** Blood carries the hormones from the endocrine glands to the place of their action. For example, the hormone epinephrine is released by the adrenal medulla located on the kidney, from where it is carried through blood to the heart. Here it stimulates heart to beat faster when required.
5) **Protection Against Infection:** The immune system of the body against various types of infections works through the blood which is capable of producing antibodies against antigens. Some cells in the blood are called phagocytes due to their phagocytic action while some white blood corpuscles are capable of releasing antitoxins to fight infections.

6) **Clotting of Blood:** The property of blood to form a thick clot over the wound is meant for preventing the excess blood loss and protection of the exposed wound against external infection. Clotting of blood is a complex automatic mechanism explained later in this chapter.
7) **Maintenance of Temperature**: In normal conditions the temperature of the blood remains constant and the same is true for the temperature of the body due to circulation of blood through all the parts. Blood also carries excess heat from the deeper tissue to the surface of the body so that the same can be expelled.
8) **Regulation of pH and Water Balance:** The circulating blood maintains the right pH of body fluid while its own pH is kept at 7.4 due to its slightly alkaline nature. It also helps in the maintenance of water balance in the body. The constancy of water balance between body fluids and blood is necessary for balanced metabolic activities.
9) **Maintenance of Physiological State of Body:** The circulating blood helps in establishing a contact between various organs which work through a type of physiological co-operation.
10) **Transport of Inorganic and Organic Substances:** In addition to the transport of nutrients, excretory products and respiratory gases, blood carries plasma proteins such as albumin globulins, fibrinogen, glucose, amino acids, electrolytes, enzymes and scavenger cells, etc.

Q5. Define and classify Vitamins. Give an account of sources, chemistry and physiological function and deficiency diseases of the followings----------

a) Vitamin B_1 b) Vitamin B_2 c) Vitamin C d) Vitamin E [3+12]

Ans. Vitamins are defined as organic compounds present in food and are required in minute quantities for normal growth, maintenance and reproduction. Their absence in food produce specific deficiency diseases**.**

<u>Classification</u>

Vitamins are classified into 2 types, a) Fat soluble vitamin b) Water soluble vitamin.

a) **Fat soluble Vitamins: -** Vitamin A, D, E & K.
b) **Water soluble Vitamins:**
   i) B-Complex group: Thiamine (B_1), Riboflavin(B_2), Pantothenic acid(B_5), Niacin(B_3), Pyridoxine(B_6), Biotin, Folic acid, Lipoic acid, Cyanocobalamin (B_{12})
   ii) Ascorbic Acid: Vitamin C

VITAMIN-B_1 (THIAMINE): -

Source:

- Unpolished rice, wheat germ, cereals, pulses, nuts and oil seeds are good sources.
- Polishing of rice removes 80% of thiamine.
- Meat, fish, milk, vegetables and fruits are poor sources.

Chemistry:

- It is a water-soluble vitamin. It contains a pyrimidine ring and a thiazole ring.

Physiological functions:

- Thiamine in the form of thia- mine pyrophosphate (TPP) acts as a coenzyme in the following reactions,
    a) decarboxylation of pyruvic acid and a-ketoglutaric acid in the citric acid cycle.
    b) transketolase reaction in HMP shunt of glucose metabolism.

Deficiency diseases:

Deficiency of thiamine produces a disease known as **Beriberi**.

The three important manifestations of beriberi are:

a) Gastrointestinal manifestations: Anorexia and Diarrhoea.
b) Cardiovascular manifestations: Palpitation, Enlargement of the Heart and Oedema.
c) Neurological manifestations: Peripheral Neuritis and Wernicks Encephalopathy.

Requirements: 1.5mg daily.

VITAMIN -B_2 (RIBOFLAVIN):

Source:

- Milk, eggs, liver, leafy vegetables, grains and nuts are rich sources of riboflavin.

Chemistry:

- It is also called as lactoflavin. It is an orange-yellow compound. It contains,
    a) D-Ribitol which is a ribose alcohol.
    b) Isoalloxazine which is a three ringed structure. These two groups are attached through the central nitrogen atom of isoalloxazine.

Physiological functions:

- In the living cell, riboflavin forms two phosphorylated derivatives,
    a) Flavin mononucleotide (FMN)
    b) Flavin adenine dinucleotide (FAD)
    c) FMN and FAD act as coenzymes in biological oxidation.

Deficiency diseases:

a) Cheilosis characterised by painful fissures at the angles of mouth.
b) Glossitis with swollen and magenta coloured tongue.
c) Eye changes like ulceration of cornea, photophobia and cataract formation.

Requirements: 1.5mg -1.8mg daily

VITAMIN C (Ascorbic acid):

Source:

- Citrus fruits (lemons and oranges), berries, melons, leafy vegetables, cabbages and tomatoes are good sources.

Chemistry:

- Vitamin C is also known as antiscorbutic vitamin. It is a water soluble vitamin. it has a structure similar to that of L-glucose and it is a derivative of glucose. Chemically, it is enediol lactone of gluconic acid. Vitamin C is readily oxidised to dehydroascorbic acid. So it is a good reducing agent. Both oxidised and reduced forms of ascorbic acid are biologically active.

Physiological functions:

a) It is necessary for the functional activity of fibroblasts and osteoclasts.
b) It is necessary for collagen synthesis.
c) It is involved in oxidation-reduction reactions. It acts as a hydrogen transport agent.
d) It helps in iron absorption by converting ferric iron to ferrous iron.
e) It is involved in the conversion of folic acid to active tetra hydro folic acid.

Deficiency diseases:

- Deficiency of vitamin C produces **scurvy.** The symptoms are,
  a) wide spread haemorrhage
  b) painful, swollen joints
  c) defective teeth formation
  d) defective bone formation

Requirements: 75 – 100 mg daily.

VITAMIN E (Tocopherols / Anti sterility vitamin):

Source:

- cotton seed oil, sunflower oil, wheat germ oil, cabbage, soyabeans, egg, meat, fish and liver.

Chemistry:

- Vitamin E activity is present in a group of compounds called tocopherols. The four naturally occurring tocopherols are alpha, beta, gamma and delta tocopherols. Alpha tocopherol is the most active form.

Physiological functions:

- ✓ Antioxidant action: This effect prevents vitamin A and unsaturated fatty acids from oxidant damage.
- ✓ Antisterility action: Vitamin E is necessary for the growth and maintenance of semeniferous tubules and ovary. Thus, it prevents sterility.

Deficiency diseases:

- Sterility and intrauterine death of foetus.
- Muscle dystrophy in the form of necrosis, fibrosis, weakness or paralysis of muscles.

Requirements: 15 – 30 mg daily

Q6. **What is enzyme inhibition? Explain types of inhibition with examples. Write uses of enzymes.** **[4+8+3]**

Enzyme Inhibition

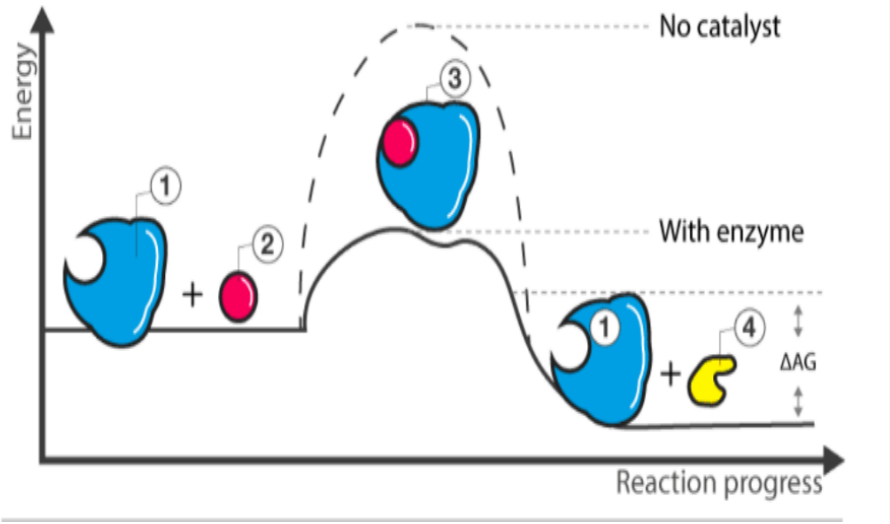
Enzyme inhibitors are substances which lower down the rate of enzyme reaction. They produce their effect by acting on the coenzyme, apoenzyme or prosthetic group. Also, they can act by inhibiting the combination of the substrate with the enzyme.

Types of Enzyme Inhibition:

- Depending on the specific action of the inhibitor used, enzyme inhibition might be reversible or irreversible. Enzyme inhibitors can block the binding site, preventing the substrate from attaching to the active site, and decreasing the enzyme's catalytic activity.
- Reversible inhibitors attach to enzymes via non-covalent interactions like hydrogen bonds, hydrophobic contacts, and ionic bonds. When attached to an enzyme, reversible inhibitors do not undergo chemical reactions and can be easily eliminated by dilution or dialysis.
- There are three types of enzyme inhibition reactions.
  1) Competitive Inhibition
  2) Non-competitive Inhibition
  3) Uncompetitive Inhibition
  4) Allosteric Inhibition

❖ **Competitive Inhibition:**

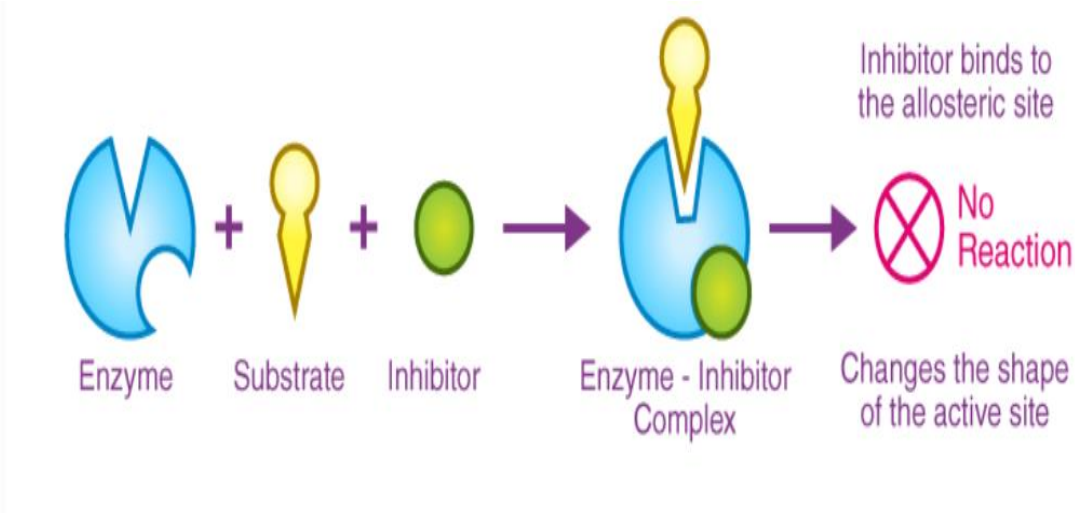
- ✓ A molecule other than the substrate binds to the enzyme's active site, causing competitive inhibition. The inhibitor (molecule) has a structural and chemical similarity to the substrate (hence able to bind to the active site).
- ✓ The competitive inhibitor hinders substrate binding by blocking the active site. Since the inhibitor competes with the substrate, increasing the substrate concentration reduces the inhibitor's actions.



❖ **Non-Competitive Inhibition:**

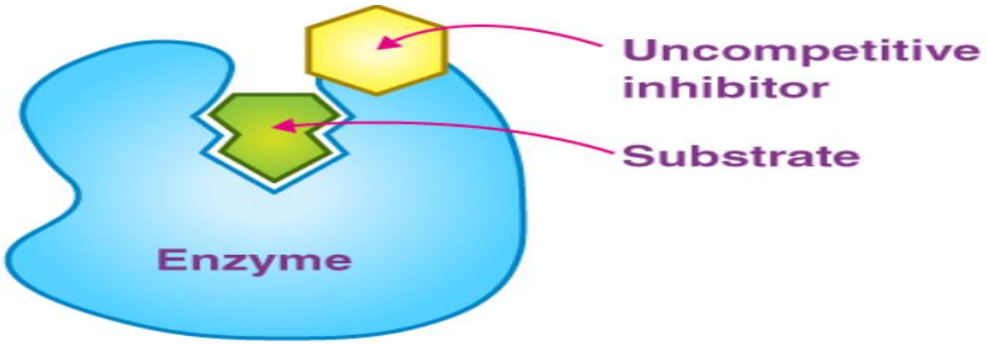
- ✓ A chemical bind to a location other than the active site in non-competitive inhibition (an allosteric site).
- ✓ When the inhibitor binds to the allosteric site, the enzyme's active site undergoes a structural shift.

- ✓ The active site and substrate no longer share affinity as a result of this alteration, preventing the substrate from binding.
- ✓ Increased substrate levels will not be able to reverse the inhibitor's action since the inhibitor is not in direct competition with the substrate.



❖ Uncompetitive Inhibition:

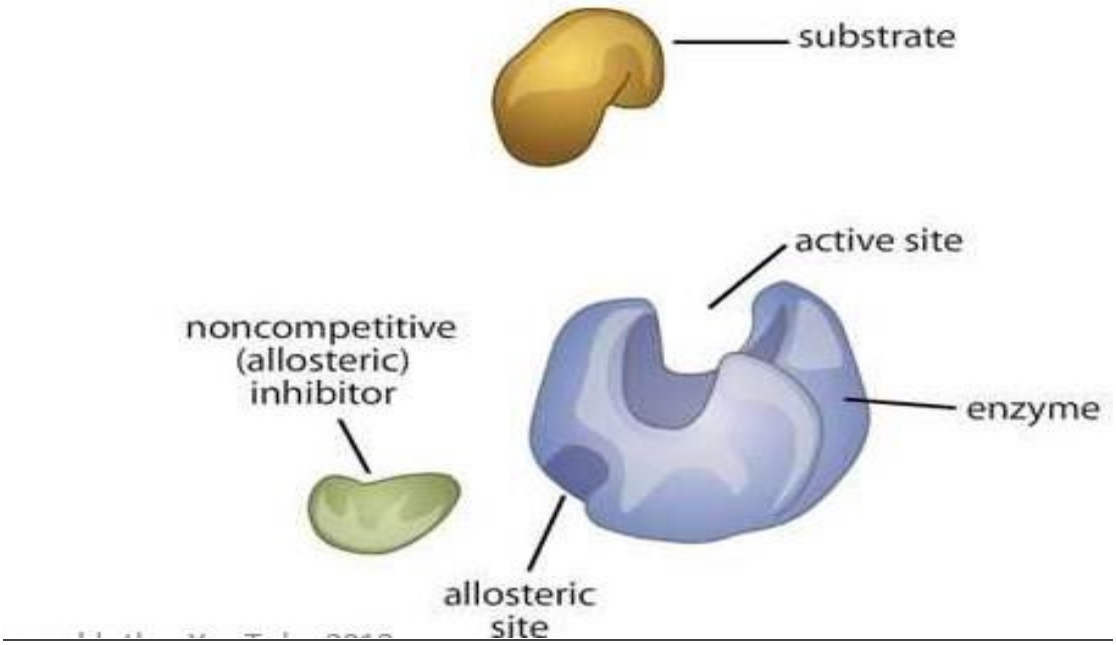
- ✓ The inhibitor binds only to the substrate-enzyme complex in uncompetitive inhibition. In reactions involving two or more substrates or products, uncompetitive inhibition is common.
- ✓ Non-competitive inhibition can occur with or without the presence of the substrate, whereas uncompetitive inhibition requires the formation of an enzyme-substrate complex.



❖ Allosteric Inhibition:

- ✓ The allosteric enzymes are modulated by noncovalent binding of some specific metabolite.
- ✓ They usually catalyze the first or the most important reaction of a multienzyme sequence and are generally inhibited by the end product of the sequence which binds to a specific regulatory or allosteric site on the enzyme molecule.
- ✓ Allosteric enzymes are usually irreversible under intracellular condition. They are usually much larger in molecular weight and more complex in configuration. Some of them are unstable at zero degree C; but stable at room/body temperature.
- ✓ Allosteric enzymes may have positive [stimulatory] or negative [inhibitory] modulators. Allosteric enzymes having a single modulator are called monovalent and having multi modulators are called polyvalent.

- ✓ Allosteric enzymes show two different types of control – heterotropic and homotropic. Heterotropic enzymes are stimulated/inhibited by an effector (modulator) molecule other their substrate. Homotropic enzymes are modulated by their substrate itself. However, a large number of allosteric enzymes are of mixed homo-heterotropic type.



Uses of enzymes:

- Enzymes are used in the treatment of a number of diseases. The following are a few examples:

a) Enzymes like pepsin, papain, and amylase are administered for **improving digestion**.
b) The enzyme hyaluronidase is used for the **diffusion** of a number of drugs.
c) The enzymes streptokinase and urokinase are used for **dissolving blood clots**.
d) The enzyme trypsin is used for liquefying the lens. So, it is used in the **treatment of cataracts**.
e) The enzyme asparaginase is used for the **treatment of cancer**.

- Many enzymes are used in the pharmaceutical industry for the **manufacture of bulk drugs**.
  a) The **enzyme penicillin acylase** is used for the production of 6-amino penicillanic acid from **penicillin G**.
  b) The enzyme **glucose oxidase** is needed for the production of **fructose syrup**.
  c) **Amylase** is needed for the production of **dextrin**.
  d) The enzyme **papain** is used in the production of **protein hydrolysate**.

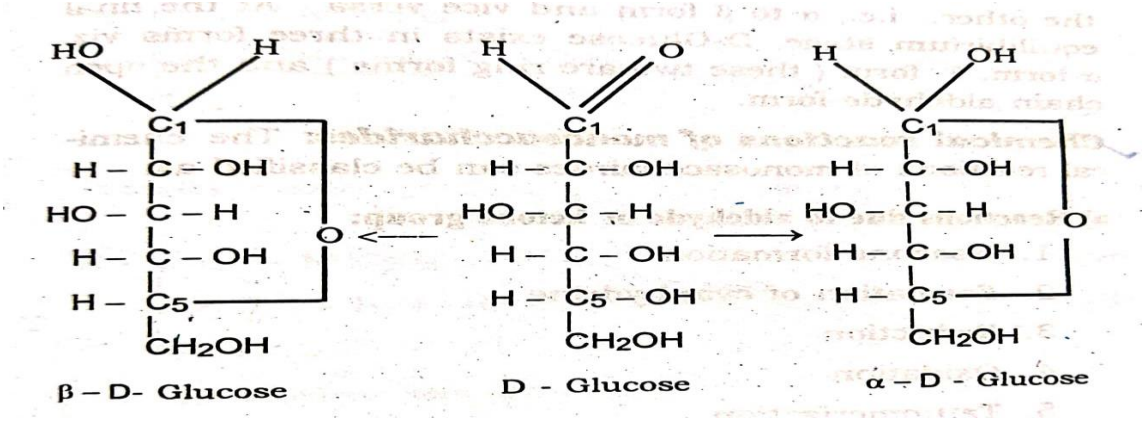
Q7. **Write short notes on any three of the following.** **[3x5]**

(i) **Ring structure of Glucose: -**

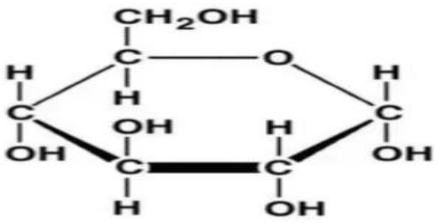
- Glucose is a group of carbohydrates which is a simple sugar with a chemical formula $C_6H_{12}O_6$**.**
- It is made of six carbon atoms and an aldehyde group. Therefore, it is referred to as aldohexose.
- It exists in two forms viz open-chain (acyclic) form or ring (cyclic) form.

Ring structure of glucose:

- The aldehyde or ketone group of glucose may condense with any of the OH groups (present on any of the other five C atoms of the chain.
- This condensation results in a six membered ring, with o forming part of this ring.
- In the figure 0 shown below, there is a condensation between the OH group of the 5th carbon atom and the 1st carbon atom which has the aldehyde (CHO) group. In this condensation, two' changes occur for the OH group at the 5th carbon atom: 1) O forms. part of the six membered ring 2) H is shifted to the O atom of the aldehyde group at the 1st carbon atom to form a new OH group.
- If the new OH group formed is on the same side of the ring (i.e., on the right side) it is a form. If the OH group is on the opposite side of the ring (i.e., on the left side) it is B form. The ring structures shown below are those of α -D Glucose and β-D glucose.



Ring structure:



ii)**Briefly describe disorders of fat metabolism**

- ✓ Lipids (or fats) are an important source of energy for the body.
- ✓ The fat stored within the body is constantly broken down and reassembled to balance the energy requirement of the body with the consumed food.
- ✓ This whole process is catalysed by specific enzymes.
- ✓ But any abnormality in these enzymes leads to the formation of specific fatty substances that normally have been degraded by the enzymes.
- ✓ If these fatty substances accumulate within the body for prolonged duration, the body organs may get harmed.

Disorders of fat metabolism:

1. **Lipidoses** are the disorders that result due to lipid accumulation. Some enzyme, abnormalities prevent the conversion of body fats into energy; this is termed as fatty acid oxidation disorders.
2. **Hypercholesterolemia:** It is a condition of high cholesterol levels in the blood.

Causes:

- ✓ Heredity, Foods High in saturated Fats and Cholesterol, Lifestyle changes etc.

Symptoms:

- ✓ **Angina** resulting due to heart disorder
- ✓ **Xanthomas** (deposits of fat on elbows, buttocks, knees, and tendons)
- ✓ **Xanthelasmas** (deposits of cholesterol around the eyelids)
- ✓ **Corneal arcus** (deposits of cholesterol around the corneas).

Treatment: Consumption of PUFA, dietary cholesterol, plant sterols, dietary fibre, avoiding high carbohydrate diet etc.

3. **Atherosclerosis**: Formation of plaque inside the arteries (blood vessels carrying oxygen-Tich blood to heart and other body parts) is referred as a state of atherosclerosis.

Causes:

- High blood pressure
- High cholesterol level
- High Triglycerides
- Smoking and other sources of tobacco
- Insulin resistance, obesity, or diabetes
- Inflammation from diseases, such as arthritis, lupus or infections, or inflammation of unknown cause.

Symptoms:

- Pain or pressure feeling in the chest (angina) in case atherosclerosis affects the arteries in heart.
- Numbness or weakness in arms or legs, temporary loss of vision in one eye, drooping muscles of face or difficulty in speaking or slurred speech in case atherosclerosis affects arteries supplying the brain.
- High blood pressure sometimes even resulting in kidney failure in case atherosclerosis affects arteries supplying the kidneys.

4)Fatty liver: It defines excessive fat accumulation in liver which accounts for more than 5-10% of liver's weight. Fatty liver condition can be Controlled by making certain changes in lifestyle. Fatty liver even shows n Symptoms in most of the cases, and it also does not damage the liver until it reaches the advanced stage.

Causes:

- Alcoholism and heavy drinking are the most common causes of fatty liver
- Obesity, Hyperlipidaemia, Diabetes, Rapid weight loss etc.

Symptoms:

- Fatty liver may cause fatigue or vague abdominal discomfort.
- Loss of appetite & Weight loss
- Weakness, Abdominal pain & Fatigue etc.

5)<u>Obesity</u>: Obesity is a condition of abnormal increase in body weight due to excessive fat deposition. Obese men and women show 20% and 25% of increase their body weight, respectively due to accumulation of fat in adipose tissues. Obesity is over-eating, i.e., excessive intake of calories in diet, and lack of physical activity.

Causes:

- An imbalance of energy between the consumed and used calories is the major cause of obesity.
- In general, increased consumption of energy-dense and fat rich foods and reduced physical activity results in obesity.

Symptoms:

- Cardiovascular disorders, Diabetes, Musculoskeletal disorders
- Cancers of endometrium, breast, ovary, prostate, liver, gall bladder, kidney and colon.

Apart from that different Inherited diseases may occur due to disorder of Fat metabolism ----------

i. **Idiopathic Hyperlipidaemia: -**
   - ✓ Inborn error associated with high levels of lipid in plasma
   - ✓ Fasting plasma is milk like
   - ✓ Contain high levels of Triglycerides & Fatty acids.

ii. **Gaucher's Disease: -**
   - ✓ Inherited disorder of Cerebroside metabolism
   - ✓ Occurs due to deficiency of enzyme β-Glucocerebrosidase
   - ✓ Accumulation of Cerebrosides in liver, Spleen & Brain
   - ✓ In result, failure of Growth & Mental retardation occurs

iii. **Niemann Pick's Disease: -**
   - ✓ Inherited disorder of Sphingomyelin metabolism
   - ✓ Occurs due to the deficiency of enzyme Sphingomyelinase
   - ✓ Accumulation of Sphingomyelin in liver, spleen & brain
   - ✓ Resul in enlargement of Abdomen, Liver & Spleen
   - ✓ Also produces Mental Retardation

iv. **Tay-Sach's Disease: -**
   - ✓ Inherited disorder of Ganglioside metabolism
   - ✓ Abnormal accumulation of Ganglioside in brain
   - ✓ As a result, the affected child is idiotic & blind

v. **Fabry's Disease: -**
   - ✓ Inherited disorder of Sphingolipid metabolism
   - ✓ So, accumulation of Sphingolipids in many tissues
   - ✓ Leads to Renal Failure, Cardiac Failure & Visual defects etc.

iii) Co-enzyme Q :-

- Coenzyme Q is also known as Ubiquinone since it is ubiquitous in living systems. It is a quinone derivative with a variable isoprenoid side chain. The mammalian tissues possess a quinone with 10 isoprenoid units which is known as coenzyme Q10 (CoQ10).
- Coenzyme Q is a lipophilic electron carrier. It can accept electrons from FMNH, produced in the ETC by NADH dehydrogenase or FADH) outside ETC (e.g. succinate produced dehydrogenase, acyl CoA dehydrogenase).
- Coenzyme Q is not found in mycobacteria. Vitamin K performs a similar function as coenzyme Q in these organisms. Coenzyme Q has no known vitamin precursor in animals. It is directly synthesized in the body.
- Coenzyme Q1o is also a micronutrient.
- Coenzyme Q1o is soluble in lipids (fats) and is found in virtually all cell membranes, as well as lipoproteins.
- The ability of the benzoquinone head group of Co-enzyme Q_{10} to accept and donate electrons critical feature in its biochemical functions.
- Reduced form can act as an antioxidant. Rich sources of dietary Coenzyme Q_{10} include mainly meat, poultry, and fish.
- Different fruits, vegetables, eggs, and dairy products are moderate sources of Coenzyme Q10.
- Coenzyme Q_{10} is synthesized intracellularly using Tyrosine.
- Adequate vitamin B_6 is essential for Coenzyme Q_{10} biosynthesis.

Functions:

- Within the cell, coenzyme Q-10 is mostly present in the mitochondria (inner membrane) (40-50%).
- The primary biochemical action of Coenzyme Q1o is as a cofactor in the electron-transport chain.
- The conversion of energy from carbohydrates and fats to ATP, requires the presence of Coenzyme Q1o in the inner mitochondrial membrane

Iv)Vitamin H:

- Also Chemically known as Biotin or Vitamin B_7.
- It is a heterocyclic monocarboxylic acid.

Chemistry:

- ✓ Biotin is a sulphur containing B-complex ring and a thiophene ring.
- ✓ The structure contains two fused rings: an imidazole and a thiophene ring.

Sources:

- Egg yolk, liver, kidney, yeast, milk, tomatoes and fruits are good sources.

Physiological functions:

- Biotin acts as a coenzyme for carboxylases which catalyse carboxylation or CO fixation
- Also Biotin acts as coenzyme in,

  1) fatty acid synthesis

  2) carbohydrate metabolism

3) purine synthesis

4) amino acid metabolism

Deficiency diseases:

- Nausea, Anorexia, Anaemia, muscular pain and Dermatitis of extremities.

Requirement:

- Biotin is sufficiently produced by intestinal bacteria.
- So, there is no need for dietary requirements.

Model Answer (E.R. -1991)

Subject:- Pharmacognosy

1. (A)

(i) Ginger:- Volatile oil, starch, zingiberene, gingerol.

(ii) Catechu :- Tannin acid, catechin, acacatechin, quercetin.

(iii) Ephedra :- Ephedrine, n-methyl ephedrine, non-ephedrine

(iv) Curcuma:- Curcuminoids, dihydrocurcumin, zingiberine, turmerone, α-phallendrene

(v) Papaya:- mixture of papain and chymopapain .

(vi) Ashwaganda:- cuscohygrine, tropine, pseudotropine, anaferine, withasomnine , vasamine, starch, reducing sugar, glycosides and resin.

(vii) Pterocarpus:- pterostilbene, epicatechin, pterosupin, marsupin, tannins, pentosan, propterol, isoflavonoid glycol, liquiritigenin

(viii) Tulsi:- Volatile oil, engenol, carvacrol, saponin

(ix) Ergot:- indole alkaloid, ergomentrine, ergotamine, ergosine, ergocristine, ergocryptine, ergosinine, ergocryptinine, histamaine, acetylcholine.

(x) Garlic:- allicin, Alliin, ajoene, s-allylcysteine

(B) Use of Drug

(i) Cinnamon:- It is mainly used as aromatic, carminative, stimulant, stomachic & mild astringent.

(ii) Arjuna:- It is mainly used as cardiotonic & improve the function of cardiac muscle & treatment of dysentery.

(iii) Shark liver oil:- It is used for treat xerophtalmia & cancer.

(iv) Ipecacuanha :-It is used for ameobic dysentery, expectorant & emetic.

(v) Ephedra:- It is used to relieving of asthma, hayfever, increase- blood pressure & treatment of allergic bronchial disorder.

(vi) Ergot:- It is use as analgesic for mignane & to prevent post-partem haemorrhage, exotoxic.

(vii) Guggul:- It is used to lower the cholesterol level, stimulation of thyroid, potential resulting in weight loss & inhibits platelet aggregation.

(viii) Amla:- It is used for common cold, improve eye sight, builds immunity & improve skin.

(ix) Punarnava:- It is used as diuretic, expectorant & stomachic.

(x) Benzoin:- It is used as expectorant, carminative, diuretic & anti septic.

(2) Short note:

(i) Peppermint oil

Synonym - Brandy Mint.

Botanical Source-

It is the oil obtained by the distillation of *Mentha piperita*, belonging to family Labiatae.

Geographical Source-

It is mainly found in Europe, United States, and also in damp places of England.

Chemical Constituents-

The chief constituent of Peppermint oil is Menthol, along with other constituents like menthyl acetate, isovalerate, menthone, cineol, inactive pinene, limonene, and other less important bodies. Menthol separates on cooling it to a low temperature (–22°C). The flavouring properties of the oil are due to both the ester and alcoholic constituents, whereas the medicinal value is attributed only due to the alcoholic components. The English oil contains 60 to 70% of Menthol, the Japanese oil containing 85%, and the American has only about 50%.

Uses

It is stimulant, stomachic, carminative, inflatulence, and colic; in some dyspepsia, sudden pains, for cramp in the abdomen and also in cholera and diarrhoea. Oil of peppermint allays sickness and nausea, as infants cordial. Peppermint is good to aid in raising internal heat and inducing perspiration. It is also used in cases of hysteria and nervous disorders.

(ii) Gymnema

Syn:- Gurmar, madhunashni

Fam:- Asclepidaceae

B.S:- It consists of dried leaves of Gymnema sylvestre

c.c:- 1. The leaves contain pentria contane, hentria candane, phytin.

2. It also contain α, β chlorophylles, resin, tartaric acid, butyric acid & mucilage.

3. It also contains alkaloid, gymnemic acid, pararabin, inositol & d-cuersitol.

Use: 1. It is used as stomachic, stimulant, laxative & diuretic.

2. Is also used in cough & sore in eye.

3. It prevent dental plaque & carries.

(iii) Vinca:-

Syn: Periwilkle, soda bahar, catharanthus

Farm:- Apocynaceae

B.S.:- Vinca is dried entire plant of Catharanthus roseus.

C.C:- 1. Vinca mainly contain indole alkaloid like vincrystin, vinblastin as the chief active constituent of vinca.

2. It also contain ajmaliane, serpentine & tetrahydrolal stronine.

Use:- 1. Vincrystine is mainly used in case of leukemia & vinblastine is used in treatment of hodgkin's disease.

2. It is also used as anti cancer & anti-tumour.

3. It is also used to control the diabetes & high blood pressure.

(iv) Clove:-

Syn:- Clove flower, Clove bud

Fam:- Myrtaceae

B.S:- It consists of chief flower buds of Eugenia caryophyllus.

C.C:- 1. It contain mainly volatile oil. The chief active constituents of volatile oil is eugenol.

2. It also contain acetyl eugerol, β-cayophyllene, tanins.

3. It also contains methyl furfural & dimethyl furfural.

Use:- 1. It is used as aromatic, carminative, stimulant & flavouring agents.

2. Eugenol also has anesthetic action.

3. Clove is used in spice & clove oil used in perfumery.

(3) (i)

- **Perfume:** Perfume makes you attractive. The sense of smell is one of the most important of the five senses. Perfumes have a vast amount of **pheromones and can make you attractive to people,** ensuring the above mentioned first impression and lasting impression be a pleasant and memorable one.

- **Flavouring agents:** They are key food additives with hundreds of varieties like fruit, nut, seafood, spice blends, vegetables and wine which are natural flavouring agents. Flavors are used as additives to enhance, **modify the taste and the aroma in natural food products** which could have got lost due to food processing.

(ii)

Secondary metabolites, also called natural products, are organic compounds of low molecular mass that are produced by bacteria (e.g., Bacillus spp., Pseudomonas spp., and Streptomyces spp.), fungi (e.g., Penicillium spp., Aspergillus spp., Trichoderma spp.), and plants of certain taxonomic groups. Plant secondary metabolites are classified by their chemical structure and can be divided into four major classes: terpenes, phenylpropanoids (i.e. phenolics), polyketides, and alkaloids.

Secondary metabolites serve: (i) as competitive weapons used against other bacteria, fungi, amoebae, plants, insects, and large animals; (ii) as metal transporting agents; (iii) as agents of

symbiosis between microbes and plants, nematodes, insects, and higher animals; (iv) as sexual hormones;

(iii)

Extraction	Isolation
Extraction is the process of moving one or more analytes from the sample or matrix to a physically separate location where further processing and analysis occur	Isolation is a separation technique in which we can obtain a purified compound
Separating a compound from a mixture	Purification of a compound
Low purity	High purity
Liquid-liquid extractions using separatory funnels, liquid-solid extractions, etc.	Distillation, affinity purification, filtration, etc.

(4) (i) Senna:-

Biological source:- It consist of dried leaf lets of Cassia angustifollia & belong to the family of Leguminosae.

Chemical Constituent:- Anthraquinone, glycoside, rhein, kaempferol, aloe-emodin, myricyl alcohol, phytosterene, salicylic acid & resin.

Use:-1. It is used as purgative & laxative.

2. It is also used to stimulate cathartic.

(ii) Digitalis:-

Biological source:- It consist of dried leaves of Digitalis purpurea, belongs to the family of Scrophulariaceae.

Chemical constituent:- Purpurea glycoside A, purpurea glycoside B, glucogitatoxin, gitatonin & verodoxin.

Use:- It is used to increase excitability of cardiac muscle & produce more powerful contraction.

(iii) Gokhru:-

Biological Source:- It consist of the dried fruits of Tribulus terrestris, belongs to the family of Zygophyllaceae.

Chemical Constituent:- Steroidal saponene, terrestosine, des galactotigonin, F-Gitonin, Des glucolantigonin, Gitanin-T & kaempferol.

Use:- 1. It is used in nephritic, kidney stone, diarrhea & dysentery.

2. It promotes lactation.

(iv) Honey:-

Biological Sourse:- It is the honey comb of the Apis mellifera, belongs to the family of Apidae.

Chemical Constituent:- Maltose, succinic acid, acetic acid, dextrin, formic acid, vitamins & proteins.

Use:- 1. It is used as demulcent sweetening agent.

2. It is act as antiseptic.

(v)Nux-vomica:-

Biological source:- It consist of dried ripe seeds of Strychnos nux vomica, belongs to the family of Logoniaceae.

Chemical Constituent:- indole alkaloids, strychnine, brucine, while vomicine, α-colubrine & pseudostrychnine.

Use:-1. It is used as stomarchic & tonic.

2. It is a stimulant to CNS.

(vi) Opium:-

Biological Source:- It is the dried latex obtained by making incision from capsule fruits of Papaver somniferum, belongs to the family of Papaveraceae.

Chmeical Constituent:- It contain alkaloid like morphine, codeine, thebaine, noscapine, narceine & papaverine.

Use:-1. It is used as analgesic, hypnotic & narcotic.

2. It is used to traet diarrhea & dysentery.

(5) Evaluation of Crude Drugs

Evaluation of a drug ensures the identity of a drug and determines the quality and purity of drugs. The main reasons behind the need for evaluation of crude drugs are biochemical variation in the drug, effect of treatment and storage of drugs, and the adulterations and substitutions.

Classification: It is classified as

1. Organoleptic(Morphological) Evaluation
2. Microscopic Evaluation
3. Physical Evaluation
4. Chemical Evaluation
5. Biological Evaluation

PHYSICAL EVALUATION

In crude plant evaluation, physical methods are often used to determine the solubility, specific gravity, optical rotation, viscosity, refractive index, melting point, water content, degree of fibre elasticity, and other physical characteristics of the herb material.

Solubility

Drugs specific behaviours towards solvents are taken into consideration. This is useful for the examination of many oils, oleoresins, etc. Few examples are the solubility of colophony in light petroleum, the solubility of balsam of Peru in solution of chloral hydrate, the solubility of castor oil in half its volume of light petroleum and the turbidity produced with two volumes of the solvent; the solubility of balsam of Peru in an equal volume of alcohol, 90%, and the production of a turbidity with a larger volume; castor oil is soluble only in three volumes of 90% alcohol, while the adulterated form it shows good solubility in alcohol. Alkaloidal bases are soluble in organic solvents and alkaloidal salts are soluble in polar solvents.

Optical Rotation

Anisotropic crystalline solids and samples containing an excess of one enantiomer of a chiral molecule can rotate the orientation of plane-polarized light. Such substances are said to be optically active, and this property is known as optical rotation. The enantiomer that rotates light to the right, or clockwise when viewing in the direction of light propagation, is called the dextrorotatory (d) or (+) enantiomer, and the enantiomer that rotates light to the left, or counterclockwise, is called the levorotatory (l) or ({) enantiomer. Few examples of drugs with this property are eucalyptus oil (0° to +10°), honey (+3° to {15°), Che-nopodium oil ({30° to {80°), etc.

Refractive Index

Refractive index is defined as the property of a material that changes the speed of light, computed as the ratio of the speed of light in a vacuum to the speed of light through the material. When light travels at an angle between two different materials, their refractive indices determine the angle of transmission refraction of the light beam. In general, the refractive index varies based on the frequency of the light as well; thus, different colours of light travel at

different speeds. High intensities can also change the refractive index. This could be used as a parameter in evaluating the herbal drugs; for example castor oil 1.4758 to 1.527, clove oil 1.527 to 1.535, etc.

Specific Gravity

It is also known as relative density. The ratio of the mass of a solid or liquid to the mass of an equal volume of distilled water at 4°C (39°F) or of a gas to an equal volume of air or hydrogen under prescribed conditions of temperature and pressure. Some examples of specific gravity of drugs are cottonseed oil 0.88–0.93, coconut oil 0.925, castor oil 0.95, etc.

Viscosity

Viscosity is the resistance of a fluid to flow. This resistance acts against the motion of any solid object through the fluid and also against motion of the fluid itself past stationary obstacles. Viscosity of a liquid is constant at a given tempera-ture and is an index of its composition. Viscosity also acts internally on the fluid between slower- and faster-moving adjacent layers. Since it is constant at a given temperature, it is used as an evaluation parameter; for example, pyroxylin kinematic viscosity, 1100–2450 centistokes.

Melting Point

The melting point of a solid is the temperature at which it changes state from solid to liquid. Plant constituents have very sharp and constant melting points. As far as crude drugs are concerned, melting point range has been fixed due to mixed chemicals. The following drugs could be evaluated using this parameter; for example, beeswax 62–65°C, wool fat 34–44°C, agar melts at 85°C, etc.

Moisture Content

The moisture content of a drug will be responsible for decomposition of crude drugs either producing chemical change or microbial growth. So the moisture content of a drug should be determined and controlled. The moisture content is determined by heating a drug at 105°C in an oven to a constant weight. Following are the examples of two crude drugs with their moisture content limit: the moisture content of Digitalis and Ergot should not be more than 5% w/w and 8% w/w, respectively.

Ultraviolet Light

Certain drugs fluoresce when the cut surface or the powder is exposed to ultraviolet radiation, and it is useful in the identification of those drugs. Some pieces of rhapontic, Indian, and Chinese rhubarb are very difficult to distinguish, and it is very difficult in powdered form, but

examination in ultraviolet light gives such marked differences in fluorescence that the varieties can be easily distinguished from each other.

Ash Values

The determination of ash is useful for detecting low-grade products, exhausted drugs, and excess of sandy or earthy matter. Different types of ash values are used in detection of crude drugs like, total ash, acid-insoluble ash, water-soluble ash, and sulphated ash.

Total ash is useful in detecting the crude drugs that are mixed with various mineral substances like sand, soil, calcium oxalate, chalk powder, or other drugs with differ-ent inorganic contents to improve their appearance, as is done with nutmegs and ginger. The maximum temperature used for total ash should be not more than 450°C because alkali chlorides that may be volatile in higher temperatures would be lost.

Acid-insoluble ash means the ash insoluble in dilute hydrochloric acid. It is often of more value than the total ash. The majority of crude drugs contain calcium oxalate, and the quantity of calcium oxalate varies very frequently. So total ash of a crude drug vary within wide limits for specimens of genuine drug, for example, rhubarb, total ash range from 8 to 40%. In this case, the total ash is useless to detect earthy matter adherent to such a drug. So acid-insoluble ash would be preferable for rhubarb. The calcium oxide or carbonate, yielded by the incinerated oxalate, will be soluble in hydrochloric acid when the ash is treated with hydrochloric acid; the remaining ash is weighed, which is known as the acid-insoluble ash. By this we can detect the presence of excessive earthy matter, which is likely to occur with roots and rhizomes and with leaves which are densely pubescent, like those of foxglove, clothed with abundant trichomes secreting resin, as in henbane, and tend to retain earth matter splashed on to them during heavy rainstorms.

The water-soluble ash is used to detect the presence of material exhausted by water. Sulphated ash is done by addition of sulphuric acid in order to get sulphate salts, and the percentage ash is calculated with reference to the air-dried drug. The temperature used for this is above 600°C. The total ash and acid-insoluble ash values of Guduchi are not more than 16 and 3%, respectively. The total ash value and water-soluble ash values of ginger are 6 and 1.7%, respectively.

Extractive Values

The extracts obtained by exhausting crude drugs with different solvents are approximate measures of their chemical constituents. Various solvents are used according to the type of the constituents to be analysed. Water-soluble extractive is used for crude drugs containing water-soluble constituents like glycosides, tannins, mucilage, etc.; alcohol-soluble extractive is used for crude drugs containing

tannins, glycosides, resins, etc.; and ether-soluble extractives are used for drugs containing volatile constituents and fats.

Extractive Values of Some Crude Drugs

Water-soluble extractive (% w/w)		Alcohol-soluble extractive (% w/w)		Ether-soluble extractives (% w/w)	
aloe	Not less than 25.0	aloe	Not less than 10.0	linseed	not less than 25.0
glycyrrhiza	Not less than 20.0	asafoetida	Not less than 50.0	capsicum	not less than 12.0

Foreign Organic Matters

The parts of the organ or organs other than those parts of drugs mentioned in the definition and description of the drug are known as foreign organic matters. They may be insect, moulds, earthy material, animal excreta, etc. Each and every vegetable drug has their own limits. Few examples of such limits are: garlic should not contain more than 2%, saffron should not contain more than 2%, satavari should not contain more than 1%, etc.

BIOLOGICAL EVALUATION

The plant or extract can then be evaluated by various biological methods to determine pharmacological activity, potency, and toxicity. The biological evaluation would serve better than the physical and chemical evaluation for drugs that could not be satisfactorily assayed by these last two methods. Moreover, this is an important method, the crude drugs are considered important only because of their biological effects and this evaluation would conclude the effect. These methods are considered to be less precise, more time-consuming and more expensive. Bioassays should be as simple as possible, and attempts should be made to have access to a large number of different tests so that many biological properties can be screened. The bioassay methods are of three types they are, toxic, symptomatic and tissue or organ methods. Different animals are used in toxic and symptomatic method and isolated organ or tissue is used in the third method.

These assays are conducted by determining the amount of drug of known potency required to produce a definite effect on suitable test animals or organs under standard conditions. Reference standard are used in certain bioassay procedures to minimize errors.

Pharmacological evaluation

Pharmacological evaluation is an essential component in the development of herbal drugs (phytomedicine). In traditional medicine, generally entire plants or plant parts including leaves, roots flowers, seeds, bark, and stem, fresh or dried, are used as crude homogenates, extracts, decoctions, and tinctures.

The efficacy of a pharmacological treatment is usually evaluated as the resulting (clinical) response to a given drug, when administered at a particular dose.

(6) (i) Identification test of Alkaloids:-

(1) Dragendroff's Test:- When the Dragendroff's reagent(potassium bismuth iodide) is mix with extract it form brown ppt.

(2) Mayer's Test:- When Mayer's reagent (potassium mercuric iodide) is mix with extract is form white, brown ppt.

(3) Hanger's Test:- When the Hanger's reagent (picric acid) mix with extract in form yellow ppt

(4) Wagner's Test:- When the Wagner's reagent (Potassium iodide) is mix with extract it form reddish brown ppt.

(ii) Identification test of Tannin:-

(1) Gelatin Test:- To a solution of tannin, aqsolution of 1% zelatin and 10% sodium chloride are added a white buffer colour ppt is formed. It conformed the presence of tannin and pseudo tannin.

(2) Gold beater's skin test:- A small piece of gold beater's skin is soaked in 2% HCl rinsed with distil water and placed in a solution of tannin for 5min. The skin piece is washed with distil water and kept in a solution of ferrous solphate. A brown or block colour appear on the skin due to presence of tannin.

(3) Catechin Test:- A match stick is dipped in aq.plant extract dried near burner & moistered with con.HCl. On warming near a flame the matchstick wood turns pink or red due to formation of phloroglucinol.

(4) Phenarone Test:- A mixture of aq. Extract of a drug and sodium acid phosphate (0.5gm) is heated, cooled and filtered. A solution of phenarzone (2%) is added to the filtrate a bulky colour ppt is form.

(iii) Pharmaceutical aids-

Pharmaceutical aids are those substances or material which have not any its own pharmacological action. But pharmaceutical aids are the essential element for pharmaceutical preparation.

Pharmaceutical aids play an important role in the formulation of preparation, preservation and transportation. Pharmaceutical aids have no specific effect on human body. Pharmaceutical aids used in the formulation of pharmaceutical product to mask the bitter taste or odor of the formulation. So that the patient compliance towards the medicine increased. Different pharmaceutical aids are used in the formulation of different dosage form like tablet, capsule, emulsion, suspension etc. Coloring agents, flavoring agents, sweetening agents, emulsifying agents, suspending agents, diluents. lubricants are the examples of pharmaceutical aids.

A good pharmaceutical aids should have the following characteristics. They should be inert and non-reactive.⎫ They should be non-toxic.⎫ They should be cost effective.⎫ They should be chemically stable.⎫ They should have sufficient capacity to mask the⎫ bitter taste or odor of the formulation.

Classification Pharmaceutical aids can be classified as follows. 1) Based on their origin a) Animal sources i) Lactose ii) Gelatin iii) Lanolin iv) Honey b) Vegetable sources i) Turmeric ii) Acacia iii) Starch iv) Peppermint c) Mineral sources i) Silica ii) Talc

(iv) Isolation of Volatile Oils:-

(1) Expression Method:- This method is used for the extraction of citrous oils where oils cells are ruptured mechanically using pointed projection by twisting raw material over them in clock wise direction either mechanically or manually.

The screened juice is centrifuged in a high speed centrifugal machine when nearly half of the essential oil are extracted by this method.

(2) Steam Distillation:- This is the most widely used method in the plant material is macerated and then steam distilled when the essential oil go in to distillate from which their extracted by the use of pure organic volatile solvents like light petroleum.

Howe ever the method should be used with a great care since some essential oils are decomposed during distillation and some are hydrolyzed to none or less fragrant compounds.

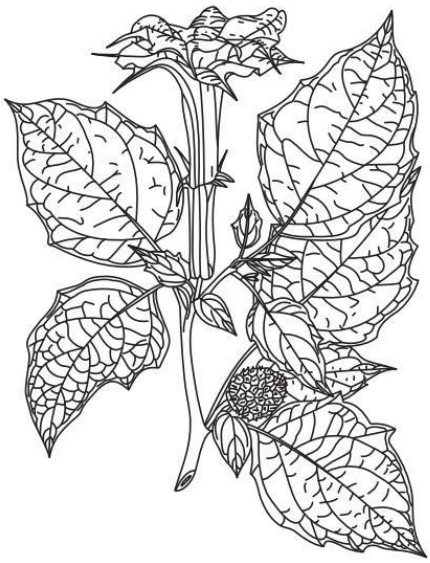
(3) Extraction by means of Volatile solvents:- As described above some essential oil are sensitive to heat & hence decomposed during distillation in such cases the plant material is directly treated with light petrol at 50^0C & the solvent is remove by distillation under reduce pressure.

7. (i)Chemotaxonomical Classification

This system of classification relies on the chemical similarity of a taxon, i.e. it is based on the existence of relationship between constituents in various plants. There are certain types of chemical constituents that characterize certain classes of plants. This gives birth to entirely a new concept of chemotaxonomy that utilizes chemical facts/characters for understanding the taxonomical status, relationships and the evolution of the plants.

For example, tropane alkaloids generally occur among the members of Solanaceae, thereby, serving as a chemot-axonomic marker. Similarly, other secondary plant metabo-lites can serve as the basis of classification of crude drugs. The berberine alkaloid in Berberis and Argemone, Rutin in Rutaceae members, Ranunculaceae alkaloids among its members, etc., are other examples.

It is the latest system of classification that gives more scope for understanding the relationship between chemical constituents, their biosynthesis and their possible action.
(ii)

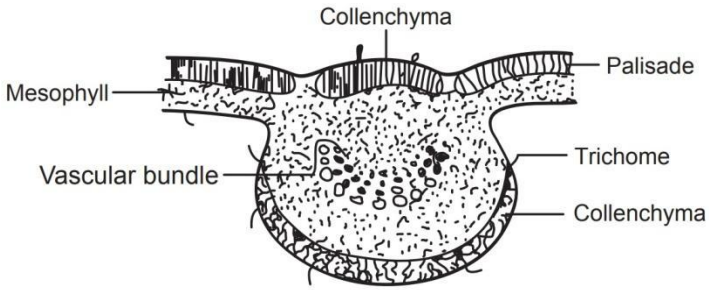


Datura metel

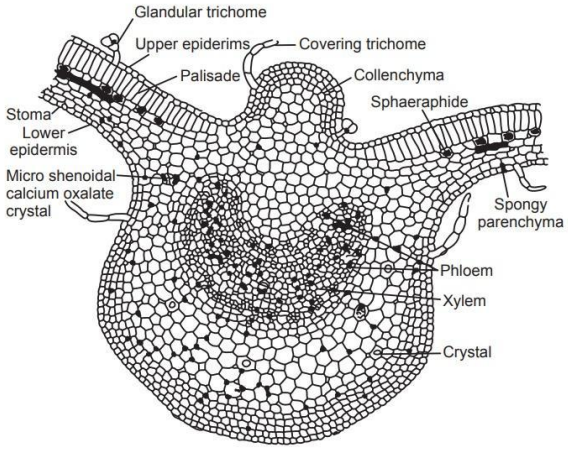
Microscopy

Transverse section shows a bifacial structure. The following characters were observed in the lamina and the midrib region. In the lamina it has the upper epidermis which is single layer, rectangular cells covered with cuticle. Both covering and glandular trichomes are present. The covering

trichomes are uni-seriate, multicellular, warty and with blunt apex. The glandular trichomes have one stalk consisting of one cell and multicellular head. The mesophyll has spongy parenchyma and palisade parenchyma in it. Palisade cells are radially elongated, single layer and compactly arranged. Spongy parenchyma are several layers, loosely arranged consisting of micro-sphenoidal crystals and vascular strands. In the midrib, strips of collenchyma appear below the upper and above the lower epidermis followed by the cortical parenchymatous cells containing calcium oxalate. The lower epidermis is similar to that of the upper one but has more number of trichomes and stomata when compared with upper epidermis.



T.S. (schematic) diagram of datura leaf



Transverse section of datura leaf

(iii)

Fibres may be defined as any hair-like raw material directly obtainable from an animal, vegetable, or mineral source and convertible into nonwoven fabrics such as felt or paper or, after spinning into

yarns, into woven cloth. A natural fibre may be further defined as an agglomeration of cells in which the diameter is negligible in comparison with the length. Although nature abounds in fibrous materials, especially cellulosic types such as cotton, wood, grains, and straw, only a small number can be used for textile products or other industrial purposes.

The introduction of regenerated cellulosic fibres (fibres formed of cellulose material that has been dissolved, purified, and extruded), such as rayon, followed by the invention of completely synthetic fibres, such as nylon, challenged the monopoly of natural fibres for textile and industrial use. A variety of synthetic fibres having specific desirable properties began to penetrate and dominate markets previously monopolized by natural fibres.

CLASSIFICATION AND PROPERTIES

Natural fibres can be classified according to their origin.

1. The vegetable, or cellulose-base, class includes such important fibres as cotton, flax, and jute.
2. The animal, or protein-base, fibres include wool, mohair, and silk.
3. Regenerated and synthetic fibres include Nylon, Terylene, Orlon, Viscose, Alginate fibres, etc.
4. An important fibre in the mineral class is asbestos.

(iv)

Quantitative Microscopy (Lycopodium Spore Method)

This is an important technique employed in identification of crude drug when chemical and physical methods are inapplicable. Using this, one can determine the proportions of the substances present by means of the microscope, using the Lycopodium spore method.

The powdered drugs with well-defined particles which may be counted—for example, starch grains or single-layered cells or tissues—the area of which may be traced under suitable magnification or the objects of uniform thickness, and the length of which, can be measured under suitable magnification and actual area calculated are usually evaluated using this method.

Adulterated starchy drugs can be determined by counting the number of starch grains per mg and calculating the amount from the known number of starch grains per mg of the pure starch or starchy material.

Thus, if spent ginger is the adulterant, one knows that ginger contains 286,000 starch grains per mg, and the amount used as an adulterant can be calculated by using this figure. The percentage purity of an authentic powdered ginger is calculated using the following equation:

$[N \times W \times 94{,}000 \times 100] / [S \times M \times P] = \%$ purity of drugs

where,

N = number of characteristic structures (e.g. starch grains) in 25 fields;

W = weight in mg of lycopodium taken;

S = number of lycopodium spores in the same 25 fields

M = weight in mg of the sample, calculated on basis of sample dried at 105°C; and

P = 2,86,000 in case of ginger starch grains powder.

If the material is one for which a constant is not available, it is necessary to determine one by a preliminary experiment.

Model Answer
Pharma – Chem- I (T)
D. Pharma – I

Q-1 (A)

i) Sodium Thiosulphate
Formula – $Na_2S_2O_3.5H_2O$
Use- Antioxidant, Antidote, Antifungal

ii) Sodium Nitrite
Formula – $NaNO_2$
Use – Antidote

iii) Aluminium Phosphate
Formula – $AIPO_4$
Use- Antacid

iv) Magnesium Carbonate
(Hydrated $MgCO_3$)
Heavy- $3MgCO_3.Mg(OH)_2.4H_2O$
Light- $3MgCO_3.Mg(OH)_2.3H_2O$
Use- Combination Antacid, Saline Cathartic and Dentifrice.

v) Magnesium Sulphate
Formula- $MgSO_4.\ 7H_2O$
Use- Saline Cathartic and Antidote

vi) Titanium Dioxide
Formula- TiO_2
Use- Topical protective

vii) Alum (Official)
(Potash Alum).
(Aluminium Potassium Sulphate)
Formula - $KAl(SO_4)_2.12H_2O$
Use- Astringent

viii) Sodium Metaphosphate
Formula – $(NaPO_3)n$ (n may be 2 or more)
Use- Dentifrice

ix) Ammonium Carbonate
Formula- $(NH_4HCO_3)m\ (NH_2CO_2NH_4)n$
(Official ammonium carbonate consists of verying proportions of ammonium bicarbonate (NH_4HCO_3) and ammonium carbamate ($NH_2CO_2NH_4$))
Use- Respiratory Stimulant.

x) Ammonium Chloride
Formula- NH_4Cl
Use- Expectorant, Diuretic, Systemic Acidifier

(B**) Definitions**

i)**Buffers**:- Buffers are the chemical systems capable of maintaining a constant P^H of a solution when a small amount of acid or base is added.

ii)**Emetics**:- An emetic is a drug which induce vomiting.

iii)**Astringents**: -These are substances locally applied protein precipitants ,which have low cell permeability and making the cell surface toughen by contraction of tissues after topical application.

iv)**Deodorants**:-Deodorants are the agents which reduce undesirable odour by interacting with liberated odorous fatty acids, or odour produced by bacteria on lipids in sweat. They suppress bacterial growth by decreasing P^H of the skin.

v)**Molarity**:-Morality is the number of moles of solute present in one litre of solution and can be represented as 'M'.

vi) **Hygroscopic**:-A substance that has the ability to absorb water from the atmosphere or air.

vii) **Oxidation**:-The process which results in the loss of one or more electrons by atoms or ions.

viii) **Acid**:-A substance that ionizes in aqueous solution to yield a hydronium ion as one of the ions or a substance that donates proton or accepts electron. The strength of an acid depends upon the degree of ionization.

ix) **Hydrolysis**:-Hydrolysis is the process in which a compound splits / breakes into its ions in presence of water.

x) **Base**:-A substance that ionizes in a aqueous solution to yield hydroxide ion as one of the ion or as substance that possesses at least a lone pair of electrons or which accepts a proton. The strength of a base depends upon the degree of ionization.

Q2)(a) **Sources of Impurity** –

The presence of impurities in pharmaceutical substances can be detected, if it is possible to know-

- The process employed to manufacture the substances.
- The composition of raw materials used to manufacture the substance.
- The properties of the substance.
- The behavior of the substance in normal / abnormal storage conditions.

Source of impurities in pharmaceutical chemicals are _____

(1)**Raw Materials**

The impurities in raw materials e.g. ores, metals, etc. are carried through during the manufacturing process of pharmaceutical substances. The final compound or product may be contaminated with these impurities.

For example-

Copper sluphate is prepared by using sulphuric acid and copper turnings.

$Cu + 2H_2SO_4 \rightarrow CuSo_4 + 2H_2O + SO_2$

Cupper turnings contain impurities like iron and arsenic. These impurities carried to the final products $CuSO_4.5H_2O$ during manufacturing in more amount than IP limits.

(2)**Reagents used in the manufacturing process.**

The Reagents used in the manufacruring of pharmaceutical substances are not removed completely by washing, they still be present in final product.

For Example

Ammoniated mercury is prepared by adding a mercury chloride solution to dilute ammonia solution.

$2HgCl_2 + 2NH_4OH \rightarrow NH_2HgCl + NH_4Cl + H_2O$

The precipitate contain ammonium hydroxide as impurity should be washed completely by cold water from the final product ammoniated mercury.

(3)**Intermediate products in the manufacturing process**

Some intermediate substances produced during manufacturing process are carried through to the final product.

For example

Potassium iodide is prepared by interaction of potassium hydroxide and iodine.

$6KOH + 3I_2 \rightarrow 5KI + KIO_3 + 3H_2O$

The resulting solution is evaporated to dryness and the residue is heated with charcoal.

$KIO_3 + 3C \rightarrow KI + 3CO$

In the preparation of potassium iodide, the potassium iodate is an intermediate product and if it is not converted to KI completely, then it may present in final products as impurity.

(4)**Defects in the manufacturing process**

Improper mixing, incomplete reaction, no use of proper temperature, pressure, P^H and reaction condition etc. are cause of production of impure compounds.

For example

i) Calcium chloride IP ($CaCl_2.6H_2O$) is manufactured by adding excess of pure calcium carbonate to hot dil HCl followed by stirring and filtration. Filtrate is then concentrated and crystallized.

$CaCO_3 + 2HCl \rightarrow CaCl_2 + H_2O + CO_2$

The excess of $CaCO_3$ neutralizes HCl completely. If these are not removed perfectly, some HCl may still remain as impurity in CaCl2 crystals.

ii) Zinc metal may still be present in ZnO as impurity.

5) **Solvents**

Water is a common solvent used in manufacture of inorganic chemicals.

i) Tap water contains calcium, magnesium, sodium, chlorides, sulphates and carbonates as impurities. Traces of these may still remain in the final products.

ii) Softened water contain sodium salts as impurity, may present in final product.

iii) De-mineralised water may contain organic matter as impurities.

iv) Distilled water- Free from all impurities. So, the final product does not contain any impurity.

6)**Action of solvents and reagents on reaction vessels**

Some solvents and reagents may react with metal vessels during manufacturing process and dissolves these metals which appear in final product as impurities.

i) Iron vessels give impurities like arsenic and iron in final product.

ii) Galvanized Iron vessel gives zinc as impurity in final product.

iii) Sodaglass vessels gives alkali as impurity

iv) Hardglass and stainless steel vessels do not give any impurity in final products.

7)**Atmosphoric contamination during the manufacturing process**-

The atmosphere of industrial area may contain

(a) dust particles e.g aluminium oxide, silica glass particles, porcelain particls, plastic fragments etc.

(b) gases e.g sulphur dioxide, hydrogen sulphide and black smoke (soot)

These impurities may enter into product during manufacturing, during purification and crystallization resulting in contamination of final product. Some substances get contaminated with CO_2 and water vapour during their preparation.

For example- NaOH readily absorbes CO2

$2NaOH + CO_2 \rightarrow Na_2CO_3 + H_2O$

8) **Defective storage of final products.**

Some pharmaceutical chemicals undergo chemical decomposition if not stored properly.

For example-

Ferrous sulphate IP ($FeSO4.7H_2O$) undergo slow oxidation and gets coated with ferric sulphate as an impurity. The compound should be stored in well closed containers.

9)**Adulteration**

Some pharmaceutical chemicals may be adulterated with cheaper substances.

For Example.

Potassium Bromide is adulterated with Sodium Bromide.

2(b). **Gutzeit Test for Arsenic**

Arsenic is an undesirable and harmful impurity in medicinal substances. All pharmacopoeias limits its presence in the drugs and prescribed a limit test for it. The test method is known as Gutzeit Test.

Principle

In this test the arsenic impurity in the sample is converted into arsine gas which when passed over a mercuric chloride test paper produces yellow stain. The intensity of the stain varies with amount of arsenic present.

Standard stain Produced separately from a definite amount of arsenic is used for comparison of the test stain .The chemical reactions involved in the test are-

The sample is dissolved in acid (or its aqueous extract is acidified) which convert the arsenic impurity into arsenious acid or arsenic acid depending upon the valency state of arsenic present in the drug sample:

i) $As^{3+} \rightarrow H_3AsO_3$

(Trivalent Arsenic) (Arsenious Acid)

ii) $As^{5+} \rightarrow H_3AsO_4$

(Pentavalent Arsenic) (Arsenic Acid)

The arsenic acid is reduced by a reducing agent (stannous chloride as per IP) to convert the pentavalent arsenic acid in to the Trivalent arsenious acid.

$H_3A_SO_4$ $\longrightarrow$ H_3AsO_3

(Arsenic acid) (Arsenious acid)

The arsenious acid is converted into arsenious hydride (arsine gas) with the help of nascent hydrogen (Produced by Zn + HCl).

$H_3AsO_3 + 3H_2 \rightarrow AsH_3 + 3H_2O$

Arsenious Acid — Nascent hydrogen — (Arsenious hydride) (Arsine Gas)

Arsine gas reacts with mercuric chloride paper i.e. reaction between arsine and mercuric chloride.

$2AsH_3 + HgCl_2 \rightarrow Hg(AsH_2)_2 + 2HCl$

(Arsine gas)

This reaction results in formation of yellow stain on the mercuric chloride paper. The intensity of colour is proportional to the quantity of arsenic.

In the same manner a standand stain is separately produced by the prescribed quantity of arsenic as per Pharmacopoeia.

The intensity of test stain and standard stain are compared. If the intensity of the stain of 'test' (sample) is more than that of the 'Standard', than the sample contains more arsenic than limit. So, the sample fails the test.

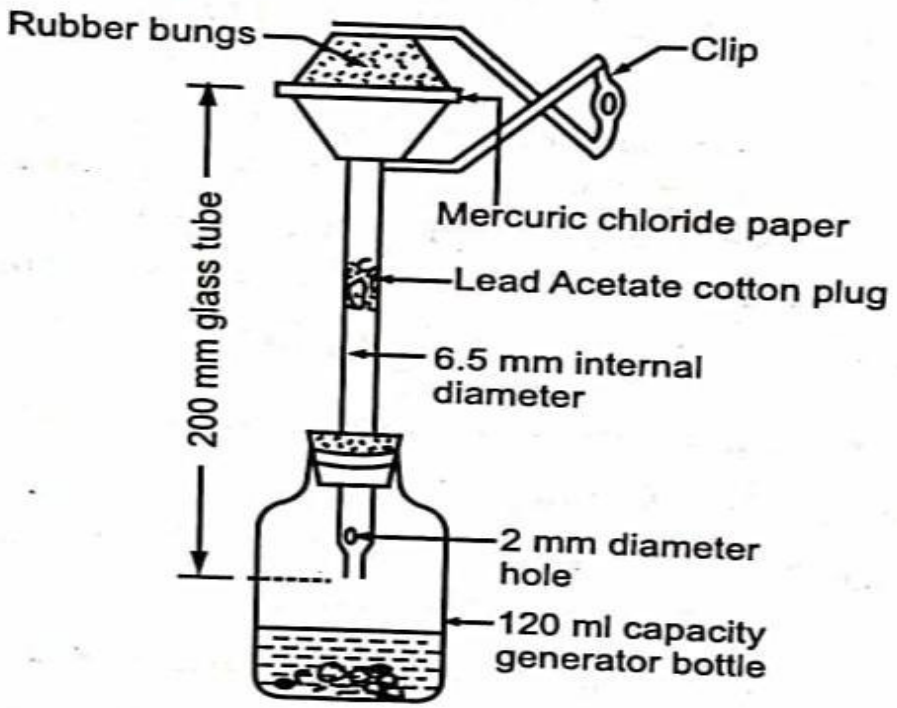
Test Apparatus

As per IP(1985) specification the apparatus is used for limit test for arsenic. The apparatus is consisting of

i) A wide mouth glass bottle of 120ml capacity.

ii) A glass tube of 200 mm long and 6.5 mm internal diameter with a hole of 2mm at one end and the other end cut smooth to hold rubber bungs.
iii) Two rubber bungs of size 25 X 25 mm
iv) A mercuric chloride paper.
v) A spring clip

The mouth of the test bottle is fitted with the glass tube through a rubber (stopper) bung. The end with hole of the tube is inside the bottle. The other end of the tube carry two rubber bungs in between which the mercuric chloride paper is sandwiched at the outside of the bottle. The rubber bungs are held together by means of the clip.



(Apparatus for arsenic limit test) The glass tube is lightly packed with cotton wool which has been previously moistened with lead acetate solution and dried. The lead acetate cotton traps any hydrogen sulphide (H_2S) gas which would otherwise interfere with this test.
Separate apparatus is used for the 'Test' and for the 'Standard'.

<u>Test procedure</u> (Method)

The solution of 'Test' (Sample) is prepared in the acid and Stannous chloride as specified in IP and is placed in the wide mouth bottle. To this is added 1gm of Potassium iodide AsT and 10gm of Zinc AsT. The glass tube with its other fittings is placed quickly in position in the bottle. The action is allowed to proceed for 40minutes.

The yellow stain is produced on the mercuric chloride paper if Arsenic is present. It is compared in day light with the Standard stain produced by doing the test separately in a similar manner with known quantity of the dilute Arsenic solution. This solution contains 1.32mg of Arsenic trioxide in 100ml.(=1mg of Arsenic in 100ml)
Note-

1. This test is a modification of the Gutzeit test and is called Modified Gutzeit test.
2. All the reagents which are used for this test must be completely free from arsenic impurity. These are marked as 'AsT'
3. Potassium iodide is used to reduce the pentavalent asenic acid in to trivalent Arsenious acid. The potassium iodide first convert into hydroiodic acid(HI) which helps in this reduction process.
4. If the evaluation of hydrogen gas is very slow the two apparatus should be warm to 40^0C in a warm or in a water bath.
5. Granulated zinc is used for steady and prolonged evolution of nascent hydrogen.
6. The arsenic impurities expressed in terms of ppm(parts per million). 1ppm is 1mg in 1kg or 1mcg in 1gm.

N.B-For method of Limit Test for Arsenic refer the latest I.P or other pharmacopoeia.

3. (a) **According to G. N. Lewis-**

An acid (proton) is an electron- deficient or electrophilic species.

A base is a species which have unshared electron pairs to share (or donate) with proton (or nucleophilic species).

Thus, a base is an electron pair donor and acid is an electron pair acceptor

This explains the other non-protonic entities that react as acids in manger similar to proton. All compouns containing unshared electron pairs are potential Lewis bases e.g. ammonia, amines, derivatives of ammonia, ethers, alcohol etc. All Bronsted acis are also Lewis acid because the proton from any proton donor (acid) coordinates with unshared electron pair. From this definition it understood that all Lewis acids are not Bronsted acids. Similarly all Bronsted bases are also Lewis bases because of their electron doner property but since all lesis bases may not react with a proton, they cannot be Bronsted bases.

Thus, molecules with 'open sextet' are Lewis acids because they can accept a pair of electrons from a donor atom or a molecule to from coordinate covalent bond to complete the octet e.g. BF_3, $AlCl_3$, SO_3, $ZnCl_2$, $FeCl_3$ etc. All of these contain an element which have short of two electrons to complete their valency shell.

Many positive or metal ions are onveniently regarded as Lewis acids e.g. Ag^+, Fe^{2+} and Zn^{2+} etc. They accept electron pairs from donor molecules like H_2O, NH_3 etc or anions like F^-, S^{2-}, CN^- etc.

$$Ag^+ + : NH_3 \rightarrow [Ag:NH_3]^+$$

Transition metal complexes are examples of the combination of a Lewis acid (metal cation) with a Lewis bace (the ligand). The compound which posses a central species cabale of expanding the valence shell to accept a pair of electron are also lewis acids e.g. SiF_4, $SnCl_4$ and SF_4.

Any anion and any neutral molecule having a pair of non-bonded electrons can react as a Lewis base e.g. H_2O, NH_3, halide ions, etc.

The chemical reactions between Lewis acid and Lewis results in a product that is that are known as adduct, an acid-base complex or a coordinated complex.

Why $AlCl_3$ act as Lewis acid

According to the Lewis acid-base concept the molecules with open sextet of electrons are Lewis acids because they accept pair of electrons from a donor atom or a molecule to form coordinate covalent bond to complete the octet.

If we see the molecule of $AICl_3$ (Aluminium trichloride) as an Lewis acid which has deficient of two electrons . So it require a pair of electrons from a donor atom or a molecule to complete its octet to form coordinate covalent bond.

Q.3(b) Antacid

Antacids are substances which react with the gastric and lower the acidity of gastric contents. They produce a symptomatic relief of heartburn, pain and also reduce spasm in addition to relief from the uncomfortable feeling from overeating and a growing hungry feeling between meals.

Antacids are weak bases and they raise the gastric pH above 4 by neutralising excess gastric hydrochloric acid, which may be causing pain and possible ulceration.

Antacids also used to inactivate to cure proteolytic enzyme and pepsin.

Antacids can be classified as:-

(i) Systemic (absorbable) antacids: which are soluble, readily ab- sorbable and capable of producing systemic electrolytic alterations and alkalosis e.g. sodium bicarbonate.

(ii) Non-systemic (non-absorbable) antacids: which are not ab- sorbed to a significant extent and thus do not exert an appreciable systemic effect. This group is further sub-divided into follow-

ing:- (a) Aluminium containing antacids: e.g. aluminium hydroxide, aluminium phosphate, dihydroxyaluminium aminoacetate, dihydroxyaluminium sodium carbonate, basic aluminium car- bonate (gel).

(b) Calcium containing antacids: e.g. calcium carbonate, tri- basic calcium phosphate.

(c) Magnesium containing antacids: e.g. magnesium carbonate, magnesium citrate, magnesium hydroxide, magnesium oxide,

magnesium phosphate, magnesium trisilicate. (d) Combination antacid preparations: e.g. aluminium hydrox- ide gel & magnesium hydroxide, aluminium hydroxide gel and magnesium trisilicate, magaldrate (monoalium hydrate; hydrated magnesium aluminate), simethicone (defoaming agent) contain- ing antacids, calcium carbonate containing antacid mixtures, alginic acid-sodium bicarbonate containing antacid mixtures.

Method of preparation and uses of Potassium sodium tartarate

Potassium sodium tartarate is also known as Rochelle Salt or Seignette Salt. It is the synonym of Sodium potassium tartarate. Its chemical formula is $CuH_4KNaO_6.4H_2O$.

Potassium sodium tartarate is prepare by neutralizing a solution of sodium carbonate with potassium bitartarate. The solution is boiled for some time and neutralized. The solution is filter and allowed to crystallized. Then separate out the crystals.

Uses- i. It is a saline purgative.
ii. depending upon dose it can be used as laxative or active hydragogue.
iii. Its palatable form is compound effervescent powder.
iv. Causes watery evacuation of bowel after 1-2 hrs without irritation due to poor absorption of tartarate anion.

Q. 3 C) Difference between antiseptics and disinfectants

Antiseptics	Disinfectants
1. These are agents employed for living tissues to destroy or inhibit the growth of micro organisims. 2. They are applied before injection or surgical procedure and for hand sanitation.	1. These are employed for in animate (non-living) objects to destroy micro organisims. 2. Play major role in public health sanitation.

Preparation of potassium permanganate

For preparation of potassium permanganate : maganese dioxide is fused with excess of potassium hydroxide in the presence of free supply of air or with addition of some suitable oxidising agent such as potassium nitrate or potassium chlorate . Potassium Manganate is formed.

$2KOH+MnO_2+[O] \rightarrow\rightarrow K_2MnO_4+ H_2O$

Potassium permanganate is prepare from potassium manganate by any one of the following three methods.

1. Solution of potassium manganate is treated with carbon dioxide gas which precipitates one third of the manganese as manganese dioxide and the rest of manganese is converted into permanganate which remains in the solution.

$3K_2MnO_4+2CO_2 \rightarrow\rightarrow 2KMnO_4+MnO_2+2K_2CO_3$

2. By passing chlorine gas through potassium manganate solution.

   $2KMnO_4+Cl_2 \rightarrow\rightarrow 2KMnO_4+2KCl$

3. By electrolysis of potassium manganate solution.

   $2KMnO_4+Cl_2 \rightarrow\rightarrow 2K^++2MnO^-_4$

   At cathode $2K^++2H_2O \rightarrow\rightarrow 2KOH+H_2$

   At anode $KMnO_4^- --e^- \rightarrow\rightarrow KMnO_4$

   The solution of potassium permanganate thus obtained is concentrated to crystalisation.

Uses of potassium permanganate

1. It is a topical anti infective (anti-bacterial and anti-fungal)
2. 1 in 1000 solution is used cleanse ulcers and abscaeses.
3. 1 in 4000 solution is used as gargles and mouth washes.
4. 1 in 4000 solution also used for bathing eczema and dormatoses.
5. 1 in 10000 to 1 in 15000 solution is used for weping skin lesions and for urethral irrigation.
6. 0.02% solution used for stomach wash is poisoning of morphine, opium and strychnine but mostly completely remove from stomach after its use.
7. It destroys any venom (snake venom) lying free on the skin surface.
8. Its solution is frequently used as an antiseptic in vetenary practice.

4.(a) <u>Definition</u>

i) **Intracellular fluid(ICF**) - It comprising 45-50% of body weight. The intra-cellular fluids contain K+, Mg2+, and phosphate (HPO_4^{2-} and H_2PO_4) ions.

ii) **Extracellular fluids-** Consists of both interstitial fluids (comprising 12-15% of body weight) and plasma or vascular fluids (comprising 4-5% of body weight). The extra cellular fluids contain Na^+ and Cl^- predominantly. It also includes CSF fluids, peritoneal, pleural and synovial fluids.

Combine electrolyte therapy-

Combined electrolyte therapy is used as supplement of water and electrolytes before serious fluid loss or to replace fluid loss due to diarrhoea and other conditions of fluid loss.

<u>Electrolyte Combination Therapy</u>

Electrolyte Combination Therapy is of two categories :

i) Intravenous fluid
ii) Oral rehydration salt

iii) **Intravenous fluid-** These are fluids or solutions of electrolytes are administered intravenously to the patients when the patient is unable to take food orally. These fluids contain at least 5% glucose.

Preparation

i) Sodium lactate injections (I.P. and B.P)
It is a sterile solution of continaing 1.75 to 1.95% w/v of sodium lactate. It is 1/6 molar solution. It contains 167 millimole(approx) of sodium and bicarbonate ions(as lactate) per litre. It is used as a fluid & electrolyte replenisher.

ii) Compound sodium chloride injection (IP)
(Ringers's Injection)
It is a sterile solution of –
NaCl- 0.82 to 0.9% w/v
KCl- 0.285 to 0.0315% w/v
$CaCl_2.H_2O$- 0.03 to 0.036% w/v

iii)compound sodium lactate intravenous infusion (BP)
compound sodium lactate injection (IP)
Lactic acid-2.4 ml
Sodium hydroxide -1.15gm
Dilute HCL –qs
Sodium chloride-6.0gm
Potassium chlorode-0.4gm
Calcium chloride-0.27gm
Water for injection-qs to1000ml

LABEL

Miliequivalent of ions in one litre –
Sodium-131,potassium-5,calcium-4,chloride-111,carbonate(lactate)-29

Oral Rehydration Salt (ORS)- As dry powers/solutions

In prolonged diarrhea and dehydration it is necessary to rehydrate the patient orally by administering a solution with composition approved and recommended by WHO to reduce morbidity and mortality. 90-95% cases of cholera and acute diarrhoea can be successfully treated with ORS alone.

WHO recommended composition of ORS

Sodium chloride- 3.5g
Potassium chloride- 1.5g
Sodium Bicarbonate- 2.5g
Or
Trisodium Citrate- 2.9g
Glucose - 20 g.
Safe drinking water - 1 Litre.

The solution provides 90 mEq/l of (2) Na^+, 20 mEq/l of K^+, 80 mEq/l of Cl^-, 30 mEq/l of HCO_3^-. III mEq of glucose to compensate electrolyte and nutritional losses. It

should be given freely till hydration is corrected. The ORS of 90mEq/l of sodium is suitable for all types of diarrhoea for all ages. There may be minimal risk of hypernatremia developing in neonates and young infants with immature kidney fuctions.

New ORS Formula by WHO and UNICEF

New ORS formula by WHO is sodium and glucose solution used to treat children with acute diarrhoea. This ORS is primary tool to fight acute diarrhoea and mortality rate for children.

A study says that using low-sodium and low-glucose ORS formula reduces the need of i/v fluids by 33% and result is fewer children hospitalization of lower healthcare cost.

Reduce Osmolarity ORS

This new ORS formula has Reduced Osmolarity.

Sodum – 75 mEq/l

Glucose- 75 mmol/l

Total Osmolarity of 245 mOsm/L

It has similar effectiveness as standard ORS in adults with cholera. However, it is associated with asymptomatic hyponatraemia. This formula may be used in place of standard ORS for treating adult with cholera but careful monitoring is required for risk of symptomatic hyponatraemia.

The improved effectiveness of reduced Osmolarity ORS solution, especially for children with acute, non-cholera diarrhea can be used. WHO and UNICEF now recommended the countries to use and manufacture this formula in place of previously recommended ORS solution having total osmolarity of 311 msom/L.

The same criteria has to be followed for the new fomula as recommended by WHO and UNICEF. The criterias are

The total substance concentration (including that contributed by glucose) should be within the range of 200-310 mmol/L

The individual substance concentration:

- Glucose should at least equal that of sodium but should be exceed III mmol/L
- Sodium should be within the range of 60-90 mEq/L
- Potassium should be within the range of 15-25 mEq/L
- Citrate should be within the range of 8-10 mmol/L
- Chloride should be within the range of 50-80 mEq/L

Reduced osmolarity ORS	grams/ litre	Reduced osmalarity ORS	mmol/litre
Sodium chloride	2.6	Sodium	75
Glucose, anhydrous	13.5	Chloride	65
Potassium chloride	1.5	Glucose, anhydrous	75
Trisodium citrate		Potassium	20
dihydrate	2.9	Citrate	10
		Total Osmolarity:	**245**

Q4. B) **Antidote**:- An antidote is an agent that counteracts a poison.

Clasification:- Antidote classified according to their mechanism of action.

a) Physiological antidote- they counter act the effect of poison by producing other effect
   Ex:- Sodium nitrite convert haemoglobin into mephaemoglobin in order to bind cyanide
b) Chemical antidote: They change the chemical nature of poison
   Ex:- Sodium thiosulphate convert systemically toxic cyanide to non toxic thiocyanate
   Ex: Sodium or calcium edetate chilate heavy metal poisoning.
c) Mechanical antidote: prevent absorption of poison into the body.
   Ex: Activated charcoal , kaolin which absorbs the poison before crosses the intestinal wall.
   Ex: Cuppor sulphate, Magnesium sulphate, Sodium monohydrogen phosphate they inactivate and pesipitate the toxic material as insoluble salts.

i) **Method Of preparation of Sodium Nitrite**

It can be prepared by strongly heating sodium nitrate.

$2NaNO_3 \xrightarrow{\Delta} 2NaNO_2 + O_2$

It is more conveniently made by heating the nitrate with metallic lead.

$NaNO_3 + Pb \xrightarrow{\Delta} NaNO_2 + PbO$

Now, sodium nitrite is obtained by absorbing the gases resulting from the catalytic oxidation of ammonia in sodium carbonate solution.

$4NH_3 + 5O_2 \xrightarrow{Catalyst} 4NO + 6H_2O$

$2Na_2CO_3 + 4NO + O_2 \longrightarrow 4NaNO_2 + 2CO_2$

ii) Method of preparation of Sodium Thiosulphate ($Na_2S_2O_3.5H_2O$)

a) Sodium Thiosulphate is prepared by boiling sodium sulphite with sulphur

$Na_2SO_3 + S \rightarrow Na_2S_2O_3$

b) It can also prepared by passing SO_2 gas in mixture of sulphide liquors (8%) and sodium carbonate (6%)

$2Na_2S + Na_2CO_3 + 4SO_2 \rightarrow 3Na_2S_2O_3 + CO_2 \uparrow\uparrow$

Storing conditions of antidotes used in cyanide poisoning

Sodium nitrite and sodium thiosulphate should be stored in air tight containers . sodium thiosulphate should be store under below 33^0 C.

Q5. a) **Nitrous Oxide**

Chemical formulae – N_2O

Molecular weight – 44.01

Synonym – Laughing gas , Nitrogen Monoxide, Dinitrogen Oxide

Preparation :- It can be obtained by heating ammonium nitrate at about 170^0C. The reaction may be explosive at higher temp. With formation of nitrogen, other oxides of nitrogen and NH_3.

$NH_4NO_3 \rightarrow\rightarrow N_2O \uparrow\uparrow + 2H_2O$

It can also prepare by heating a mixture of sodium nitrate and ammonium sulphate.

$2NaNO_3 + (NH_4)_2SO_4 \rightarrow\rightarrow Na_2SO_4 + 4H_2O + 2N_2O \uparrow\uparrow$

Properties :- It is colourless gas , odourless and tasteless

It may also describes as having a slightly sweet odour and taste

one litre of N_2O weigh about 1.97g at 0^0C and at pressure of 760mmhg

One volume of gas dissolves in 1.4volume of water at 20^0C and 760mmhg pressure

It is freely soluble in ether and oils

It liquefies at 15^0C and under 50atm pressure

Storage Labelling and colour markings

- It must be stored under compression in metal cylinders as confirming safety regulations.
- It should be stored under 37^0C
- The cylinder should be painted blue and carry a label stating the gas nature.
- The cylinder shoulder is labelled with gas name or the symbol N_2O stencilled in paint.

Uses:-

- It is used as the only inorganic compound the oldest and safest and weak inhalation.
- It is non irritant when given alone.
- As general anaesthesia.

Q5.b) **Radio opaque contrast media**

Radio opaque contrast media are chemical compounds which have ability to absorb x-ray and block the passage of x-ray thus they are opaque to x-ray examination.

All radio opaque compounds are not radio pharmaceutical unless they contain radio isotopes in their structure.

X-rays are capable of passing through soft tissue like skin and other soft structure.

The X-rays are blocked or arrested significantly by bony structure, cartilage and teeth.

When a photographic film or photosensitive plate is placed opposite to the x-rays source through patients body or organ portions : the film or plate is darken in an amount proportional to the number of x-rays that are able to pass in case of soft tissue or appear like on exposed x-ray Film or plate in case of bone, teeth etc.

Thus on viewing it can diagnose the fractured, malformation etc

Bone and teeth mainly consists of calcium and phosphorus represents higher atomic number and closely packed in biological structures and provide large electron density.

The capacity of absorbing / stopping the passage of x-rays is directly proportional to availability of electrons in the system. Therefore skin and soft tissues have less electron density and primarily composed of low atomic number atoms (C, H, N, O_2) and do not capable of forming dense electron

barrier or screen to stop x-rays. At must the soft structure appears only as shadow on x-ray film or plate.

On account of different composition of various tissues the capacity to absorb or block the passage of x-rays varies. Therefore it is possible to have a fair idea on size and shapes of various anatomical organs upon visualising the produced shadows on exposed x-ray films / plates. However the may be little variation in x-ray films or plates which is not possible to make correct diagnosis and may lead to incorrect conclusion. The radio opaque contrast medias can be use for much clear and distinguishing shadows on x-ray films or plates for proper diagnosis and interpretation of different anatomical organs. Various radio opaque contrast media are used in the examination of git, gall bladder and bile duct, kidney and ureter, fallopian tubes, liver, blood vessels, heart and brain etc.

The radio opaque contrast medias do not require pharmacodynamic effect in the body and such effects are considered as side effects. Most common contrast media are either inorganic or organic compounds contain barium or iodine respectively.

Their x-ray opacity depends on their concentration in specific organ under study.

i) Inorganic compounds e.g. Barium sulphate as suspension given orally.

ii) Iodinated organic compound e.g. (a) Iodinated aromatic organic acidizes and their derivatives (b) Iodine added ethyl esters of fatty acids of poppy seeds oil (Iodise oil fluid injection) . These are given by I/G or by retrograde (Mechanically instillation into the organs).

5.c**) Anti caries agent –** Anti caries agent prevents dental caries or tooth decay is defined as a disease of the teeth caused by acids formed by the action of microorganisms on food contain carbohydrates and characterised by decalcification of tooth with foul odour of the mouth . It is believed that the dental carries begins on the surface of the teeth or between teeth . When foods of fermentable carbohydrates are lodged and undergo decay by bacterial action to produce acid e.g. lactic acid . The formation of plaque on tooth surface, also potentiates the decay process . The acid so produced dissolves enamel and dentine of the teeth and carries develop. Dental carries in infants due to poor nutrition and poor architecture of the teeth. Candies, pastries and sweets are easily fermentable and make more worst carries.

Prevention –

In order to prevent dental carries and to maintain clean and healthy teeth ,it is necessary to maintain oral hygiene includes cleaning of teeth and prevention of tooth decay. Brushing with dentifrice regularly removes adhered food particles from teeth and prevents bacterial actions .

Fluoride containing preparation in low concentration of 1-2 ppm prevents dental carries . Fluoride salts and solutions when taken orally deposits on the surface of teeth and prevent the action of acids or enzymes. Fluoride in drinking water decries the dental carries in population . This action of fluoride may be due to fluorine which is an essential elements in the composition of enamel and help the enamel to resist the action of acid. It may act locally to inhibit the action of enzymes to produce organic acids. Thus fluorides are administered in two ways

i) orally

ii) topically.

important fluoride containing compounds are sodium fluoride and stannous fluoride.

Fluoride containing products –

i) fluoridated water

ii)fluoride drops

iii)topical fluoride application to teeth

iv) fluoride containing vitamins

v)fluoride denitrifies e.g pastes and powder

uses-

i)sodium fluoride-

* prophylaxis of dental carries in communities by low (1ppm) fluoride containing drinking water and food .

* 2% solution of sodium fluoride in water or 75% sodium fluoride in glycerine as application to teeth and rubbed and removed by mouth wash may be beneficial for tooth health .

NOTE- excessive ingestion of sodium fluoride cause mottling of teeth .

ii) **Stannous fluoride –**

- it is a valuable adjunct in prevention of dental carries and superior to sodium fluoride in application and effectiveness.
- A single application of 8% stannous fluoride as aqueous solution to the tooth surface is enough for every six months to one year .

5.d**) Anti oxidants**-

**Definition- ***An anti oxidant is an agent which is added such preparation to prevent oxidation and subsequent degradation of the pharmaceutical product. They act by two ways

i) Anti oxidant is oxidised it self in place of the active ingredients of the product.

ii) If the active ingredients are oxidised the anti oxidant reduces it back to its normal oxidation state .

Theory- It is based on oxidation –reduction or redox reaction . These reaction are considered similar to Bronsted acid base reaction . The said conjugate pairs of oxidised and reduce forms of a compound can be separated from the chemical equation . In redox reaction the

transfer electron from one compound to other the loss or gain of electron is used to balance the oxidation states on both sides of the half reaction.

For example-

It oxidised form of compound 1 is Ox_1 and reduced from of compound 2 is Red_2 ,then each half reaction can be represented as-

$Ox_1 + e^- \rightleftharpoons Red_1$ and $Red_2 \rightleftharpoons Ox_2 + e^-$

The total redox reaction is –

$Ox_1 + Red_2 \rightleftharpoons Red_1 + Ox_2$

Selection of antioxidants

i) An antioxidant should possess desired redox reaction

ii) Should be non toxic

iii) Should be physiologically and chemically incompatible

iv) It should not pose any solubility problem in its reduced or oxidised form

Important official antioxidant

Hypophosphorous acid (HPH_2O_2), Sulphur dioxide(SO_2), Sodium bisulphate($NaHSO_3$), Sodium metabisulphite($Na_2S_2O_5$), sodium triosulphate($Na_2S_2O_3.5H_2O$), Sodium nitrite($NaNO_2$) and Nitrogen(N_2). These are used as antioxidant along with some other uses.

Q6) **Radioisotopes:**

Radioactive isotopes are unstable and emit radiations. The naturally occurring radioactive isotopes are like Uranium, Radium and etc or may be produced artificially. The phenomenon of emitting radiations by these isotopes is known as radioactivity and such isotopes are called radioactive isotopes.

Types of radionuclides

Radioisotopes are of two kinds-

i)Natural radionuclides- 40 nuclides eg- U-235.Ra-226,Rb-87,K-40,etc

ii)Artificial radionuclides-(produced in nuclear reactions by reactor irradiation).

Properties of radioisotopes:

The atoms of radioactive isotopes emit radiations as alpha particles, beta particles, gamma rays. Each radionuclide whether natural or artificial gets disintegrated at a characteristic rate by emitting energy in the characteristic form of electromagnetic radiation. The forms of radiation are of two types.

i)Particulate-(alpha and beta radiation)

ii)electromagnetic (gamma –rays)

these forms of radiation are interchangable.the particles radiations are beams high speed charged particles which -

i)can be deflected by electrical or magnetic fields

ii)can penetrate matter

iii)can ionise matter (e.g gas) through which they pass

iv)cause scintillation (emit flashes of light)in certain substance

v)can darken photographic plates; these properties are the basis of detection,estimation and measurement of radioactivity.

Application of radio isotopes

Radio isotopes are widely used in various fields like medicines, industries agriculture pollution control, pest control, food preservation etc.

The use of radio isotopes in medicine for diagnosis ,radiation therapy, research, sterilization etc. The preparations of radio isotopes used in medicine are called Radio Pharmaceuticals /Nuclear medicines.The radio pharmaceuticals are used in two ways –

i)Radiation source in therapy(therapeutic application).

ii)For diagnostic purpose.

The treatment with gamma radiation by focusing radiation to the area under treatment is called "Teletherapy"

The other mode of administration of radio pharmaceuticals are-

i)Implantation therapy

ii)Remote controlled shutter therapy

iii)Contact therapy and etc.

1)Therapeutic application-

Include use of open source in which radiations ionise atoms produce destructive effect on cells and prevent new cell formation.

a) Applied in cellular metabolic malfunction or malignant growth

Examples-

i)Hyperthyroidism and treatment of thyroid cancer-NaI^{131},

ii)Carcinoma of bone- Ca^{44} and Ca^{45}

iii)Polycythemia vera-$Na_2HP^{32}O_4$

iv)Teletherapy and Brachytherapy-Uses sealed sources eg. Co^{60},Cs^{137} etc.

v)Particulate emitters for therapy –P^{32},Sr^{89},Y^{90},I^{131},Sm^{153}, Re $^{186/188}$,Au^{198} etc.

2)Diagnostic applications –Includes scintigraphy of organs both static and dynamic imaging and as radioactive tracers. The static imaging study the size and morphology of organs under study The dynamic imaging study the functioning of the organs. A variety of mechanisms are exploited for achieving the desired organs specificity and includes active transport, capillary blockage, antigen antibody reactions etc. The important radioisotopes used in formulation for diagnostic work are

-Cr^{51},$co^{57/58}$,$Fe^{52/59}$,Ga^{57},Kr^{81},Rb^{82},Tc^{99},ln^{111},$I^{123/125/131}$,Xe^{133},Yb^{169},$Au^{195/198}$,Ti^{201} etc.

Handling and Storage Of Radioactive Materials-

Great care must be taken in handling and storage of radioactive materials so as to people and personnel from harmful radiations which the radioactive materials emits. Exposure to

radiation can cause serious complications including Leukemia (Blood cancer). The persons handling radioisotopes must use Lead Shielding which absorb radiations. Second precautions to be taken while working with detectors, tracer experiment, radio-assay, manufacturing of radioactive materials are-

i)Radioactive materials must never be touch with naked hand but handled by suitable forceps.

ii)Smoking , eating, drinking activities must not be carried out in the laboratory where radioactive materials are handled . Food contaminated with radioactive materials cause serious organ damage.

iii) Sufficient protective clothing (shielding) must be used while handling radioactive materials.

iv) Radioactive materials should be stored in labelled containers and shielded by lead bricks and preferably in a remote corner.

v) Where the radioactive materials are stored and used should be monitored and tested for radioactivity continuously.

vi) Disposal of radioactive materials is done with great care.

Q-7 (a) **Principle of limit test for Sulphates**

Limit test for sulphates depend upon the interaction of sulphates with Barium chloride in the presence of dil.HCL. This results in precipitation of sulphates as Barium sulphates

Sulphates + $BaCl_2$ $\xrightarrow{\text{dil HCL}}$ $BaSO_4$ + Chlorides

(soluble) (soluble) (precipitate) (soluble)

SO_4^{2-} + $BaCl_2$ ⟶ $BaSO_4$ + $2\ Cl^-$

(sulfate ion) (barium chloride) (barium sulphate) (chloride ion)

Hydrochloric acid prevents precipitation of other acid radicals such as phosphates,oxalates etc. by common ion effect with Barium chloride solution so that less barium ions are formed and only sulphates are precipitated. The test turbidity of sample is produced as specified by monograph of the Pharmacopoeia. The turbidity produced by test solution is compared with standard turbidity under uniform conditions of illumination in Nesseler cylinders. If the turbidity produce by the **Test.**(sample) is less than the turbidity produced by the **Standard** then it means that sample contains less quantity of sulphates as impurity than permissible limit.The standard turbidity is produced by one ml of 0.1089% w/v solution of potassium sulphate and 2 ml of dil. HCl in another Nessler cylinder, dilute to 45 ml with water then add 5 ml of Barium sulphate.

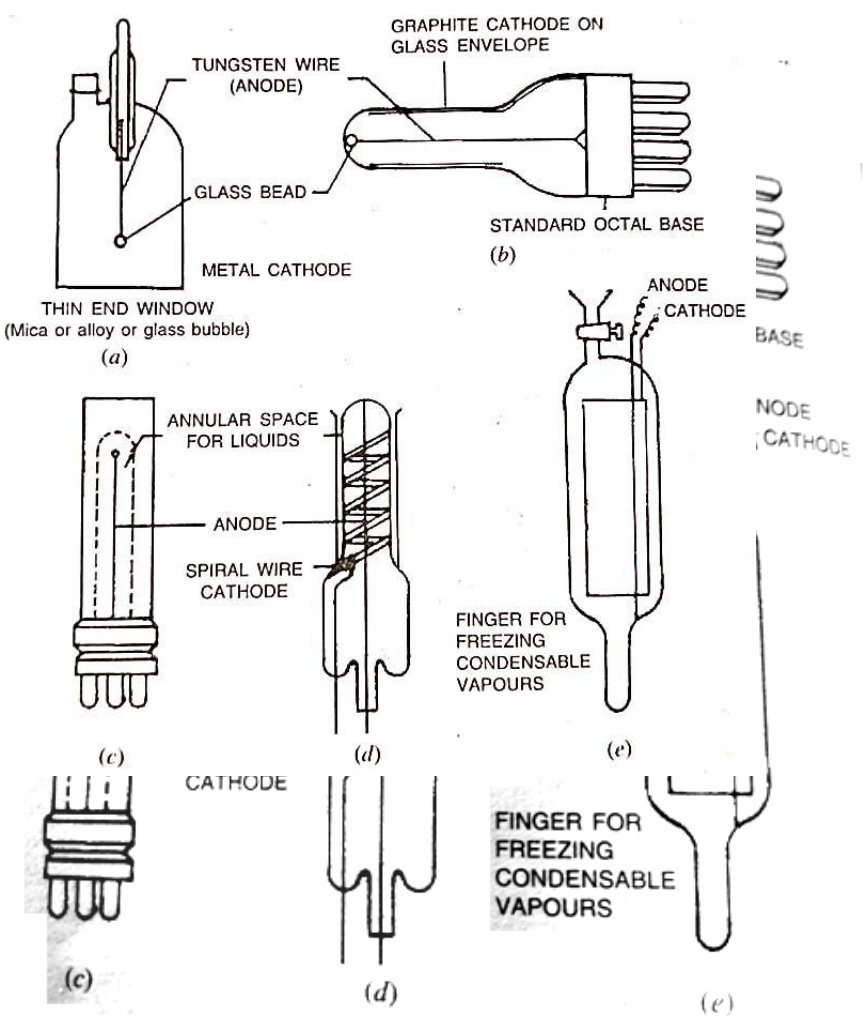
The test is revised in IP 2010 in which distilled water is used to prepare solutions. This revised test uses one reagent -Ethanolic Sulphate Standard solution(10 ppm SO_4).It also reffered as Sulphate Standard Solution(10ppm SO_4) for Test and Standard solution.

Q.7(b) **G.M counter (Geiger-Muller Counter)**

The rate of emission of α, β and γ radiations can be detected by G.M counter.

The G.M counter is the oldest radiation detector .Due to its simplicity,low cost and easy operation is still continued as best radiation detector. They do not require high-gain amplifier and can detect α, β and γ radiations.

A G.M counter consists of a cylinder (1-2cm in diameter) made up stainless steel or glass with silver coated on the inner side which act as an cathode. A fine tungsten wire mounted Coaxially inside the tube, which act as an anode. The cylinder space is filled with a special gas mixture of ionizing gas (Ar and He being the common choice) which also contains a small proportion quenching vapour. The functions of quenching vapour are (i) to prevent the false pulses positive ions towards cathode and absorb the photons emitted by exciting atoms /molecules returning to their ground state. Chlorine, bromine, ethyl alcohol, and ethyl formate are commonly used quenching agents.



(a) For solids (b) For solids to count high energy β particles (above 0.5MeV)and I-counting (c) and (d) both for liquids (e) for gases

Radiation when enters the tube through a window (a thin section of outer wall) causes ionisation of atoms of the gas. When a high voltage (300-1300 V) is maintained between two electrodes, the electrons and positively charged ions are attracted by the anode and cathode respectively .There is a

flow of current due to passages of these ions through the tube. Each particle of radiation produces a brief flow or pulse of current which can be recorded by a scaler which show the total number of pulses. All pulses of radiation have same amplitude. The container does not distinguish between different radiation types and their energy.

Design and Construction of G-M Counters is dependent upon the state of radioactive material and the purpose of their requirement.

Q.7(C) **Saline cathartics**

Cathartics are the drugs used to relieve constipation. The term laxative is used for mild cathartic whereas purgative used for strong cathartic. The mild cathartics are bulk producing drugs and stool softeners. The strong purgatives are irritant or stimulant purgatives and saline cathartics.

The use of cathartics become necessary to –

(i) Relieve acute constipation

(ii) Avoid raise in blood pressure during defecation of cardiovascular or cerebral diseased patients

(iii) Easy defecation in patients with painful haemorrhoids ,other rectal disorders

(iv) Avoid excessive strain and simultaneous abdominal pressure in patients with hernias

(v) Remove solid materials from intestine prior to certain X-ray studies

Saline cathartics/Osmotic laxatives

The saline cathartics are salts of poorly absorbable ions (eg Biphophate,Phophate,sulphate,tartarate,Magnesium) which increase the osmotic load on the intestinal tract. The hypertonicity of the gut is relieved by the secretion and drawing of fluids into the the intestinal tract. This increase of the bulk in the intestine stimulates peristalsis and bowel movement. Excessive loss of body fluids in form of watery stool occurs usually following administration of saline purgatives. Therefore saline purgatives are taken with large volume of water.

Patients with low sodium diet should avoid long term use of sodium containing saline cathartics. Patients with impaired kidney function and mental depression should not use magnesium containing saline cathartics.

Classification

i) Sodium containing compound – eg. Sodium biphosphate, sodium phosphate, potassium sodium tartarate

ii) magnesium containing compound- eg. Magnesium hydroxide(milk of magnesia), magnesium citrate, magnesium sulphate

iii) Sulphur

iv) Non official cathartics-eg. Sodium sulphate, potassium phosphate, potassium bitartarate, calomel(murcurous chloride)

examples of saline cathartics

1) sodium potassium tartarate

Formula- $C_4H_4KNaO_6.4H_2O$

Synonym- Rochelle salt

Use- Saline purgative without irritation
Dose- 10gm (8-16gm) for adult
Half the adult dose for children
2) Magnesium sulphate
Formula- $MgSO_4.7H_2O$
Synonym- Epsom Salt
Use- Oral saline cathartic, antidote
It should not be given to the patients with impaired renal function

Q.7(d) **Haematinics-**
Certain Iron containing compounds used to increase the haemoglobin content of blood is called as Haematinics .Iron is essential in the formation of haemoglobin and for various physiological needs.

Some iron preparations used internally as iron supplement. Currently IP 1996 includes Ferrous fumarate, ferrous gluconate, ferrous sulphate, dry ferrous sulphate, iron and ammonium citrate as official substances in the monograph. All these substances are used as Haematinics.

Other iron preparations are Ferrous succinate, colloidal iron, sodium iron edetate, iron dextran inj. and iron sorbital inj. , of these only iron dextran inj. Is currently official. It is a sterile colloidal solution containing a complex of ferric hydroxide with dextrans.

The best food source as of Iron are liver, meats, egg yolk, green leafy vegetables, whole grains and cereals. The recommended dietary allowances per day are 10mg for male and 80mg for female. The demand of iron increases during growth, menstruation, pregnancy and pathological bleeding. The deficiency of iron in the body is clinically manifested by anaemia (hypochromic i.e lack of haemoglobin in the blood).

Example-
Ferrous sulphate-
Formula- $FeSO_4.7H_2O$
Synonym- Iron vitriol, Green vitriol, ferrosi sulfas
Use- Haematinic in the treatment of anaemia

Dry ferrous sulphate- (approx $FeSO_4.2H_2O$). It contains 80-90% of ferrous sulphate. It is dispense as tablet or as sugar coated tablet.

PHARMACEUTICS – I 2022 Special Examination E. R. - 1991

MODEL ANSWER

01. (A)

(i) **Enteric coated tablet -** These tablets will not disintegrate in the stomach but pass through it as such and get disintegrated in the intestine.

(ii) **Comminution –** Comminution or size reduction is the process of reducing drugs (vegetable and chemical substances) into smaller pieces, course particles or fine powders.

(iii) **Isotonic solution –** A solution that has the same salt and water concentration as cells and blood. A solution containing 0.9 % sodium chloride is practically isotonic with blood plasma.

(iv) **Filter aid –** Substance which reduce the resistance of the filtrate to flow, generally 0.1 to 0.5 % are used before filteration.

(v) **Slug –** When the medicament is unstable in presence of moisture the dry powder is compressed into large tablets or slugs.

(vi) **Lozenges –** These are solid dosage forms that are intended to be dissolved or disintegrated slowly in the stomach.

(vii) **Pessaries –** They are meant for introduction into vagina, weight from 4 to 8 gram, conical, wedge or rod shaped and also called as vaginal tablet.

(viii) **Soxhlet extraction –** Soxhlet extraction or continuous hot percolation is used when active constituents of the drug are not freely soluble in the solvent or difficult to be displaced from the cells of the drug.

(ix) **Steam distillation –** It is used for the separation of two immiscible liquids. It is used for the preparation of volatile oils.

(x) **Wetting agent –** By reducing the interfacial tension between solid particles and liquid medium, excess may cause foaming.

01. (B) (i) Percolation & Infusion -

Percolation	Infusion
1. Used for preparation of tinctures. 2. The marc is pressed. 3. Final volume is adjusted with the menstruum and then filter.	1. Cold or boiling water is used as menstruum. 2. Drug is made in contact with menstruum for 15 mins. 3. Marc is not pressed.

(ii) Purified water & Water for injection –

Purified water	Water for injection
1. It is free from volatile and non-volatile impurities. 2. It is prepared by distillation, ion-	1. It is free from volatile and non-volatile impurities, micro-organism and pyrogens.

exchange treatment, reverse osmosis. 3. Not used in parenteral preparation.	2. It is prepared by distillation. 3. Used in parenteral preparation.

(iii) Fine powder & Granules –

Fine powder	Granules
1. Does not flow evenly through the hopper of the tablet machine. 2. Air is imprisoned during compression which may cause capping. 3. Fine powder tends to blow out of the die and cause sticking of machine.	1. Granules flow evenly through the hopper of the tablet machine. 2. Air is not entrapped during compression which form sound tablet. 3. Granules do not blow out of the die and therefore no sticking to the machine.

(iv) Vaccines & Toxoids –

Vaccines	Toxoids
1. Vaccine preparation containing antigens which stimulate the body to produce antibodies 2. Vaccines containing either living or killed organism.	1. Bacterial poison (toxin) whose toxic property is destroyed by using chemicals but its antigenic property still remain. 2. They retain the ability to stimulate the formation of antitoxins, which are antibodies directed against the bacterial toxin.

(v) Evaporation & Drying –

Evaporation	Drying
1. Escape of vapor from the surface of a liquid below its boiling point. 2. In evaporation the main process is carried out on liquid materials. 3. The equipment used for evaporation is evaporators.	1. Removal of liquid from solids by vaporization with the aid of heat. 2. Drying is carried out on solid materials. 3. The equipment used for drying is dryer.

02. Tablet – Solid dosage form containing medicament or medicaments, usually circular in shape and may be flat or biconvex, prepared by the compression method.

Methods of preparation of tablet – The tablet can be prepared by the following steps –

Preparation of granules for compression

(i)Weighing of the ingredients: Accurately weight by using a good quality balance, double check to minimize human error.

(ii) Mixing the powdered ingredients and excipients: Mixing of medicaments and excipients can be done in an ascending order of their weight to form homogeneous mass, so that uniform tablets can be prepared.

(iii) Converting the mixed ingredients into granules: The granules can be prepared by the following methods –

01) Moist granulation method :

- Powdered medicaments plus excipients such as diluent, binding agent and a part of the disintegrating agent are moistened with sufficient quantity of granulating agent to make a coherent mass.
- The coherent mass is passed through sieve No. 8 or 10.(not to stick to the wire of the sieve)
- The wet granules are dried in a hot air oven at 60 degree C by spread in trays.
- The dried granules are passed through sieve No. 20 to form uniform size.
- The lubricating agent, any volatile substance and remaining part of the disintegrating agent are mixed.
- Now granules are ready for compression.

02) Dry granulation method :

- This method is used when medicaments are available in crystalline form or in the form of granules having its own binding property, such medicaments are passed through sieve No. 20 and then mixed with other excipient.
- Tablet of aspirin, sodium bromide, potassium chlorate and dried yeast etc.

03) Granules by preliminary compression or Slugging method :

- This method is used when medicament is unstable in presence of moisture.
- Dry powder is compressed into large tablets or slugs
- Slugs are broken into small pieces which are passed through a specified sieve to form suitable size of granules.
- The granules are mixed with a lubricating agent and a disintegrating agent before compression into the tablets.

After preparation of granules by using any method, the dried granules are compressed into tablets by using various type of tablet making machine.

03. Filtration – Filtration is the process where solid particles are separated from the liquid or gas by passing it through a porous medium which retain the solid but allows the fluid to pass. The porous medium is called as porous medium, the solids which retain on filter is known as filter cake, and the clear liquid passing through filter is known as filtrate.

Factors affecting the rate of filtration –

The rate of filtration can be explained by Darcy's law i.e.

$V = KA \Delta P / \mu l$ where

V – Volume of filtrate

K – Permeability coefficient and is dependent on the nature of the precipitate and the filter medium

A – Area of filter bed

ΔP – Pressure difference on the liquid and below the filter medium

μ - Viscosity of the fluid

l – Thickness of filter cake

1) **Pressure** - Rate of filtration is directly proportional to the pressure difference between the filter medium and filter cake. Thus, rate of filtration can be increased by either applying pressure on the liquid being filtered or by reducing the pressure beneath the filter.
2) **Viscosity** - The rate of filtration is inversely proportional to the viscosity of the liquid for filtration. Very viscous liquid get filtered slowly. Viscosity can be reduced by raising temperature in order to accelerate filtration. E.g. syrups.
3) **Surface area of filter media** - Rate of filtration is directly proportional to the surface area of filter media. Pleating the filter paper by using fluted funnel increases surface area.
4) **Temperature of liquid to be filtered** – Rise in temperature reduces viscosity which can increase rate of filtration. E. g. viscous oils, syrups etc.
5) **Particle size** – The rate of filtration is directly proportional to the particle size of the solid to be removed. Coarse particles can filter easily then fine particles because course filtering medium can be used and hence increase the rate of filtration.
6) **Pore size of filter media** – The rate of filtration is directly proportional to the pore size of the filter media.
7) **Thickness of the cake** – The rate of filtration is inversely to the thickness of the filter cake formed during filtration. During filtration the solid particles gets depositing on filter medium thus increase thickness of the cake and decrease rate of filtration.
8) **Nature of the solid material** - The rate of filtration is inversely to the porosity of the filter cake. The porosity of the filter cake depends on the nature of the solid material to be removed from the liquid.

Filter aid – These are the substances which reduce the resistance of the filtrate to flow, added in 0.1 to 0.5 % before filtration. The ideal character of filter aids are –

- It should be able to remain suspended in the liquid.
- It should be free from impurities.
- It should be light, porous and inert.
- It should have a structure that permits formation of porous cake.
- It should prevent the blocking of filter medium to form an open porous cake.
  e. g. asbestos, cellulose, activated charcoal, talc, kaolin etc.

04. (i) Indian Pharmacopoeia –

- Indian Pharmacopoeia (IP) is published by by the Indian Pharmacopoeia Commission (IPC) on behalf the Ministry of Health & Family Welfare, Government of India in fulfillment of the requirements of the Drugs & Cosmetics Act, 1940 and Rules 1945 there under
- IP is recognized as the official book of standards for the drugs being manufactured and/or marketed in India.
- IP contains a collection of authoritative procedures of analysis and specifications of drugs for their identity, purity and strength.
- The standards of the IP are authoritative in nature and are enforced by the regulatory authorities for ensuring for quality of drugs in India.
- IP 1955 - First edition, followed by supplement in 1960.
- IP 1966 - First edition, followed by supplement in 1975.
- IP 1985 - Third edition, followed by its addendum in 1989 and 1991.
- IP 1996 - Fourth edition, followed by its addendum2000, supplement 2000 for Veterinary Products, addendum 2002 and addendum 2005.It contains 1149 monographs and 123 appendices and available in two volumes.
- IP 2007 - Fifth edition, followed by addendum 2008, containing three volumes.
- IP 2010 - Sixth edition, with DVD followed by its addendum 2012, contains three volumes.
- IP 2014 - Seventh edition with DVD followed by its addendum 2015 and addendum 2016, contains four volumes.

- IP 2018 - Eighth edition with DVD.
- IP 2022 - Ninth edition.

(ii) Fluidized bed dryer -

Theory – If gas is allowed to flow upward through a bed of solid particles at a velocity greater than its settling velocity of the particles, the particles are partially suspended in the gas stream. The resultant mixture of solids and gas behaves like a liquid and the solids are said to be fluidized. Each individual solid particle is surrounded by the drying gas that drying takes place in a much shorter period. This type of mixing between the solids and hot gas provides a uniform condition of temperature, composition and particle size distribution.

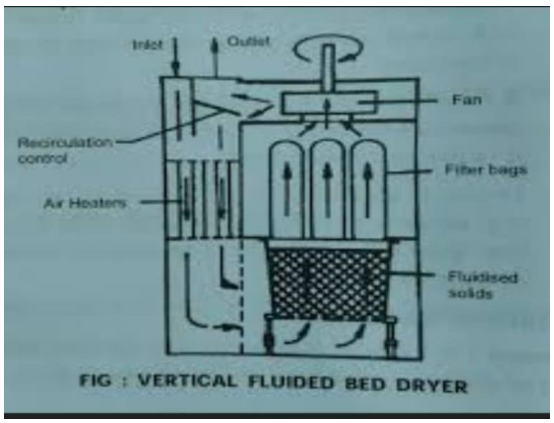


FIG : VERTICAL FLUIDED BED DRYER

Construction and working – Two types of fluidised bed dryers are used in industry.

1. Vertical fluidized bed dryer
2. Horizontal fluidized bed dryer

- Fluidised air stream is induced by a fan at the upper part of the dryer.
- The air is heated by air heaters to the required temperature.
- Hot air is passed through the wet material contained in a drying chamber with a mesh support at the bottom.
- The air flow rate is controlled by means of re-circulation.
- Passage of fine particles is prevented by fabric filter bags.
- Vertical fluidized bed is a batch type dryer and the drying chamber is removed from the unit for charging and dumping.
- It is available from 5 kg to 200 kgs with drying time of about 20-40 minutes.
- Horizontal vibrating conveyer fluidized bed dryers are used for continuous drying of a large volume.

Advantages –

1. High drying rate (15 times more than tray dryer)

2. Drying takes place from individual particles at a constant rate and from entire bed.
3. Temperature inside the fluidized bed dryer can be controlled so less danger of over heating.
4. High output and occupies a small floor space.

Disadvantages –

1. Due to turbulence produced, attrition may occur which leads to the production of fines.
2. The vigorous movement of solid particles in hot air can lead to the generation of an electric charge.

Applications –

1. This method is suitable for drying of thermolabile materials.
2. This can be used for drying any powdered material, mostly granules for the manufacture of tablets.

(iii) Cyclone separator –

Principle – Separation of solids from liquids takes place due to centrifugal force. The separation depends on particle size and density of particles. Hence depending on the fluid velocity, the cyclone separator can separate all types of particles or to remove only coarser particles and allow fine particles carried through the fluid.

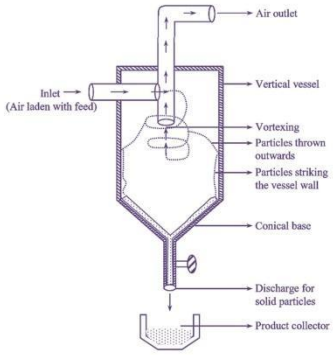


Figure 1: Cyclone Separator.

Construction – It consists of cylindrical vessel with a conical base. Upper part of the vessel is fitted with a tangential inlet and a fluid outlet and at the base it is fitted with a solid outlet.

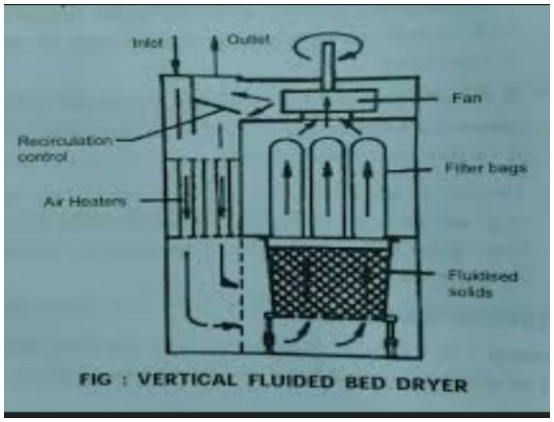
Working – The suspension of a solid in gas usually air is introduced tangentially at a very high velocity, so that rotary movement takes place within the vessel. The fluid is removed from a central outlet at the top. Due to the rotary flow centrifugal force act on the particles, solids are thrown out to the walls and fall to the conical base and discharged through solid outlet.

Uses – To separate suspension of solid in gas (air).

05. Drying – Removal of liquid or moisture from solids by vaporization with the aid of heat. Proper drying can prevent deterioration of the product and also improves the solubility of the product.

Fluidised Bed Dryer

Theory – If gas is allowed to flow upward through a bed of solid particles ata velocity greater tham its settling velocity of the partyicles, the particles are partially suspended in the gas stream. The resultant mixture of solids and gas behaves like a liquid and the solids are said to be fluidized. Each individual solid particle is surrounded by the drying gas that drying takes place in a much shorter period. This type of mixing between the solids and hot gas provides a uniform condition of tempersture, composition and particle size distribution.



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- Horizontal vibrating conveyer fluidized bed dryers are used for continuous drying of a large volume.

Applications –

3. This method is suitable for drying of thermolabile materials.

4. This can be used for drying any powdered material, mostly granules for the manufacture of tablets.

06. Aerosol – Aerosols may be defined as disperse phase system, in which very fine solid particles or liquid droplets get dispersed in the gas which acts as continuous phase. These are also called pressurized dosage form.

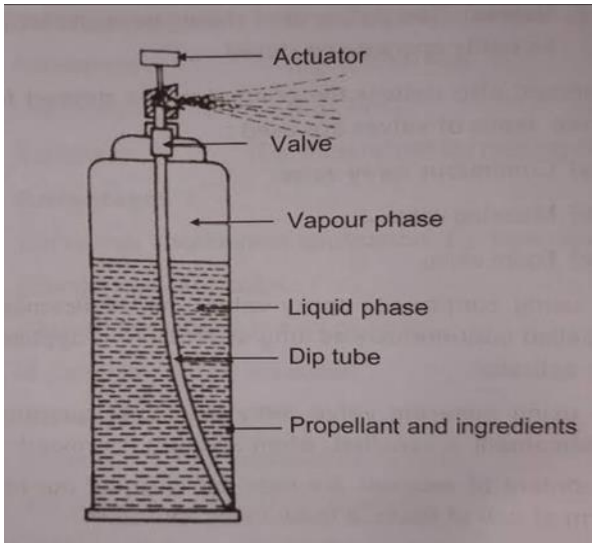
Advantages of aerosols –

1. The medicament can be delivered directly to the affected area such as burnt skin and wound which minimizes discomfort of manual application.
2. Prevent oxidation due to absence of air.
3. Prevent hydrolysis of medicaments.
4. Drug can be given by oral inhalation.
5. The sterility of the products can be maintained.
6. The application of the medicament is easier.
7. Manual contact with the medicaments can be avoided.
8. Drugs given by oral inhalation do not pass through G.I.T. Hence decomposition chances is less.

Disadvantages of aerosols –

1. Aerosols are costly preparation.
2. Some propellants are very toxic.
3. Cooling effect of highly volatile propellants may cause discomfort on injured skin.
4. If the drug is not soluble in propellant it is difficult for preparation.

Parts of aerosol container –



1**. Container –** Containers are made from metal (such as tin plated steel, aluminium and stainless steel) glass and plastic. These containers can withstand high pressure.

2.**Valves –** It is used for easy opening and closing to deliver the content in the desired form. Three types of valves are used –

a. Continuous spray valve
b. Metering valve
c. Foam valve

Continuous spray valve can expelled medicament continuously as long as pressure is applied on the actuator but metered valve can expelled only a definite quantity when pressed actuator and foam valve can expelled a bulk of foam.

3. **Actuator –** Actuator is fitted on the valve stem and helps in easy opening and closing of the valve, whenever it is required. Different types of actuator can produce spray, fine mist or foam.
4. **Dip tube –** Dip tubes are made from polyethylene or polypropylene, must be extended to the bottom of the container (not to touch the bottom) and used for
    a. It carry the liquid from the bottom of the container to the valve at the top.
    b. It prevents the propellant to come out without dispensing the content of the package.

Process of filling of aerosol products –

Depending on the nature of the product concentrate the aerosol can be filled by a cold filling or a pressure filling process.

Cold filling process –

- Used to fill metered aerosol products using a fluorocarbon propellant.
- By lowering the temperature of a propellant below its boiling point, the propellant becomes liquid at atmospheric pressure.
- The active ingredients or concentrate and propellant are cooled to -30 degree to -40 degree F.
- The chilled concentrate is poured into the chilled container and propellant is added.
- Propellant is vaporized in sufficient time to expel the air in the container.
- The valve is fitted on to the container which is placed in a water bath and heated to 130 degree F (54 degree C) in order to check the leakage and strength of container.

Pressure-fill process –

- This process is used for filling aerosols containing hydrocarbon propellant.
- The product concentrate is placed into the container and valve is sealed.
- The propellant is forced through the valve under pressure.
- The container is immersed in a water bath at 130 degree F (54 degree C) to check leakage and strength of container
- Air must be expelled before filling the content into the container.

07. (i) Human normal immunoglobulin –

- It is a transparent or slightly opalescent liquid, colorless or brownish in color, sterile solution containing antibodies derived from human blood which contains gamma-G globulins together with other plasma proteins.

Preparation – Prepared from the pooled material of a minimum quantity of 25 liters which is collected from about 1500 donors. The globulin are separated and dissolved in a vehicle containing preservative or stabilizing agent. It is sterilized by filtration through bacteria proof filter, distributed in the final container and sealed.

Storage – Stored in a glass container protected from light at 2 and 10° C.

Uses – Prevention of measles in small children, infective hepatitis and rubella in a pregnant women.

Dose – Intramuscular injection

(i) Prevention of measles – 250 mg (below 1 year), 750 mg for children aged three years and for attenuation of measles 250 mg.
(ii) Prevention of rubella in pregnant women – 750 mg.
(iii) Prevention of infective hepatitis – 250 mg upto 10 years and 750 mg over 10 years.

(ii) Rabies Vaccine –

- This vaccine is white, flocculent suspension in a clear liquid or white to brownish white turbid liquid.
- It is a sterile suspension in saline or other suitable solution, isotonic with blood, of a suitable killed rabies virus in uncontaminated brain tissues from animals previously injected intracerebral with rabies virus.

Preparation – It is prepared by injecting rabies virus intracerebrally in animals like sheep, rabbit, suckling rats, mice or other animals. Animals show paralysis are killed, brain are harvested under aseptic condition, tested for absence of bacteria and then suspended in sodium chloride injection (saline) or suitable liquid.

- The suspension is inactivated by using phenol or beta propiolactone or any other means. It is diluted to produce a vaccine of required strength. The vaccine is preserved by adding 0.01 % w/v thiomersal and pH is adjusted between 7.0 and 7.2 and transferred into a sterilized containers and sealed.
- This vaccine must comply with the test or sterility and the test for undue toxicity of vaccines.

Storage – Stored in containers protected from light, at 2 to 8° C.

Uses – As prophylactic against rabies for both post immunization of person bitten by rabid animal and pre-immunization of high risk individuals.

Dose – By subcutaneous injection, 1 to 5 ml daily for 7 to 14 days according to the site and severity of infection.

(iii)Tuberculin tests –

This testy is performed to detect the immunity or susceptibility to tuberculosis

1. **Mantoux test –**
    - A dose of 5 tuberculin units or equivalent dose of purified protein derivative (PPD) is injected intra-dermally.
    - After 48 to 72 hours observe at the site of injection
    - A positive reaction – measure the raised indurated area, if it is 10 mm or more then it is interpreted as positive for post and present infection with Mycobacterium Tuberculosis.
    - In duration of 5 to 9 mm regarded as doubtful significance.
    - In duration of less than 5 mm regarded as negative.
    - The presence of erythema without induration is not significant.
2. **Tine test –**
    - A stainless steel disc with four tines (teeth) 2 mm long is attached to a plastic handle. The tines are dipped into the solution of old tuberculin containing acacia and lactose as stabilizers, dried and sterilized using ethylene oxide gas.
    - The disc is placed over upper $1/3^{rd}$ of the patient's forearm and pressure is exerted on the plastic handle so that four puncture site of tines and a circular depression of plastic base on the skin area visible.
    - Evaluation criteria are same as that of Mantoux test.

ODISHA STATE BOARD OF PHARMACY 08/09/2023

D. Pharm Part - I **E. R. 2020** **2022 Special examination**

DO NOT WRITE ANYTHING ON YOUR QUESTION PAPER EXCEPT YOUR ROLL NO.
QUESTION PAPER CONTAINING ANYTHING WOULD BE TREATED AS MALPRACTICE

Answer the question serially and continuously

Subject: SOCIAL PHARMACY (Theory)

Full Mark -80 **Time -3 hrs**

1. **Answer any six questions:** **(6x5)**
   a) Discuss the social impact of alcohol & tobacco products on health and productivity.
   b) Write a detail note on Amoebiasis.
   c) Differentiate between hepatitis A & hepatitis B. How viral hepatitis can be prevented.
   d) Discuss the role of pharmacist in educating community for prevention of surface infections.
   e) Enumerate the National Nutritional Anemia Prophylaxis program.
   f) Discuss the epidemiology of Meningococcal meningitis.
   g) Elucidate the National health policy.

2. **Answer any Ten questions** **(10x3)**
   a) Write down the cause of Filaria. How it can be prevented.
   b) Differentiate between Avian flu and Swine Flu.
   c) Discuss about the causative agent, symptoms and prevention of dengue.
   d) What is the importance of fibre in diet ?
   e) Discuss the role of calcium in our body.
   f) What are the ill effects of air pollution ?
   g) Discuss about the various modes of transmission of AIDS.
   h) Discuss the ill effects of junk food.
   i) Differentiate between primary response and secondary response.
   j) Discuss the symptoms of drug addiction.
   k) Discuss about the health economics.

3. **Define the followings :** **(20x1)**

a) Drug abuse	b) Balanced diet	c) Hansen's disease	d) Pesticides
e) TFR	f) Humoral immunity	g) Virulence	h) Red ribbon
i) Sludge	j) Occupational disease	k) Malnutrition	l) Micronutrients
m) Rubella	n) Genetically modified food	o) IgA	p)Bagassosis
q) Living Fluid	r) Latent period	s) Formite borne transmission	

t) Ziehl – Neelsen Staining

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ODISHA STATE BOARD OF PHARMACY 05/09/2023

D. Pharm Part - I **E. R. 2020** **2022 Special examination**

DO NOT WRITE ANYTHING ON YOUR QUESTION PAPER EXCEPT YOUR ROLL NO.
QUESTION PAPER CONTAINING ANYTHING WOULD BE TREATED AS MALPRACTICE
ANSWER THE QUESTIONS SERIALLY AND CONTINUOUSLY

Subject: HUMAN ANATOMY & PHYSIOLOGY (Theory)

Full Mark -80 **Time -3 hrs**

1. **Answer any six questions :** **(6x5)**

a) Write a note on mechanism of hearing.
b) Write down the process of Hemopoiesis. Discuss about Blood Groups ?
c) Write a short note on structure and functions of skin.
d) Write down a brief note on Cardiac Cycle.
e) Discuss a brief note on Spleen.
f) Define & differentiate between Exocrine and Endocrine Gland.
Write down a brief note on Thyroid Hormones ?
g) Write down a brief note on Spinal cord.

2. **Answer any ten questions :** **(10x3)**

a) Write difference between spermatogenesis & Oogenesis ?
b) Describe the physiology of muscle contraction ?
c) Skin is responsible for regulation of body temperature. Justify it.
d) Write a note on salivary gland ?
e) Write a note on physiology of food digestion & absorption ?
f) Write a short note on WBC ?
g) Write a note on cerebellum ?
h) Write a note on reflex action ?
i) Write a note on structure & function of lymph nodes ?
j) Write a note on pancreas.
k) Write a note on retina.

3. **Define the following terms :** **(20x1)**

a) Haematuria	b) Haemostasis	c) Passive Transport
d) Cartilage	e) Agranulocytes	f) Megaloblastic Anemia
g) Atrio-Ventricular Node	h) Phagocytosis	i) CSF
j) Vagus Nerves	k) Vital Capacity	l) Gastric Juice
m) RAAS	n) Scrotum	o) Pineal Gland
p) Stroke Volume	q) Thrombocytes	r) Synovial Joints
s) Micturition	t) Functional Residual Capacity	

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ODISHA STATE BOARD OF PHARMACY 02/09/2023

D. Pharm Part - I **E. R. 2020** **2022 Special examination**

DO NOT WRITE ANYTHING ON YOUR QUESTION PAPER EXCEPT YOUR ROLL NO.
QUESTION PAPER CONTAINING ANYTHING WOULD BE TREATED AS MALPRACTICE

Answer the questions serially and continuously

Subject: PHARMACOGNOSY (Theory)

Full Mark -80 **Time -3 hrs.**

1. **Long Answer type question (Answer any six)** **(6x5)**

a) Write brief notes on physical methods of evaluation of crude drugs.
b) Write biological sources, Chemical constituents of following class of crude drugs i) Oxytocic ii) Anti hypertensive
c) Write a short note on ergot.
d) Define Adulteration, Discuss about different types of adulteration of crude drugs.
e) What is the basic principle involved in Ayurveda ? Write a note on preparation of Lehya
f) Write down the biological sources, chemical constituents and uses of following drugs i) Rauwolfia ii) Vinca
g) Define dietary fibres. Classify it and write notes on its recommended intake amount and therapeutic applications of dietary fibres.

2. **Short answer type questions (Answer any ten)** **(10x3)**

a) Write notes on leaf constant.
b) Write notes on Pharmacological classification of crude drugs.
c) What do you mean by Ash value. Write significance of total ash.
d) Write notes on Antioxidant of herbal origin.
e) Differentiate between "Organised and Unorganised" crude drug.
f) Write notes on Surgical dressing.
g) Mention different methods of extraction of volatile oils.
h) Write the biological sources, chemical constituents and use of Senna.
i) What are the common identification tests for Alkaloids ?
j) Write briefly about Biological evaluation of crude drugs ?
k) Define Antiseptic and Disinfectant. Write the biological sources and used of Benzoin.

3. **Answer all questions :** **(20x1)**

A) Define the followings :

i) Shinodal test ii) Steam Distillation iii) Moisture content
iv) Fixed oil v) Carotenoids

B) Write down the Biological sources of the followings :

i) Digitalis ii) Vasaka iii) Neem
iv) Liquorice v) Honey vi) Clove
vii) Rauwolfia viii) Colchicum ix) Coriander
x) Opium

C) Answer the followings :

i) Define Pharmacognosy.
ii) Write down the uses of Agar
iii) What is the source of omega-3 fatty acids.
iv) Define Bhasma.
v) Define Sutures.

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ODISHA STATE BOARD OF PHARMACY 31/08/2023

D. Pharm Part - I **E. R. 2020** **2022 Special examination**

DO NOT WRITE ANYTHING ON YOUR QUESTION PAPER EXCEPT YOUR ROLL NO. QUESTION PAPER CONTAINING ANYTHING WOULD BE TREATED AS MALPRACTICE

Answer the questions serially and continuously

Subject: PHARMACHEMISTRY (Theory)

Full Mark -80 **Time -3 hrs**

1. **Answer any six question :** **(6x5)**

a) Define and classify Anti-Depressants with examples. Write the structure, chemical name & popular brand name of followings :

i) Fluoxetine ii) Imipramine Hydrochloride

b) Describe the principle, chemical reaction & procedures of limit test for Iron.

c) Describe the principle, involved, procedure & limitations of Volhard's Method.

d) Define cholinergic blockers & give examples of synthetic cholinergic blockers. Write the structure, chemical name & popular brand name of followings.

i) Atropine Sulphate ii) Dicyclomine Hydrochloride

e) Define Complexometric Titrations and describe its types with examples.

f) Define & classify Anti-Viral agent with examples. Write the structure, chemical name and popular brand name of Acyclovir. Mention the uses of Remdesivir & Favipiravir.

g) Define Hypertension & Anti-hypertensive agents. Classify Anti-Hypertensive agents with examples. Mention the structure and chemical name of (i) Propranolol, (ii) Captopril.

2. **Answer any ten questions :** **(10x3)**

a) Distinguish between determinate & indeterminate error.

b) Write a brief note on any three Metallochromic Indicators ?

c) Calculate the equivalent weight of $KMnO_4$ in Acidic, Neutral & Alkaline Media ?

d) Define protective and mention of chemical formula, storage & uses of Talc ?

e) Define Acidifiers, mention it types and write a note on uses of Muriatic Acid ?

f) Write down the uses, storage & incompatibility of light kaolin ?

g) Write down the role of Ostwald's ripening process in gravimetric analysis ?

h) Discuss the chemical formula, synonym, storage condition & uses of Bleaching Powder ?

i) Define Sulfonamide. Write the structure, chemical name of Sulfacetamide and chloramphenicol ?

j) Define Narcotic Antagonists with examples ? Briefly discuss its uses & storage condition ?

k) Write the structure, chemical name & uses of Ofloxacin and Pretomanid ?

3. **(A) Write down the structure of one drug for each of the following Heterocyclic ring with its name & numbering.** **(1x5)**

i) Acridine ii) Pyrazine iii) Thiophene iv) Pyrrole v) 1,4-benzodiazepine

(B) Write down the structure & uses of the following compounds : **(1x5)**

i) Ketamine Hydrochloride ii) Diazepam iii) Glibenclamide

iv) Ibuprofen v) Mefloquine

(C) Write the structure & IUPAC name of the following compounds : **(1x5)**

i) Fluorouracil ii) Ketoconazole iii) Dopamine

iv) Phenytoin Sodium v) Haloperidol

(D) Define the followings : **(1x5)**

i) Primary standards ii) Masking agents & demasking agents

iii) Osmotic Purgatives iv) Iodimetry

v) Levelling Solvents & differentiating Solvents

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ODISHA STATE BOARD OF PHARMACY 28/08/2023

D. Pharm Part - I **E. R. 2020** **2022 Special examination**

DO NOT WRITE ANYTHING ON YOUR QUESTION PAPER EXCEPT YOUR ROLL NO.
QUESTION PAPER CONTAINING ANYTHING WOULD BE TREATED AS MALPRACTICE
ANSWER THE QUESTION SERIALLY AND CONTINUOUSLY

Subject: PHARMACEUTICS (Theory)

Full Mark -80 **Time -3 hrs**

(Answer any five questions including question No. 1)

1. Long type questions (Answer any six) **(6x5)**

a) Classify various Pharmaceutical powders. Write about mixing of liquid preparations.
b) Discuss, advantage and disadvantages of different types of glass as packaging materials.
c) What is vaccine ? Write the general methods of preparation of BCG vaccine.
d) What is extraction ? Write down the details about maceration with suitable examples.
e) Explain details about granulation process used in manufacturing of tablets.
f) Differentiate between hard and soft gelatin capsule. Draw a neat and lebelled diagram of hand operated capsule filling machine.
g) Mention different types of suppositories. Discuss in detail about the types of suppository bases with suitable examples of each.

2. Short type questions (Answer any ten) **(10x3)**

a) Define organoleptic additives. Write down various types of flavouring and colouring agents used in pharmaceutical preparations.
b) Write short note on different excipients used in tablet manufacturing.
c) Define the followings :
(i) Gel (ii) Sera (iii) Suspension
d) Write difference steps of sugar-coating process.
e) Write different excipients used for processing of capsule with examples.
f) Define mottling problem with its remedy.
g) Differentiate between "Lotion and Liniment" ?
h) Write down application of membrane filter.
i) Write notes on Bacterial Vaccine.
j) Discuss about the principle, working and applications of double cone blender.
k) What is creaming of emulsion. How it can be prevented ?

3. (A) Answer the following **(20x1)**

i) Write down one major difference between Monophasic & Biphasic liquid dosage forms.
ii) Write down difference between oral tablet and sublingual tablet.
iii) Write about sterilization of rubber containers.
iv) Classify different extraction processes.
v) Write disadvantages of Plastic.

(B) Define the followings :

i) Tablet	ii) Elixir	iii) Ointment	iv) Toxoid
v) Cream	vi) Emulsion	vii) Eye drop	viii) Capping & Lamination
ix) Coloured Glass	x) Levigation	xi) Gelatin	xii) Creaming
xiii) Drying	xiv) Lyophilization	xv) Condensation	

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MODEL ANSWER

SUBJECT: SOCIAL PHARMACY

Q.1.a) Discuss the social impact of alcohol & tobacco products on health and productivity.

Ans : Alcohol has a significant effect on the CNS and produces psychic dependence of varying degrees from mild to strong, develops slowly. Alcoholism is considered a disease and alcohol a disease agent which causes acute and chronic intoxication, cirrhosis of liver, psychosis, gastritis, pancreatitis, cardiomyopathy and neuropathy.

Tobacco is in legal use in some part of the world but more people die from tobacco related diseases other than cancer such as stroke, myocardial infarction and peptic ulcer. Around 80 percent of the world's 1.1 billion smokers live in low-middle-income countries where burden of tobacco-related illness and death is heaviest. Women who smoke have more risk then men. Evidence indicates that fertility is impaired with smoking, miscarriages and intrauterine growth retardation etc. These products cause dependence which is detrimental to the individual and the community.

Further, alcohol or tobacco is an important causing factor in suicide, automobile or other accidents, and injuries and deaths due to violence. The health problems, for which alcohol or tobacco is responsible, are only part of the total social damage which includes family disorganization, crime and loss of productivity.

The health, safety and socio-economic problems related to alcohol or tobacco can be effectively reduced and requires actions.

b) Write a detail note on Amoebiasis.

Ans. Amoebiasis is the condition of harbouring (shelter) the protozoan parasite Entamoeba histolytica with or without clinical manifestations.The infected person suffer from symptomatic disease. Amoebiasis can be intestinal and extra intestinal. The intestinal amoebiasis produces symptoms like abdominal discomfort, diarrhea and dysentery.

The extra intestinal amoebiasis (migration of the trophozoites of E.histolytica) produces lesions in the extra colonic areas such as liver, lung, brain, spleen, skin etc.

Causative Agent: Entamoeba histolytica is the causative agent of amoebiasis. It exists in two forms – (i) vegetative (trophozoite) – are short lived outside human body and cannot transmit the disease. (ii) Cyst – remain viable and infective for several days, in faeces, soil, water and sewage, resistant to the action of chlorine in concentration normally used for purification.

Mode of transmission: transmitted by faecal – oral route and takes place through contaminated water or food particularly raw vegetables.

Incubation period: 2 to 4 weeks or longer.

Prevention and control:

Primary prevention: Prevent contamination of water, food, vegetables, fruits etc., from human faeces.sanitation and personal hygiene, safe drinking water supply and health education.

Secondary prevention: Early diagnosis and treatment (fresh mucus examination) – presence of trophozoites containing red cells is the indication.

Treatment: Metronidazole 200 mg twice daily or 400 mg once daily or 30 mg / kg/ day in three divided doses for 8 – 10 days.

c) Differentiate hepatitis A & hepatitis B. How viral hepatitis can be prevented.

Ans.

Hepatitis A	Hepatitis B
1.Infectious hepatitis 2.Caused by hepatitis A virus 3. Routes of transmission is faecal or oral. 4. Incubation period is 25 to 30 ranging from 15 to 45 days.	1.Serum hepatitis 2.Caused by hepatitis B(double shelled DNA virus) 3. It is transmitted through infected blood and blood products – transfusion, dialysis, contaminated syringes and needles. 4. Incubation period is 45 to 180 days.

Prevention:

i) Hepatitis B vaccine: It is a formalin inactivated sub-unit viral vaccine for intramuscular use. It is given in 3 doses of each 1 ml (for children below 10 years, dose 0.5 ml).The 2nd dose is given 1 month after the 1st dose and the booster dose is given 6 months after 1st dose. It is included in routine immunization program.

ii) Hepatitis B immunoglobulin (HBIg): It should be given immediately after accidental inoculation ideally within 6 to 48 hours, 2 doses of HBIg are given 1 month apart, each containing 0.05 to 0.07 ml of HBIg/kg body weight.

iii) HBIg produces production for about 3 months.

iv) All blood donors should be screened for HBV infection.

d) Discuss the role of pharmacist in educating community for prevention of surface infections.

Ans.:

- The pharmacist should educate the regarding surface infections and STDs.
- Prolonged, close contact with patient of leprosy and trachoma should be avoided.
- Both the partners should know the importance of personal hygiene in prevention of STDs.

- Safe blood transfusion should be encouraged to prevent HIV and Hepatitis B etc.
- Clean and sterile syringes and needles should be used always at individual or hospital level.
- Pharmacist should educate the people about using condom.
- Drug abuse can add to the spread of HIV infection.

A pharmacist should educate the community regarding these facts.

e) Enumerate National Nutritional Anemia Prophylaxis Program.

Ans.: The program was launched (1970) as part of National Family Planning Program. The Haemoglobin (Hb) Level of 10 % or below for women and 8 % for children was set as therapeutic dose of iron and folic acid tablets. The doses recommended were 60 mg ferrous sulphate and 0.1 mg folic acid for children and for pregnant and lactating women was 180 mg ferrous sulphate and 0.5 mg folic acid. Evaluation shown that there was no improvement over a period of 20 years due to inadequate dose and quality of drugs.

The strategy was revised and a new program launched by the name National Nutritional Anemia Control Program 1991.

The objectives are ……

i) *Promotion of consumption of food rich in iron*: Green leafy vegetables and cereals such as wheat, ragi, jowar, bajra, pulses must be promoted, these food items should also be included in the weaning food for infants. Vit.C rich foods should be added to increase absorption of dietary iron.

ii) *Supplementation*:
   - Pregnant women and lactating women after 1st trimester everyday for 100 days: 100 mg iron and 0.5 mg folic acid.
   - If already anemic (Hb < 10 %), 2 tablets are recommended.
   - Preschool children (6 months to 5 years):20 mg iron and 0.1 mg folic acid.
   - School children (6 –10 years):30 mg iron and 0.25 mg folic acid.

iii) *Treatment*: women with Hb level below 7% are considered as severely anemic, 2 tablets per day for 100 days are recommended and referral to PHC is advised.

Community leaders and elder family members can help in improving the intake of tablets and in providing iron rich diet to mothers and children.

f) Discuss the epidemiology of meningococcal meningitis.

Ans.: It is also called cerebrospinal fever. It begins with severe headache, vomiting, stiff neck and high fever and may progress to coma.

Causative agent: They are bacteria. *Neisseria Meningitidis* usually found in nasopharyngeal secretions of human beings as commensal.The disease occurs when the resistance of the host is low and it spreads through the blood to the brain and meninges. Man is the only known reservoir.

Mode of transmission: Droplet infection is the common mode; oronasal secretions can also transmit the infection through contact. Patient can transmit the infection until the bacteria disappears from the secretions.

Incubation period: 2-10 days (more in low atmospheric temperature).

Treatment/Prevention: Specific antibiotics started within 1 – 2 days of onset of illness are the key to prevent mortality. Penicillin, ceftriaxone and cephalosporins are generally used.

- Carriers state cannot be treated with penicillin (due to large number of carriers in the community). The contacts are also given treatment simultaneously to eliminate the carriage of the bacteria. Usually rifampicin, ciprofloxacin and azithromycin are used for contacts.
- *Vaccine*: 2 types of vaccines are available.

Polysaccharide vaccine: Subcutaneous single dose to persons more than 2 years. (Adverse reaction – mild fever, redness and pain at local site).

Conjugate vaccine: Combination of N.Meningitidis and Hemophilus influenza type 'b' given intramuscularly in deltoid muscle to infants and a 2nd dose after 6 – 8 weeks followed by a booster after 1 year of the 2nd dose (one dose is sufficient for elders).

Conjugate is preferred over polysaccharide one due to better immunogenicity and herd protection. Both vaccines are safe and effective during pregnancy and lactation.

g) Elucidate the national health policy.

Ans.: National Health Policy is a planned statement from the Government of India to take further actions in the direction of improvement of health and allied fields for eliminating poverty, illiteracy, ill health, ignorance and inequality.

A health policy which was approved in the year 1983 which was HEALTH FOR ALL. It was also called primary health care i.e. to achieve a level of health that will enable every individual to lead socially and economically productive life.

The priorities are:-

- Small family norm.
- MCH improvement.
- Immunization program.
- Safe water supply.
- Environment protection
- Prevention of adulteration and contamination of food drugs.

After 15 years in 2002, The National Health Policy was revised and the objective was to achieve acceptable level of health by increasing access to available existing services, rational use of drugs, participation of private sector.

The goals were……

- Eradication of Poliomyelitis ---2005
- Elimination of Leprosy—2005
- Elimination of Filariasis—2015
- Reduce 50% mortality by tuberculosis, malaria, water borne and vector borne diseases—2010 and many more.

Again after 15 years, in the year 2017 The National Health Policy was revised. The goals are to inform, clarify, strengthen and prioritize the Government's role in moulding the health system in various dimensions such as investment in health, prevention of diseases and promotion of good health through cross sectoral action, organization of healthcare services and financial protection and also proposes free drugs, free diagnostics and free emergency.

The key targets are:-

- Increase life expectancy at birth from 67.5 to 70 by 2025
- Reduce infant mortality rate to 28 by 2019 & less than 5 mortality to 23 by 2025.
- Reduce HIV prevalence by 2020.

Q.2 a) Write down the cause of filarial. How it can be prevented.

Ans. The term used for a group of diseases caused by certain nematodes. Filariasis can be caused by about 8 species of filarial parasite. Causative organisms are W. Bancrofti, B. Malayi, B. Timori. All the 3 are transmitted to man by the bite infected mosquitoes (similar life cycle).

- Adult worm living in lymphatic vessels but their offsprings, the microfilaries circulate in the peripheral blood and are available to infect the vector mosquito. The disease is manifested in acute or chronic stage in the form of lymphangitis, lymphadenitis, and elephantiasis of scrotum, legs and arms.

Prevention:

I) Chemotherapy: The only available drug presently is DEC (diethylcarbamazine)

DEC – 6 mg/kg body weight /day orally after meals in divided doses for 12 days.

II) Vector control: Ideal method of vector control would be elimination of breeding places of mosquitoes by adequate sanitation and underground waste water disposal system.

b) Differentiate between Avian flu & Swine flu.

Ans:

AVIAN FLU (BIRD FLU)	SWINE FLU(PANDEMIC INFLUENZA)
1.Cause by H_5N_1 2. Primarily affect birds 3. Incubation period: 2-5 days. 4.Vaccine:inactivated influenza vaccine-2 doses, 28 days apart	1.Caused by H_1N_1 2. Seassonal influenza, Primarily affect human being. 3. Incubation period: 1-4 days, up to 7 days. 4. Vaccine: inactivated influenza vaccine-2 doses, 28 days apart along with Live attenuated influenza vaccine (this is provided in a single dose sprayer unit, half of the dose is administered in to each nostril.

c) Discuss about the causative agent, symptoms and prevention of dengue.

Ans: Dengue viruses are arbo (living in trees) viruses, it is an acute viral fever caused by serotype1, 2, 3, and 4. the reservoir of infection is both man and mosquito. **Aedes aegypti** is the main vector.

Incubation period: i) Extrinsic—8 -10 Days.

ii) Intrinsic---3-10 Days.

- Onset is sudden high fever, chills, headache and muscle and joint pain. Retro orbital pain (pain behind the eye) and photophobia. Skin eruption appears 80% of cases during remission or 2nd febrile phase. Fever lasts for 5 to 7 Days. Infection with one serotype provides immunity against that serotype and partly others. Rash may be diffuse, flushing, mottling (bluish-red and lace like pattern) eruption on face, neck and chest.

Treatment:

- Bed rest.

- Oral fluid and electrolyte therapy.
- Vigorous I.V fluid replacement with colloids and crystalloid solutions.
- Platelet transfusion.

d) What is the importance of fibre in diet?

Ans: Dietary fibre is the remnants of the edible parts of the plants and analogous carbohydrates that are resistant to digestion.

Importance of fibre ----

i) It exhibits laxation (faecal bulking and softening: increased frequency and/or regularity).
ii) It helps enzyme yielding reactions at different P^H.
iii) It promotes helpful microbes colonization pattern (probiotic & prebiotic)
iv) It has the property of digestibility, capacity of holding water and swelling properties of the diet.
v) It increases the transit time of the food in the gut.
vi) It reduces incidence of coronary heart disease and post-prandial glucose level in the blood.

e) Discuss the role of calcium in our body.

Ans.: Calcium is a major mineral element of the body. It constitutes 1.5 – 2 % of the body weight of an adult human. There is a dynamic equilibrium between the calcium in the blood and that in the skeleton.

Role of calcium……

i) It is directly related to formation of bones and teeth.
ii) It helps in coagulation of blood.
iii) It helps in contraction of muscles and production of milk.
iv) It also help in relay of electrical and chemical messages at cell's surface membrane (cardiac action)
v) It also plays a crucial role in the transformation of light to electrical impulses in the retina.
vi) Calcium ion controls many life process e .g cell divisions.

f) What are the ill effects of air pollution?

Ans.: Pollutants and their derivatives can cause adverse effects by interacting with and impairing molecules crucial to the biochemical and physiological processes of the human body.

Mostly lungs are affected due to air pollution and causes different types of respiratory illness.

- Chronic bronchitis: over secretion of mucus in the bronchial lining.
- Pulmonary emphysema: progressive destructive changes in the alveoli of lungs.
- Lungs cancer.
- Edema: fluids accumulate in the alveoli.
- Pulmonary fibrosis: thickening of tissue of lungs.
- Pneumoconiosis: illness due to inhalation.

Sulphur dioxide, fluorine and lead affects the plants leading to stunted growth, burning of leaves and crop destruction.

g) Discuss about the various modes of transmission of AIDS.

Ans: The basic modes of transmission are:

i) *Sexual transmission*: The most frequent mode of transmission of HIV is through sexual contact with an infected person the majority of all transmissions worldwide occur through heterosexual contacts. Exposed adolescent girls and women above 45 years of age are more prone to get HIV infection.

ii) *Body fluid or Blood contacts*: AIDS can also be transmitted by contaminated blood – transfusion of whole blood cells, platelets and factors VIII and IX derived from human plasma. It may be noted that transfusion of blood and blood products has played a minor role in the spread of AIDS in the developed countries.

iii) *Mother – to – child*: HIV can be transmitted from an infected mother to her foetus during pregnancy through the placenta or to her infant during delivery or through breast milk during breast feeding. The risk of infection is higher if the mother is newly infected.

h) Discuss the ill effects of junk food.

Ans: Junk food is described as the food which contains empty calories in the form of excess sugar, saturated fats and lot of salts and lacking in ideal nutrients.

The ill effects are…

i) Increase in LDL and lowering of HDL.

ii) Suffering from lifestyle diseases i.e. Diabetes, Hypertension, CHD and stroke etc; due to sedentary lifestyle.

iii) The changing lifestyle: With the increase of socio-economic status, purchasing capacity globalization of food, lack of physical activities etc.

iv) Obesity: Imbalance between energy intake as food and energy expenditure in terms of physical activity.

v) Dental caries.

i)Differentiate between primary response and secondary response.

Ans:

PRIMARY RESPONSE	SECONDARY RESPONSE
1. Latent period is long. 2. IgM produced for short period & IgG start appearing and then declines within few weeks. 3. These are memory cells.	1. Latent period is short. 2. Both IgM & IgG are produced but IgG produced in large concentration and for prolonged period. 3. Here antibodies are more vigorous in combining with the antigen.

j) Discusses the symptoms of drug addiction.

Ans: Drug addiction is a state of periodic or chronic intoxication, detrimental to the individual or to the society, produced by repeated consumption of habit-forming drugs.

Symptoms are….

i) Overpowering desire or need to continue the taking of the drug.
ii) Tendency to increase the dose(tolerance)
iii) A psychic and sometimes physical dependence.
iv) Life threatening is produced on cessation of the drug.

k) Discuss about the health economics.

Ans.: Health economics has been defined as the description and analysis of the cost of the drug therapy to healthcare systems and society. It identifies, measures, and compares the costs and consequences of drugs and health services.

- It includes the determinants of health, the demand for and supply of health care; planning and market mechanism, micro-economic evaluation of individual procedures and treatments and evaluation of the performance of heath care.

Q.3 a) Drug abuse: Drug abuse is defined as the use of certain drugs for the purpose of “mood alteration” or ‘euphoria’ or ‘kick ‘but subsequently leading to habit-forming, dependence and eventually addiction.

b)Balance diet: it is defined as one which contains a variety of foods in such quantities and proportions that need for energy, amino acids, vitamins, minerals, fats, carbohydrates and other nutrients is adequately met for maintaining health, vitality and general well being.

c) Hansen's disease (Leprosy): It is chronic infectious disease caused by Mycobacterium Laprae. It mainly affects the peripheral nerves and skins, but muscles, bones, eyes and internal organs can also be affected by the disease.

d) Pesticides: These are the chemicals or compounds which are used to kill pests, including insects, rodents, fungi and weeds. Or chemical compounds of substances intended for preventing, destroying, repelling any pests, otherwise called insecticides.

e) TFR (Total fertility Rate): A average number of children a woman would have if she were pass through her reproductive years bearing children at the same rates as the women now in each age group.

f) Humoral immunity: Humoral immunity comes from the B- cells (bone marrow derived lymphocytes) which proliferate and manufacture specific antibodies after antigen presentation by macrophages.

g) Virulence: This is defined as the proportion of clinical cases resulting in severe clinical manifestations including consequences of previous disease.

h) Red ribbon: it is a symbol to demonstrate care and concern about people living with HIV/AIDS and to remind others of the need for their support and commitment.

i) Sludge: It is mainly decomposition of organic matter into simple compounds, results the formation of sediment called sludge. It is occurred in the primary sedimentation tank.

j) Occupational disease: It can be described as an illness a person has acquired because of a particular occupation. The illness may be caused by inhalation, ingestion physical or any other type of contacts with some substances or a condition from the work place.

k) Malnutrition: Malnutrition refers to a group of conditions caused by deficiency of essential vitamins and minerals, scarcity of suitable foods, lack of purchasing power of the family as well as traditional beliefs often lead to an insufficient balance diet, resulting in malnutrition.

l) Micronutrients: These are substances required in very small quantities (mcg to mg) but are very essential for normal body functions. All micronutrients are not synthesized by the body so they should be supplied from outside usually from the diet. Ex. vitamins and minerals.

m) Rubella: It is also called "German Measles" or "three day Measles". It is usually a mild childhood viral fever but if it occurs in early pregnancy (up to 4 months)it may cause congenital malfunction in fetus called Congenital Rubella Syndrome (CRS) or even death of fetus.

n) Genetically modified food: It is defined as Organisms (plants, animals or microorganisms) in which the genetic material (DNA) has been altered in a way that does not occur naturally by mating and/or natural recombination OR It is a biological technique that effect alterations in genetic machinery of all kinds living organisms.

o) IgA: Immunoglobulin A – It is found in large quantities in body secretions, e. g. saliva, milk, colostrums, tears, bronchial secretions, nasal mucosa, prostatic fluid, vaginal secretions and mucus secretions of the small intestine: it provides the primary defence mechanism at the mucus membranes against local infections.

p) Bagassosis: It is an occupational illness caused by inhalation of dust from sugarcane industry. The fibre is called bagasse. Moist bagasse if inhaled results lung symptoms.

q) Living fluid: Human milk is virtually called Living fluid (Breast milk) it contains other proteins whose functions are not nutritive, but anti-infective e. g. IgG, lysogyme, living cells etc.

r) Latent period: It is the period from disease initiation to disease detection. It is used in non-infectious diseases as the equivalent of incubation period in infectious diseases.

s) Fomite borne transmission: Fomites are the belongings of the patient which come in contact with the patient and get contaminated. Fomite includes cloths, towels, utensils, instruments and removed dressings.

t) Ziehl – Neelsen Staining: Prepare a smear of the mucoid part of the sputum on a slide and fix it + steaming carbol fuchsin for 5 mins. ---- wash and add 20% H_2SO_4 for 1 min. then throw it out and wash the slide with water + methylene blue wait for 30 secs. Wash with water, dry the slide and observe it under oil immersion lens. ***Inference:*** The pink coloured, rod shaped tubercle bacilli will be seen scattered in the sputum of open cases of tuberculosis.

Model answer

Subject: Human anatomy and physiology (ER 2020)

1. Answer any six questions: (6×5)

a) Mechanism of hearing:

- Hearing commences with the outer ear.
- The sound reaches the outer ear, the sound waves or vibrations travel down the external auditory canal and can reach the tympanic membrane (eardrum).
- The tympanic membrane vibrates. These vibrations reach the three tiny bones in the middle ear called ossicles.
- These ossicles amplify the sound. The sound waves then reach the inner ear to the fluid-filled hearing organ, cochlea.
- On reaching the inner ear, the sound waves get converted to electric impulses.
- These electric impulses are sent to the brain via auditory nerve.
- The electric impulses get translated to sound by brain.

b) Hemopoiesis:

The hemopoiesis process is a continuous process that occurs throughout the lifespan, as blood cells are continuously produced and used by the body.

Each of the three primary types of blood cells, red blood cells, white blood cells, and platelets, begin as hemocytoblasts, which are generalized stem cells that are capable of forming any type of blood cell.

The haematopoiesis process begins when these hematopoietic stem cells begin to multiply and differentiate.

As the stem cells multiply, they become more specialized towards producing one of the types of blood cells.

Blood Group:

The blood grouping system is pivotal in blood transfusion.

Our immune system recognizes another blood type as foreign and attacks it if introduced in the body causing a transfusion reaction.

Any inappropriate match with the Rh and ABO blood types, causes the most serious and life-threatening transfusion reactions.

Therefore, before blood transfusion, it is suggested to have a blood group checked.

During the blood transfusion, the two most important group systems examined are the ABO-system and the Rhesus system.

The ABO blood group system consists of 4 types of blood group – A, B, AB, and O and is mainly based on the antigens and antibodies on red blood cells and in the plasma. Both antigens and antibodies are protein molecules in which antigens are present on the surface

of Red Blood Cells and antibodies are present in the plasma which is involved in defending mechanisms.

c) Skin

Structure:

As the body's largest organ, skin protects against germs, regulates body temperature and enables touch (tactile) sensations.

Three layers of tissue make up the skin:

- Epidermis, the top layer.
- Dermis, the middle layer.
- Hypodermis, the bottom or fatty layer.

Epidermis

The epidermis is the thin outer layer of the skin. It consists of 3 types of cells:

- Squamous cells. The outermost layer is continuously shed is called the stratum corneum.
- Basal cells. Basal cells are found just under the squamous cells, at the base of the epidermis.
- Melanocytes. Melanocytes are also found at the base of the epidermis and make melanin. This gives the skin its colour.

Dermis

The dermis is the middle layer of the skin. The dermis contains the following:

- Blood vessels
- Lymph vessels
- Hair follicles
- Sweat glands
- Collagen bundles
- Fibroblasts
- Nerves
- Sebaceous glands
- The dermis is held together by a protein called collagen. This layer gives skin flexibility and strength. The dermis also contains pain and touch receptors.

Hypodermis

- The subcutaneous fat layer is the deepest layer of skin.
- It consists of a network of collagen and fat cells.
- It helps conserve the body's heat and protects the body from injury by acting as a shock absorber.

Function of skin

Following are a few important function of the skin in the human body:

1. Protection from the Environment

This is foremost and the most important function of the skin. It keeps the pathogens away so that they do not enter into the skin and cause any harm.

2. Prevents Water Loss

Humans possess thick skin that loses less water. In deserts, the human skin gets thicker to prevent water loss to dry air.

Organisms with thin skin have the possibility of losing water all the time and need to stay near water to prevent it from drying.

3. Sensation

Skin is the main sense organ that can sense touch, heat, pressure, cold, pain, and pleasure. A network of nerves transmits these signals to the brain. Thus we can respond appropriately to a particular stimulus.

4. Regulation of Temperature

Our skin loses water through perspiration and cools itself, thereby, removing heat from the body. It also allows the hot blood to move to the surface of the skin, where its heat is radiated out of the skin. The phenomenon of "goose bumps" is also a temperature regulation response.

5. Storage

The skin can store fats and water in its tissues. These provide extra insulation to our body.

The animals found in colder regions develop thick layers of fat to prevent themselves from the outside cold.

d) Cardiac cycle:

The cardiac cycle comprises all of the physiological events associated with a single heartbeat, including electrical events, mechanical events (pressures and volumes), and heart sounds.

The atria and ventricles alternately contract in each cardiac cycle. The pressures in the chambers change greatly over the course of the cardiac cycle.

The cardiac cycle is essentially split into two phases, systole (the contraction phase) and diastole (the relaxation phase). Each of these is then further divided into an atrial and ventricular component.

The cardiac cycle therefore proceeds in four stages:

1. Atrial systole: lasts about 0.1 seconds - both atria contract and force the blood from the atria into the ventricles.
2. Ventricular systole: lasts about 0.3 seconds - both ventricles contract, blood is forced to the lungs via the pulmonary trunk, and the rest of the body via the aorta.
3. Atrial diastole: lasting about 0.7 seconds - relaxation of the atria, during which the atria fill with blood from the large veins (the vena cava).
4. Ventricular diastole: lasts about 0.5 seconds - begins before atrial systole, allowing the ventricles to fill passively with blood from the atria.

e) Spleen:

- Spleen is a small organ that sits inside your left rib cage, just above your stomach.
- In adults, the spleen is about the size of an avocado.
- The spleen is part of lymphatic system.
- It does several important jobs to keep your body healthy.

Parts of spleen:

- White pulp: As part of the immune system, the white pulp produces white blood cells. These blood cells make antibodies. Antibodies fight infection.
- Red pulp: The red pulp acts like a filter. It removes waste from the blood and gets rid of old or damaged blood cells. Red pulp also destroys bacteria and viruses.

Function:

- Stores blood.
- Filters blood by removing cellular waste and getting rid of old or damaged blood cells.
- Makes white blood cells and antibodies that help you fight infection.
- Maintains the levels of fluid in your body.
- Produces antibodies that protect you against infection.
- It produces all types of blood cells during foetal life.

f) Exocrine gland:

- Exocrine glands are glands that secrete substances on to an epithelial surface by way of a duct.
- Examples of exocrine glands include sweat, salivary, mammary, pancreas, lacrimal, sebaceous, prostate etc.
- It secretes pancreatic juice, digestive juice, saliva, sebum etc.

Endocrine gland:

1. Ductless glands which secretes hormones
2. Examples of endocrine glands are pituitary gland, thyroid gland, parathyroid gland etc.
3. It secretes hormones like oxytocin, vasopressin, gastrin, TSH etc.

Thyroid hormone

1. The thyroid gland is a ductless endocrine gland situated in the anterior/front portion of the neck.
2. It resembles the shape of a butterfly.
3. It weighs about 25 – 30 g.
4. This gland has two lobes on either side of the trachea, with each lobe measuring 4 – 6 cm in length and 1.3 – 1.8 cm in width.
5. It secretes three hormones T4, T3 and calcitonin
6. Calcitonin's main job is to lower calcium levels in your blood .

Function of thyroid hormone:

- Increase in oxygen consumption and heat production in tissues.
- Increase in basal metabolic rate(BMR)
- Increase in the absorption and utilisation of glucose.
- Anabolic effects like growth promotion and protein synthesis
- Increase in the rate of cholesterol synthesis in liver.
- Myelination of central nervous system
- Storage of iodine.

g) Spinal cord:

1. The spinal cord is a part of the central nervous system.
2. It is a long pipe-like structure arising from the medulla oblongata, part of the brain consisting of a collection of nerve fibres, running through the vertebral column of the backbone.
3. It is segmented with a pair of roots (dorsal and ventral roots) consisting of nerve fibres joining to form the spinal nerves.
4. In adults, the spinal cord is usually 40cm long and 2cm wide.
5. It forms a vital link between the brain and the body.

The spinal cord is divided into five different parts.

- Sacral cord
- Lumbar cord
- Thoracic cord
- Cervical cord
- Coccygeal

There are 8 pairs cervical, 5 lumbar, 12 thoracic, 5 sacral and 1 coccygeal pair of spinal nerves.

It performs the primary processing of information as it carries sensory signals from all parts of the body to the Central Nervous System through afferent fibres.

The Spinal cord runs through a hollow case from the skull enclosed within the vertebral column.

Cross-section of spinal cord displays grey matter shaped like a butterfly surrounded by a white matter.

Grey matter consists of the central canal at the centre and is filled with a fluid called CSF (Cerebrospinal fluid). It consists of horns (four projections) and forms the core mainly containing neurons and cells of the CNS. There are two dorsal and two ventral horns.

The white matter consists of a collection of axons permitting communication between different layers of CNS

Spinal nerves act as mediators, communicating information to and from the rest of the body and the spinal cord. We have 31 pairs of spinal nerves.

Three layers of meninges surround the spinal cord and spinal nerve roots.

- Dura mater
- Arachnoid mater
- Pia mater

Important functions of Spinal Cord are mentioned below:

- Forms a connecting link between the brain and the PNS.
- Provides structural support and builds a body posture.
- Facilitates flexible movements.
- Myelin present in the white matter acts as an electrical insulation.
- Communicates messages from the brain to different parts of the body.
- Coordinates reflexes.
- Receives sensory information from receptors and approaches towards the brain for processing.

2. Answer any ten questions: (10×3)

a) Spermatogenesis:

1. The production of sperms from spermatogonia is known as spermatogenesis
2. Occurs in testes
3. All stages are completed in testes
4. It is a continuous process
5. Produces motile gametes
6. Equal cytokinesis occurs during the spermatogenesis producing four sperms

Oogenesis:

1. The production of eggs from oogonia is known as oogenesis
2. Occurs inside the ovary
3. The major part of oogenesis occurs inside the ovary. The last few stages occur in the oviduct.
4. It is a discontinuous process. The early stages take place in the foetus and the rest in later stages of life.
5. Produces non-motile gametes
6. Unequal cytokinesis occurs during oogenesis ultimately producing one large ovum and tiny polar bodies

b) Physiology of muscle contraction:

The contraction cycle is described in following four steps:

- ATP Hydrolysis.
- Formation of cross bridges.
- Power stroke.
- Detachment of Myosin from Actin.

A. ATP Hydrolysis:

- The Myosin head contains an ATP binding site an ATPase enzyme.

- When ATP binds to the Myosin head the enzyme hydrolyses it to ADP giving the Myosin head energy.
- The ADP and formed Phosphate group remain attached to the myosin head.

B. Formation of cross bridges:

- The energized myosin head attaches to the myosin binding site on the actin filament.
- This binding of myosin head to the actin during contraction is termed as “Cross Bridge Formation”.

C. Power stroke:

- Once cross bridges are formed the power stroke occurs.
- The cross bridges pull the actin filaments towards the centre of the sarcomere this pulling is called power stroke.
- This results in the contraction of the sarcomere and ultimately the skeletal muscle.

D. Detachment of Myosin from Actin:

- At the end of the power stroke in the centre of the sarcomere an ATP molecule attaches to the myosin head.
- This causes detachment of the myosin from actin filament.

c) Skin:

The integumentary system keeps body temperature within limits even when environmental temperature varies; this is called thermoregulation.

1. Heat makes the blood vessels enlarge (dilate), allowing large amounts of blood to circulate near the skin surface, where the heat can be released. Cold makes the blood vessels narrow (constrict), retaining the body's heat.
2. The skin regulates body temperature with its blood supply.
3. The skin assists in homeostasis.
4. Humidity affects thermoregulation by limiting sweat evaporation and thus heat loss

d) Salivary Glands: There are three pairs of salivary glands in mouth. They are parotid, submandibular and sublingual glands.

1. Parotid glands: Parotid glands are just in front of ears. Similar to submandibular glands, parotid glands have two parts: superficial and deep. The saliva produced by parotid glands enters mouth from small ducts near upper molars.
2. Submandibular glands: Located below jaw, submandibular salivary glands consist of two parts: the superficial lobe and the deep lobe. Like sublingual glands, the saliva produced in your submandibular glands enters the mouth from under the tongue.
3. Sublingual glands: These are below either side of your tongue, under the floor of your mouth.

Saliva: It is a mixed secretion of all three pairs of salivary glands. It is an alkaline fluid containing water to the extent of 99%.The solid contents of saliva are: i) mucin which is glycoprotein ii)ptyalin, an enzyme which converts starch into maltose. Also it contains salts of sodium, potassium, calcium and magnesium.

Functions:

- It converts cooked starch into a soluble sugar called maltose.
- It acts as a solvent for food and helps in its swallowing.
- It moistens, lubricates and cleans the mouth.
- It excretes organic and inorganic substances and some drugs.

e) Digestion:

Digestion is the process of breaking large, insoluble food molecules into smaller molecules for absorption into the bloodstream.

Digestion occurs in following ways:

Mechanical digestion is a physical process in which food is broken into smaller pieces without becoming changed chemically. The process of mechanical digestion continues in the Stomach. This muscular organ churns and mixes the food it contains, an action that breaks any solid food into still smaller pieces. Although some mechanical digestion also occurs in the intestines, it is mostly completed by the time food leaves the stomach. At that stage, food in the GI tract has been changed to the thick semi-fluid called chyme. Mechanical digestion is necessary so that chemical digestion can be effective.

Chemical digestion is the biochemical process in which macromolecules in food are changed into smaller molecules that can be absorbed into body fluids and transported to cells throughout the body. Substances in food that must be chemically digested include carbohydrates, proteins, lipids, and nucleic acids. Carbohydrates must be broken down into simple sugars, proteins into amino acids, lipids into fatty acids and glycerol, and nucleic acids into nitrogen bases and sugars. Some chemical digestion takes place in the mouth and stomach but most of it occurs in the first part of the small intestine (duodenum).

Absorption

When digestion is finished, it results in many simple nutrient molecules that must go through the process of absorption from the GI tract by blood or lymph so they can be used by cells throughout the body. A few substances are absorbed in the stomach and large intestine. For example, water is absorbed in both of these organs, and some minerals and vitamins are also absorbed in the large intestine. However, about 95 percent of nutrient molecules are absorbed in the small intestine. The absorption of the majority of these molecules takes place in the second part of the small intestine called the jejunum. However, there are a few exceptions. For example, iron is absorbed in the duodenum and vitamin B12 is absorbed in the last part of the small intestine called the ileum. After being absorbed in the small intestine.

f) WBC:

WBC or white blood cells major help in the process of immunity. WBC are the nucleated cells. some of the WBC contain the granules and some are without granules. Based on this the WBCare again classified in to: i) Granulocytes. and ii) Agranulocytes.

The granulocytes are Neutrophil, Eosinophil and Basophil. The Neutrophil and Eosinophil help in the process of immunity by phagocytosis. Basophil form the heparin

and histamine. The agranulocytes are monocyte and lymphocyte. The monocyte is help in the process ofimmunity by phagocytosis. The monocyte is distributed to different sites of the body andon that site that are called macrophages, which help in the process of immunity.
The lymphocyte are of two types:

a. T-lymphocyte.

b. B-lymphocyte.

T-lymphocyte help in the process of immunity by phagocytosis.

B-lymphocytes help in the process of immunity by antibody formation.

Function of WBC:

- Protection against infection-This is done by neutrophils and monocytes which engulf bacteria. This process is called as phagocytosis.
- To aid in the repair of injured tissues.
- To produce immune substances which defend against diseases. This is done by lymphocytes through the synthesis gamma globulin.
- Basophils secrete an anticoagulant substance called heparin.

g) Cerebellum:

It lies below the cerebrum It is situated in the posterior cranial fossa behind the pons and medulla. Tentorium cerebelli is a layer of dura mater which separates the cerebrum and cerebellum. It contains two hemispheres. The two cerebellar hemispheres are separated by a partition of dura mater called cerebelli. The cerebellum also contains:

i)An outer grey matter which has numerous convolutions

ii)An inner white matter.

Function:

- Cerebellum helps in co- ordination of muscle movements.
- To keep muscles in a normal state of tension.
- Maintenance of balance and equilibrium.

h) Reflex action:

It occurs independent of will and it is concerned with involuntary movements. It is a defence mechanism manifesting as a quick and automatic motor response for sensory stimulus

Reflex arc –It consists of structures which are involved in the production of a reflex action. These structures are:

- A sensory organ like skin which receives the sensory stimulus
- A sensory nerve which arises from the sensory organ. Through a peripheral nerve, it terminates at the posterior nerve root of spinal cord.
- The spinal cord

- The motor nerve which commences from the anterior horn cells of spinal cord. This nerve transmits the impulses to the motor organ such as muscle.

i) Lymph node: (Lymphatic glands)

Lymph nodes are small, oval or bean-shaped glands present in the course of lymphatic vessels. The lymph nodes are usually distributed in groups. The main groups of glands are present in the neck, axilla, thorax ,abdomen and groin.

Structure: The lymph gland contains:

- A concave border called hilum.
- An outer dense fibrous tissue called capsule. The capsule give rise to fibrous bands called trabeculae. The trabeculae divide the substance of the nodes into irregular spaces. The space between the trabeculae contain lymphoid tissues.(Which produce lymphocytes).
- Through the hylum pass: i) an afferent lymphatic vessel(for entry) ii)An efferent lymphatic vessel(for exit) iii)Arteries and veins.

Function:

- They filter out solid particles including bacteria.
- They produce lymphocytes.
- Production of plasma proteins like globulin.

j) Pancreas :

- It lies on the posterior abdominal wall in front of abdominal aorta and lumbar vertebrae It extends between the C-shaped curvature of duodenum and the spleen.
- It weighs about 60 grams
- And it is about 12-15 cm long
- It has following parts – head – body and tail
- It contains exocrine cells called acini. These acini secrete the pancreatic juice which is digestive in function.
- In between acini there are some of endocrine cells called Islets of Langerhans
- It secrets both exocrine and endocrine secretion
- Exocrine secretion – pancreatic juice, sweat etc
- Endocrine secretion – insulin, glucagon etc

k) Retina:

- Retina is the innermost layer of the eyeball.
- It is the light-sensitive layer of the eye and acts as a film of a camera where an image is formed.
- Retina is primarily made up of three layers of nerve cells, these are ganglion cells, bipolar cells and photoreceptor cells.

Photoreceptive layer

- It is present nearest to the choroid.
- The light has to pass through the other two layers to reach the photoreceptor cells. There are two types of photoreceptor cells, namely rods and cones.

- Rods – responsible for scotopic or twilight vision. They detect dim light and contain rhodopsin photo pigment, which is a derivative of vitamin A.
- Cones – responsible for photopic or daylight vision. They detect bright light and are responsible for colour vision.

Bipolar Cell Layer

- They constitute the middle layer and receive the signal from photoreceptor cells. The bipolar cells synapse with both rods and cones and ganglion cells. They transmit the signal from photoreceptor cells to ganglion cells.
- Apart from bipolar cells, there are two types of lateral interneurons present in the middle layer, namely horizontal cells and amacrine cells. They help in relaying information within the retina.

Ganglion cell layer

Ganglion cells receive signals from bipolar cells. The axons of ganglion cells unite to form optic nerve, which transmits the signal to thalamus for further processing by the brain. The visual cortex area of the brain processes the nerve impulses and the image is recognised.

3. **20X1=20**

a) Haematuria – It means there is blood in your urine.

b) Haemostasis – The mechanism that leads to cessation of bleeding from a blood vessel.

c) Passive transport -It is a type of cellular transport in which substances such as ions and molecules move down their respective concentration gradients. It means that the substance tends to move from an area of higher concentration to an area of lower concentration.

d) Cartilage - It is a strong, flexible connective tissue that protects the joints and bones.

e) Agranulocytes –This type of WBCs do not have granules. But they have a single nucleus which is not lobed. There are further classified in two the following two types. i)lymphocytes ii) monocytes.

f) Megaloblastic anemia – It is a type of anaemia occurs due to deficiency of either vitamin B_{12} or folic acid. In the deficiency of either of them the maturation of red blood cells does not occur. So immature, large sized red blood cells called megaloblasts are released in circulation

g) Atrioventricular node - The atrioventricular (AV) node is the "gatekeeper" between the atria and the ventricles and is located at the AV junction on the right side of the heart.

h) Phagocytosis –It is process by which certain living cells called phagocytes ingest or engulf other cells or particles

i) CSF - Cerebrospinal fluid is a clear, colourless alkaline fluid present in i) subarachnoid space ii)ventricle of brain iii) central canal of spinal cord. CSF bathes the entire surface of brain and spinal cord

j) Vagus nerve – It represents the main component of the parasympathetic nervous system which controls mood, immune response, digestion, and heart rate.

k) Vital capacity – It is the volume of air that can be expelled from the lungs after taking the deepest possible breath.

l) Gastric juice - A thin, clear, virtually colourless acid fluid secreted by the stomach glands which promotes in digestion.

m) RAAS -R**enin–angiotensin–aldosterone system**, is a hormone system that regulates blood pressure, fluid and electrolyte balance, and systemic vascular resistance

n) Scrotum - It is a part of a male's body that is located below the penis. It contains the testes, epididymis, and the lower part of the spermatic cord

o) Pineal Gland – It is a tiny endocrine gland in the middle of your brain that helps to regulate your body's circadian rhythm by secreting the hormone melatonin.

p) Strokes volume – It is the volume of blood pumped out of the left ventricle during each systolic cardiac contraction

q) Thrombocytes - Platelets, also known as thrombocytes, are special blood cells with an important function. Platelets control blood clotting, which means they are critical for healing wounds and stopping bleeding.

r) Synovial joints - A synovial joint is a connection between two bones consisting of a cartilage lined cavity filled with fluid, which is also known as a diarthrosis joint.

s) Micturition –It is a process where urine is expelled from the body. It occurs due to contraction of muscular coat of the bladder and relaxation of the sphincter. It is also assisted by contraction of abdominal muscles.

t) Functional Residual capacity –It is defined as the volume of gas remaining in the normal lungs at the end of an expiration

ODISHA STATE BOARD OF PHARMACY

D.Pharm Part- I , 2022 Special examination E.R 2020
Model Answer, subject – Pharmacognosy.

Q.1 a)

Physical methods of evaluation of crude drugs are to be determined , wherever possible. They may help in evaluation, specifically with reference to moisture content, specific gravity, density, optical rotation, refractive index, melting point, viscosity and solubility in different solvents.

(i) Moisture content: The percentage of active chemical constituents in crude drugs is mentioned on air-dried basis. Hence, the moisture content of a drug should be determined and also be controlled to make the solution of definite strength.

The moisture content is determined by heating a drug at 105°C in an oven to a constant weight , For the drug containing volatile active constituents, the toluene distillation method is followed.

Example :-

Drugs	Moisture content(%) w/w (not more than)
Aloes	10.0
Digitalis	05.0
Starch	15.0
Acacia	**15.0**
Ergot	**08.0**

(ii) Viscosity: Viscosity of a liquid is constant at a given temperature and is an index of its composition. Hence, it can be used as a means of standardising liquid drugs.

The suitable examples are:

1. Liquid paraffin: Kinematic viscosity not less than 64 centístokes at 37.8*c
2. Pyroxylin: Kinematic viscosity, 1100-2450 centistokes.

(iii) Melting point: It is one of the parameters to judge the purity of crude drugs. In case of pure chemicals or phytochemicals, melting points are very sharp and constant. Since crude drugs from animal or plant origin contain mixed chemicals, they are described with certain range of melting point.

Example :-

Drugs	Melting point (°C)
colophony	75-85
Kokum butter	39-42
Cocoa butter	30-33
Bees wax	62-65
Anhydrous wool fat	34-40
Hard Paraffin	50-57

iv) Optical rotation: Certain substances are found to have the property of rotating the plane of polarised light in pure state or in the solution. Thus, they are described to be optically active and this property is known as optical rotation. Plane of polarised light may be rotated towards right (dextrorotatory) or left (laevorotatory). Normally, the optical rotation is determined at 25°C using sodium lamp as the source of light.
Example :-

Drugs	Angle of optical rotation
Caraway	+70° to +80°
Castor oil	Not less than +3.5°
Clove oil	0° to -1.5°
Honey	+3 to -15°
Eucalyptus oil	-5° to +10°
Chinopodium oil	-3° to -8°

v) Refractive Index: When a ray of light passes from one medium to another of different density, it is bent from original path. Thus, the ratio of the velocity of light in vacuum to its velocity in the substance is termed as refractive index of the second medium. Depending upon purity, it is a constant for a liquid and can be considered as one of the criteria for its standardisation. Refractive index of a compound varies with the wavelength of the incident light, temperature and pressure. It is determined at 25*c using sodium lamp as the source of light.
Example :-

Drugs	Refractive index
Arachis oil	1.4678 to 1.4698
Caraway oil	1.4838 to 1.4858
Castor oil	1.4758 to 1.4798
Clove oil	1.5300 to 1.5310

Similarly, the crude drugs may be evaluated by other physical methods such as : solubility, specific gravity, density etc. further the following tests can be applied to it, wherever possible. i.e Ash content, Extractives, Volatile oil content.

Ash content:

The residue remaining after incineration is the ash content of the drug which simply represents the inorganic salts naturally occurring in drug or adhering to it or deliberately added to it. Total ash usually consists of carbonates, phosphates, silicates and silica.

Aloes	05.00	%		
Ashoka	11.00			
Bael	03.50			
Black catechu	06.00			

Acid insoluble ash not more than%:

Acid insoluble ash not more than				
Agar	1.0			
Belladonna	3.0			
Cannabis	5.0			

Extractives:

Water soluble extractives not less than%

Aloes	25.0			
Senna leaves	30.0			
Ginger	10.0			
linseed	15.0			

Alcohol soluble extractives%:

Aloes	not more than 10.0			
Rhubarb	not less than 30.0			
Ginger	not less than 04.5			
Asafoetida	not less than 50.0			

Alcohol insoluble extractives% not more than:

Myrrh	not more than 70.0			
Benzoin	not more than 24.0			

Non volatile ether soluble extractives% not more than:

Capsicum	12.0			
Cocoa	22.0			
Linseed	25.0			

Volatile oil content:%not less than

Clove	15.0			
Fennel	01.4			
Dill	02.4			
Caraway	02.5			

b) i) Oxytocic drug - Ergot

Biological Source:

Ergot is the dried sclerotium of a fungus *Claviceps purpurea*. (Family Hypocreaceae),developed on the rye plant known as Secale cereale(Graminae)

Chemical Constituents: It contains large number of highly potent indole alkaloids .Six isomeric pairs of alkaloids are known for therapeutic effect. Ergometrine and Ergotamine are the main active constituents. The other constituents are Ergosine, Ergocristine, Ergocryptine and Ergocornine . The dextrorotatory alkaloids are therapeutically inactive.

ii) Anti-hypertensive drug :- Rauwolfia

Biological source:- Its consists of dried roots of the plant know as *Rouwolfia serpentine* (family Apocynaceae.)

Chemical constituent :- It contains indole alkaloids . Reserpine is the main active constituent the other constituents present in the drug are ajamalicine, ajamaline,rauwolfinine, rescinnamine, reserpinine, yohimbine, serpentine and serpentinine. Apart from the alkaloids it also contains oleo-resin, phytosterol, fatty acids unsaturated alcohol and sugars.

c) ERGOT

Synonyms: Ergot of Rye ; Ergota.

Biological Source:

Ergot is the dried sclerotium of a fungus *Claviceps purpurea*. (Family Hypocreaceae), developed on the rye plant, known as Secale cereale. (Graminae).

Chemical Constituents:

Ergot contains large number of highly potent indole alkaloids (0.1 to 0.25 %). Six isomeric pairs of alkaloids are known for therapeutic effect. The alkaloids of ergot are classified in two groups i.e. water-soluble and water-insoluble. The therapeutically active alkaloids are laevorotatory i.e. Ergometrine(water soluble),Ergotamine ,Ergosine, Ergocristine, Ergocryptine and Ergocornine (water insoluble). The dextrorotatory alkaloids are therapeutically inactive.

life cycle of ergot:(3stages)

i) over wintering stage

ii) stage of sexual reproduction

iii) stage of asexual reproduction

Uses:

Ergot is used in labour to assist delivery and to reduce post-partum haemorrhage. Ergotamine is used in the treatment of migraine. Ergometrine is also known as ergonovine in U.S.A. It is oxytocic and produces much faster uterine stimulation than other alkaloids

d) Adulteration is the debasement of an article .An adulteration of a drug may be deliberate or accidental. An adulterant resembles the genuine drug in respect to its morphological appearance.

DIFFERENT METHODS OF ADULTERATION OF CRUDE DRUGS

The reasons for adulteration are either scarcity or the high price of drug in the market. An adulteration of a drug may be deliberate or accidental. Adulteration involves different conditions such as inferiority, spoilage, deterioration, admixture, sophistication and substitution. Inferiority refers to any sub-standard drug, whereas spoilage could be due to attack of micro-organisms. Deterioration means impairment in quality of the drug, whereas admixture is the addition of one article to other through ignorance, carelessness or an accident. Sophistication means intentional or deliberate kind of adulteration. Substitution occurs when an entirely different article is sold or used in place of one required.

The different methods for adulterating drugs are as follows:

1. Replacement by exhausted drugs: Particularly, this is observed in case of costly drugs such as cloves, saffron, tea, fennel, ginger etc. These drugs are exhausted for their active constituents and reused with genuine drugs after proper treatment! Exhausted saffron is coloured artificially, while ginger is mixed with starch and coloured to produce proper shade.

2. Substitution with superficially similar but inferior drugs: The harvesting of cultivated drug, when it has not reached minimum standard of quality, yields inferior drug. The common example of substitution is adulteration of cloves by mother cloves. Saffron is adulterated with dried flowers of Carthamus tinctorius (Safflower).

3. Substitution by artificially manufactured substitutes: This type of adulteration is observed in case of drugs which are costly. Paraffin wax is tinged yellow and substituted for yellow bees wax while artificial invert sugar is mixed with honey.

4. Substitution by sub-standard commercial varieties: Red chillies i.e. Capsicum frutescens (Capsicum minimum) are substituted by Capsicum annum, while Gentiana lutea is substituted by Picrorrhiza kurroa. The substitution of Alexandrian senna with Arabian senna, and substitution of rhubarb with many species of Rumex are other examples. Nux-vomica seed (Strychnos nux-vomica) are adulterated with Strychnos nux-blanda or Strychnos potatorum seed.

5. Presence of organic matter obtained from the same plant: In this case, advantage of similar colour, odour and constituents is taken into consideration and other parts of the same plant are added to genuine drug; eg; cloves are mixed with clove stalks, while caraway and anethum fruits are mixed with other parts of inflorescence.

6. Many a times a synthetic chemical which constitutes one of the chemical constituents of the drug is added to the genuine drugs, e.g. benzyl benzoate to balsam of peru and citral to oil of lemon-grass, and camphor oil and eucalyptus oil in oil of rosemary.

7. Several times, wastes from the market are collected and admixed with drugs. This is observed in case of unorganised or liquid drug. The pieces of amber coloured glass in

colophony, limestones in asafoetida, white oil in oil of coconut and stearin or paraffin in cocoa butter are deliberate kind of adulterations.

e) The basic principles of Ayurveda are positive health and therapeutic measures embedded in this system relate to mental, physical, social and spiritual welfare of human beings. Ayurveda encompasses the knowledge of Kayachikitsa (Internal medicine), Kaumarbhritya (Paediatrics), Trahchikitsa (Psychological medicine), Shalakya Tantra (Otorhinolaryngology and Ophthalmology), Shalya Tantra (Surgery), Agada Tantra (Toxicology), Rasayana Tantra (Geriatrics) and Vajikarana Tantra (Eugenics and Aphrodisiacs).It is also based on different theories.

i) Panchamahabhuta(earth, water, fire, air, sky)

ii)Tridosha(vatta, pitta, kapha)

iii) Panchshil (rasa, guna, virya, vipaka, prabhava)

iv) Saptadhatu (rasa, raktam, mansa, meda, asthi, majja, shukra)

v) Triguna(satva, raja, toma)

Lehya :- Leha is a semisolid preparation of drugs prepared by addition of sugar, jaggery (gur) or sugar candy and boiled with prescribed drug-juice or decoction.

Jaggery/gur or sugar candy is dissolved in the liquid, boiled and strained. When the paka(syrup) is ready, it is pressed between two fingers or sinks in water without getting dissolved,it is then removed from heating source, powdered drugs in small quantity are added, stirred continuously to form the homogeneous mass. Ghee or oil is added while preparation is hot.Honey, if an ingredient of the product is added, when the mass is cooled and mixed,uniformly.

Examples: Kutjavaleha, Drakshavaleha, Vasavaleha, Bilvadileha, and Surnavaleha.

f) i) Rauwolfia

Biological source:- Its consists of dried roots of the plant know as *Rouwolfia serpentine* (family Apocynaceae.)

Chemical constituent :- It contains indole alkaloids . Reserpine is the main active constituent the other constituents present in the drug are ajamalicine, ajamaline,rauwolfinine, rescinnamine, reserpinine, yohimbine, serpentine and serpentinine. Apart from the alkaloids it also contains oleo-resin, phytosterol, fatty acids unsaturated alcohol and sugars.

Uses :- It is used as aniti-hypertensive drug . It has depressant action on central nervous system due to reserpine. It produces tranquilizing effect and lowers the blood pressure**.** It should be used with caution in anxiety , depression and in the patients with cardiac arrhythmia , miocardial infraction, bronchitis , asthama or gastric ulcer.

ii) Vinca

Biological source :- It is the dried whole plant of *Catharanthus roseus* (Family – Apocynaceae).

Chemical constituents :- It contains alkaloids. Vincristine and vinblastine are the main active constituent. The other alkaloids are vindoline , vindolinine and catharanthine.

Uses:- Vincristine is used in treatment of leukaemia. Vinblastine is used for the treatment of generalised Hodgkin's disease and chorionepithelioma. Vinca also exhibits hypotensive and antidiabetic activity.

g) Dietary Fibres are non-digestible polysaccharides found in plant cell walls. They are present in food including fruits, vegetables, grains and legumes. Thus fibres which we eat are called dietary fibres. Dietary fibres are two types :The soluble (e.g:- Oat-meal ,Oat-bran, Nuts, Seeds) and insoluble dietary fibres (e.g :- whole- wheat, wheat-bran, Carrots, Cucumbers). Soluble fibres are partially soluble in water and form gel while insoluble fibres are insoluble in water and pass through the digestive tract largely intact.

Both types of fibres are very important in the diet and provide several benefits to the digestive tract by helping to maintain regularity. Soluble fibres are more beneficial since they reduce blood cholesterol levels and also reduce the risk of heart attack. Insoluble fibers due to water-binding property reduce their transit time in large-intestine, which promotes regularly and reduces the chance or colon cacer by decreasing the time of exposure of colonocytes to potential carcinogenic metabolites. Both type of fibres are subject to fermentability, but soluble fibers are more susceptible as compared to insoluble.Insufficient ingestion of dietary fibres causes constipation, bowel irregularities, colorectal cancer and hemorrhoids.

Recommended dose of fibres for adults per day is about 30gm and for children , it is (age of child 2-5yrs 15gm)for a child of 5-11years of age(20gm per day)11-16(25gm per da, the recommended dose of fivers for age 17 and over 30gm per day.

2. a) Leaf constant is used in case of microscopical evaluation of crude drugs. Where the identification of the crude drugs can be carried out by the stomatal number, stomatal index, vein islet number and palisade ratio. But in case of stomatal number varies considerably with the age of leaf and due to changes in climatic condition.

Stomatal no. ; It is average no. of stomata present per square mm of the epidermis.

Datura stramonium	087 upper epidermis			
Hyoscyamus niger	125 upper epidermis			

Stomatal index:

It's the percentage which the no. of stomata form to the total no. of epidermal cells, each stoma being counted as one cell.

I=S*100/E+S

Atropa belladonna	Lower surface 20.2 to 23.0			
Indian Senna	17.0 to 20.0			
Atropa acuminata	16.2 to 18.3			

Vein islet no. : It is the number of vein islets per square mm of leaf surface. It usually does not alter with the age of plant and is independent of the size of the leaf.

Digitalis purpurea	02-5.5			
Digitalis thapis	8.5-16			
Cassia angustifolia	19-23			
Erythroxylon coca	08-12			

Palisade ratio: It is the average number of palisade cells, beneath one epidermal cell, using four continuous epidermal cells for the count. It is constant for a species of a genus.

Atropa belladonna	06-10			
Datura stramonium	04-07			
Digitalis purpurea	3.7-4.2			

b) **Pharmacological classification :-**

In the pharmacological classification, the crude drugs are classified according to pharmacological actions of their chief constituents . thus , the drugs similar in their action are put together, regardless of their morphology, biological behavior and chemical nature.
Examples :-

Pharmacological action	Name of the crude drugs
Carminatives	Coriander, caraway, cinnamon, clove
Purgatives	Cascara- sagrada, aloe, senna
Cardiotonics	Digitalis, arjuna, squill
Anti- cancer	Podophyllum, vinca
Anthelmintics	**Artemisia, malefern, quassia**
Antispasmodics	**Hyoscyamus, datura,**

Anti amoebic	**Kurchi, ipecacuanha**
Bitters	**Gentian, cinchona, nuxvomica**

c) Ash content :- The residue remaining after incineration is the ash content of the drug, which simply represents the inorganic salts naturally occurring in drug or adhering to it or deliberately added to it as a form of adulteration. Therefore , it is a criteria to judge the identity or purity of crude drugs .Total ash usually consists of carbonates, phosphates, silicates and silica.

d) Antioxidant nutraceuticals are those which contain Vitamin E, Vitamin C, Vitamin A and beta-carotene. They are present in some fixed oils, fruits, vegetables and fishes. Antioxidants present in such food are the compounds which either prevent the formatin of oxygen free radicals or trap them (scavenging effect).

Allium sulphur compounds	leeks, onion, garlic			
lutein	spinach, corn			
lycopene	tomatoes, pink grapefruit, watermelon			
vitamin-C	oranges, mangoes, spinach, capsicum			
vit-A	carrot, milk, egg yolk, sweet potatoes			
vit-E	nuts, seeds, whole grains			

e) Organised crude drugs :- As the term indicates these are “organs” of plants or animals and are made up of cells or definite structure. These drugs are named as flowers, seeds,fruits, inssects etc.These are solid in nature. Botanical or zoological terminology can be used to describe these drugs. Microscopic characters are one of the important criteria for the identification of organized drugs . examples :- Digitalis, cinchona etc.

Unorganized crude drugs :- These are derived from parts of plant or animal by purification, if necessary, e.g. juices, extracts, resins etc. These are solid, semisolid or liquids in nature e.g, oils and balsams. Such terminology is inadequate to describe them, but one has to look for their physical characters, such as the solubility in various solvents, density, optical rotation, refractive index, whichever is applicable. Chemicals tests and physical standards are confirmatory test for identification of these drugs. Examples : Aloe, agar, opium etc.

f) Surgical dressings :- Surgical dressings are essential medical materials used to cover and protect wounds, incisions, and surgical sites. Surgical dressings come in various forms, including sterile gauze pads, adhesive bandages, adhesive tapes etc. They are mainly used for :-

i) To reduce or prevent infections.
ii) To offer protection to healing wound.
iii) To offer mechanical support to the tissues.

Examples :- Bandages, Gauzes, crepe bandages etc.

g) Volatile oils are extracted by steam- distillation , solvent extraction or mechanical means such as ecuelle and enfleurage techniques.

Hydro- distillation method comprising of water distillation , water and steam distillation and steam distillation is used for extraction of volatile oil from herbal drugs. The fresh material is subjected to hydro-distillation in case of the leaf drugs. Air-dried subterranean parts are extracted by steam distillation.

Enfleurage method is used for extraction of delicate perfumes. The fresh flower petals are mechanically spread on layer of fatty material, allowed to imbibe and the exhausted petals are replaced by fresh material. The process is continued till the fatty layer is saturated with volatile principles which are then extracted with lipid solvent.

Ecuelle method is used for extraction of citrus oils, wherein oil cells in ring are ruptured mechanically using pointed projections by twisting raw material over them in clockwise direction either mechanically or manually.

Liquid carbon dioxide is also used to extract essential oils. When liquefied under pressure, it acts on a solvent, reversing back to gaseous nature when pressure is reduced, leaving no residue of solvent.

h) Senna

Biological source : It consists of dried leaflets of *Cassia angustifolia* (family – Leguminosae).

Chemical constituents : Senna contains anthroquinone derivatives of glycosides.sennoside A, sennoside B are the main active constituent, it also contains sennoside C and sennoside D. Other constituents are rhein, kaempferol, aloe- emodin and isorhamnetin .

Uses :- Senna leaves are used as laxative. It is an irritant purgative due to presence of anthraquinone detivatives. The only disadvantages of senna is that is causes gripping, but it is overcome by admixing powdered senna with carminatives.

i) **The identification tests for alkaloids are** :-
   a) Mayer's reagent (potassium mercuric iodide solution) : cream or pale yellow precipitate.
   b) Dragendroff's reagent (Potassium bismuth iodide solution): Brown or reddish-brown colour or precipitate.
   c) Wagner's reagent (iodine and potassium iodide solution): Brown or reddish brown colour or precipitate.

d) Hager's reagent (saturated solution of picric acid): Yellow precipitate. Phosphotungstic acid and tannic acid are also used for detection of certain alkaloids by precipitation.

j) Biological evaluation of crude drugs are carried out by taking the microorganisms/tissues/isolated organs/animals. When the estimation of potency of crude drug or its preparation is done by means of its effect on living organisms like bacterial, fungal growth or animal tissue or entire animal, it is known as bioassay.

Digitalis	1IU	76mg of standard preparation		
Vit-A	1IU	0.344micrograms		
Vit-D	1IU	0.025 micrograms		
Heparin	1IU	7.7micrograms		

Biological assay methods are 3 types :- (i) toxic (ii) symptomatic and (iii) tissue methods. In toxic and symptomatic techniques, the animals are used, whereas in tissue method, the effect of a drug is observed on isolated organ or tissue. Among the drugs that are subjected to bioassay are cardiac glycosides, vitamins, hormones, saponins, and antibiotics (microbiological assay.)

k) **Antiseptics** -Antiseptics are the chemical sterilizing substances which are used to kill pathogenic microbes or for prevention of their growth.

Disinfectant :- Disinfect indicates destruction or to make a surface free from pathogenic organisms. The disinfectants are therefore, the substances which kill bacteria and their sopres.

Benzoin-

Biological source :- Benzoin is a balsamic resin obtained from Styrax benzoin (family-Styraceae).

Uses :- It is used externally as an antiseptic and a protective. It is an irritating expectorant, a carminative and diuretic. It is used in the form of compound tincture of benzoin, and as an inhalation, specifically in the treatment of upper respiratory tract infection.

3. A) i) Shinodal test ;- It is test for flavonoid .A few fragments of magnesium ribbon and concentrated hydrochloric acid were added to the ethanolic extract. The appearance of red to pink color after few minutes indicates the presence of flavonoids.

ii) Steam distillation :- this method is used for extraction of volatile oil from herbal drugs. The fresh material is subjected to hydro-distillation in case of the leaf drugs. Air-dried subterranean parts are extracted by steam distillation.

The plant parts are macerated followed by steam distillation when the volatile oil goes into distillate from which it is extracted using light petroleum. it should be used carefully for none or less fragrant compounds.

iii)Moisture content: The percentage of active chemical constituents in crude drugs is mentioned on air-dried basis. Hence, the moisture content of a drug should be determined and also be controlled to make the solution of definite strength.
The moisture content is determined by heating a drug at 105°C in an oven to a constant weight , For the drug containing volatile active constituents, the toluene distillation method is followed.

Example :-

Drugs	Moisture content(%) w/w (not more than)
Aloes	10.0
Digitalis	05.0
Starch	15.0
Ergot	08.0
Acacia	15.0

iv) **Fixed Oil** :-These are the reserves of food materials of plants and animals. Those which are liquid at 15.5(degree) to 16.5(degree) are called as fixed oils. They derived from plant sources, occur generally in seeds. Chemically, they are glycerides of higher fatty acids. Ex. olive oil, castor oil, linseed oil, sesame oil 1

v) **Carotenoids** :-These are one of the tetraterpenoids and consist of organic pigments that are found in chloroplasts and chromoplasts of plant and other photosynthetic organism including bacteria and fungi. The highest amount of these compounds are present in the carrot fruits and hence the name carotenoids.Ex. bita carotene, lycopene, lutein, zeaxanthin

B.(i) Digitalis: It consists of dried leaves of *Digitalis Purpurea* (family: - Scrophulariaceae)

(ii) Vasaka:- It consists of dried as well as fresh Leaves of *Adhatoda vasica* (family :-Acanthaceae)

(iii) Neem :- It consists of leaves & other aerial parts of *Azadirachta indica* (family :- Meliaceae)

(iv) Liquorice :- It consists of subterranean peeled and unpeeled stolons, roots and subterranean stems of *Glycyrrhiza glabra* (family :- Legumonasae)

(V) Honey :- It is a sugar secretion deposited in honey comb by the bees,. *Apis mellifica, Apis dorsata* and other species of Apis (family : Apidae)

(VI) Clove : - : It consists of dried flower buds of *Eugenia caryophyllus* (family :- Myrtaceae)

(VII) Rauwolfia :- : It consists of dried roots of *Rauwolfia serpentina* (family :- Apocynaceae)

(VIII) Colchicum :- : It consists of dried seeds of *Colchicum luteum* (family :- Liliaceae)

(IX) Coriander –It consist of fully dried ripe fruits of *Coriandrum sativum* (family :- Umbelliferae)

(x) Opium : - : It consists of dried latex obtained from the unripe capsules of *Papaver somniferum*. (family :- Papaveraceae).

Q.3 (C) i). Pharmacognosy is defined as the scientific and Systematic study of Structural, Physical Chemical and biological characters of Crude drugs along with their history, method of cultivation, collection and Preparation for the market.

ii) Agar is used as an emulsifying agent and bulk laxative. It is used in preparation of jellies, confectionery items and in microbiology . It is used in preparation of bacteriological culture medium.

It is the dried gelatinous substance obtained from Gelidium amansii and several other species of red algae, family, Rhodophyceae

iii)Omega- 3 fatty acids :-These are found in cold-water fishes like cod, salmon, tuna sardines , blue fish, marc kevel and herring. Additionally these are also reported in cold weather bean-oil plants like flax-seed, canola, walnuts, soyabean, and freshly ground wheat germ.

Therapeutic uses: in cardiovascular diseases, reducing risk of blood clots, lower down the blood pressure, increasing HDL

iv) Bhasma :- The powdered form of the substance, obtained by calcination of metals, minerals plant or animal products by a special process in closed crucibles in pits covered with cow dung cakes (puta), is known as Bhasma.

Examples: pravalbhasma, lauhabhasm, suvarnabhasma, Shankhbhasma

v)Sutures :- These are the sterile threads, strings or strands specially prepared for use in surgery meant for sewing tissues together.

ODISHA STATE BOARD OF PHARMACY

D. Pharm Part - I E. R. 2020, 2022 Special Examination

Subject: PHARMACHEMISTRY (Theory)

1. Answer any six question :

a) Define and classify Anti-Depressants with examples. Write the structure, chemical name & popular brand name of followings :

i) Fluoxetine ii) Imipramine Hydrochloride

Mental depression is a psychiatric condition that may affect the normal social life of the patient if serious.

Characteristics of depression: Depression is characterized by

- Intense feeling of sadness
- Hopelessness and despair
- Inability to experience pleasure in pleasurable activity
- Insomnia or hypersomnia
- Suicidal thought
- Poor concentration
- Loss of apatite
- Agitation and fatigue
- Significant weight loss/gain

Antidepressants are the drugs used to treat a mentally depressed patient to improve his mental alertness.

Classification of antidepressant:

1. First generation antidepressant

a. Tricyclic antidepressants:- Amitriptyline, Nortryptyline, Imipramine*, Chlomipramine Doxepine, Desipramine, Trimipramine

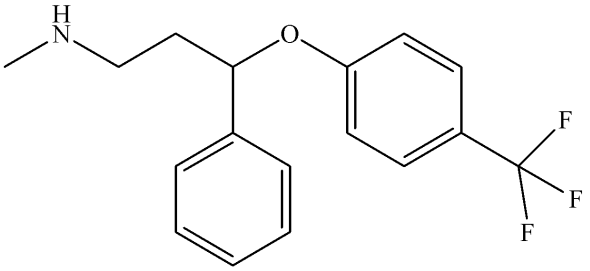
b. Monoamine oxidase inhibitors:- Isocarboxazide, Tranylcypromine, Phenelzine, Selegiline

2. Second generation antidepressant

a. Selective serotonine (5-HT) reuptake inhibitors:- Fluoxetine, Fluvoxamine, Sewrtraline

b. Serotonine-norepinephrine reuptake inhibitors:- Venlafexine, Desvenlafexine, Duloxetine

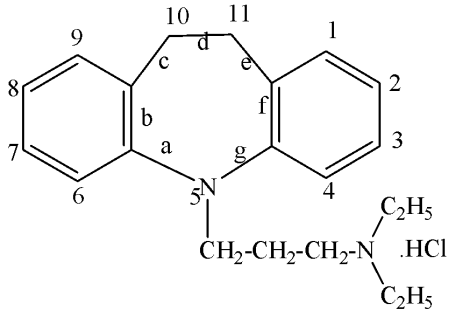
i) Fluoxetine



N-methyl-3-phenyl-3-(4-(trifluoromethyl)phenoxy)propan-1-amine

Brand names:

ii) Imipramine Hydrochloride:

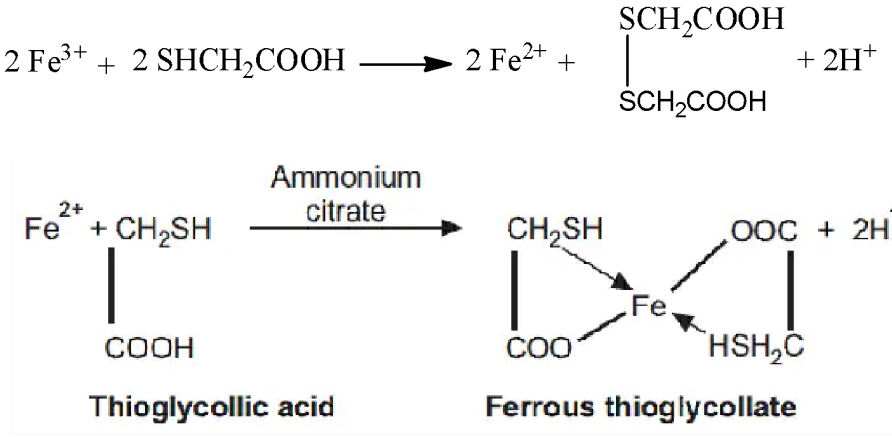


5-[3-(Dimethylamine)propyl]-10,11-dihydrodibenzo[b,f]azepine hydrochloride

Brand names: Imavate, Imidon, Deprinal

b) Describe the principle, chemical reaction & procedures of limit test for Iron.

Principle: The limit test of Iron is based on the reaction of iron in an ammonical solution with thioglycolic acid in the presence of citric acid to form iron thioglycolate, which is pale pink to deep reddish purple in color. The intensity of color produced from a specified amount of substance is compared with a standard color obtained by a similar reaction in a solution containing a definite quantity of ferric ammonium sulfate.



Iron impurity may be present in the trivalent ferric form or in the divalent ferrous form. If it is present in the ferric form, then thioglycolic acid reduces it to ferrous form.

Procedure:

Test Solution	Standard Solution
The sample is dissolved in a specific amount of water, and then the volume is made up to 40 ml	2 ml of a standard solution of iron diluted with water upto 40ml
Add 2 ml of 20 % w/v of citric acid (iron free)	Add 2 ml of 20 % w/v of citric acid (iron free)
Add 2 drops of thioglycollic acid	Add 2 drops of thioglycollic acid
Add ammonia to make the solution alkaline and adjust the volume to 50 ml	Add ammonia to make the solution alkaline and adjust the volume to 50 ml
Keep aside for 5 min	Keep aside for 5 min
The color developed is viewed vertically and compared with the standard solution	The color developed is viewed vertically and compared with the standard solution

Observation: The purple color produced in the sample solution should not be greater than the standard solution. If the purple color produced in the sample solution is less than the standard solution, the sample will pass the limit test of iron and vice versa.

c) Describe the principle, involved, procedure & limitations of Volhard's Method.

Principle: The principle of Volhard's method is based on "Back titration". The excess of silver nitrate is added to the halide containing solutions. Silver nitrate reacts with halide and

the excess of remaining silver nitrate is back-titrated with standard solution of potassium thiocyanate and ammonium thiocyanate in the presence of ferric salt as the indicator.

Procedure: Volhard method is a method used for determining the presence of chlorine, bromine, and iodine as halides in given chemical compounds. It is a kind of argentometric titration that involves the use of silver ions (in Latin, argentum means silver). It is an indirect titration procedure. It is used to determine anions that precipitate with silver, such as phosphates, chlorine, bromine, and iodine.

Volhard method is a titration method that involves the reaction of a compound containing chromates, phosphates and halides (chlorine, bromine, and iodine) with excess silver nitrate in a thiocyanate solution. Iron is used as an indicator in these reactions. An oxidizing agent such as silver nitrate is used to titrate the acidic analyte i.e. the halide ion solution. Titration is carried out with KSCN standard solution using ferric ion as an indicator. Silver precipitates in the form of white silver thiocyanate. Then the excess titrant and the ferric ions react and form a soluble red complex, which indicates the completion of the reaction.

The reactions taking place in Volhard method are-

1. Treatment of the analyte with excess silver nitrate. The chemical reaction in this step is -

$X + Ag^{+} \longrightarrow AgX + Ag^{+}$ (excess)

'X' denotes halides, phosphate and chromates.

2. Titration of unreacted silver is carried out with KSCN standard solution using iron as an indicator, which imparts red color to the solution at end point. The chemical reaction is-

$Ag^{+} + SCN^{-} \longrightarrow AgSCN$

3. The presence of excess thiocyanate imparts red colour upon the formation of the FeSCN (II) complex in the end. The chemical reaction occurring is-

$Fe^{+3} + SCN^{-} \longrightarrow Fe(SCN)^{+2}$

The limitations of volhard method are-

The method cannot be used for neutral and basic solutions.

It is a very time-consuming method.

Sometimes, false results are observed due to the adsorption of silver ions.

d. Define cholinergic blockers and give examples of synthetic cholinergic blockers. Write the structure, chemical name, and popular brand name of the following.

i) Atropine Sulphate ii) Dicyclomine Hydrochloride

Cholinergic blockers are a group of drugs that block the action of acetylcholine (ACh), in the synapses of the cholinergic nervous system. They block acetylcholine from binding to cholinergic receptors, causing reduced secretions, relaxation of smooth muscle, and reduced GI motility and peristalsis. For these reasons, cholinergic blockers are commonly used in the treatment of irritable bowel disease and GI hypersecretory states.

Synthetic Cholinergic Blockers:

a. Mydriatics: Cyclopentolate, Tropicamide

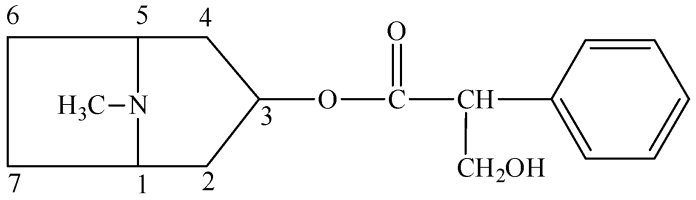
b. Vasicoselective: Oxybutynin, Flavoxate,

c. Antiparkinsonian: Procyclidine, Biperiden

d. Quaternary compounds: Propantheline, Oxyphenonium, Clidinium

e. Tertiary amines: Diclomine, Pirenzepine

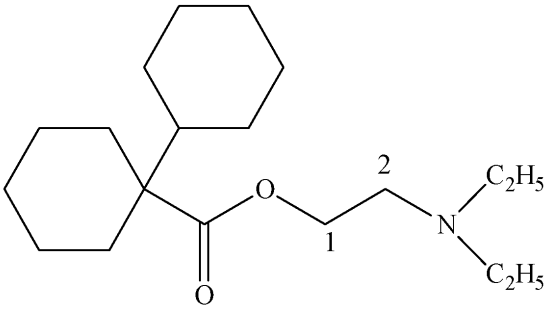
i) Atropine



Tropan-3yl-tropic acid

Brand names:- dl-Hyoscyamine

ii) **Dicyclomine Hydrochloride**



2-(diethylamino)ethyl [1,1'-bi(cyclohexane)]-1-carboxylate

Brand names: Diclopas, Cyclopam

e) Define Complexometric Titrations and describe its types with examples.

Definition: Complexometric titration is a form of volumetric analysis in which the formation of a colored complex is used to indicate the end point of a titration. Complexometric titrations are particularly useful for the determination of a mixture of different metal ions in solution.

Principle is to create a complex reaction, i.e., the metal ion and ligands are made to interact to form complexes. The metal ion behaves as Lewis acid. The ligand acts as a complexing agent.

Types of Complexometric titration:

Types of complexometric titrations

Complexometric titrations are of 4 types:

1. Direct Titration:

It is the simplest and the most convenient method used in chelometry. In this method, the standard chelon solution is added to the metal ion solution until the end point is detected. This method is analogous to simple acid-base titrations. E.g.-calcium gluconate injection, calcium lactate tablets and compound sodium lactate injection for the assay of calcium chloride (CaCl2.6H2O).

Limitations -slow complexation reaction

-Interference due to presence of other ions

2. Back Titration

In this method, excess of a standard EDTA solution is added to the metal solution, which is to be analyzed, and the excess is back titrated with a standard solution of a second metal ion.

E.g.- Determination of Mn. This metal cannot be directly titrated with EDTA because of precipitation of $Mn(OH)_2$. An excess of known volume of EDTA is added to an acidic solution of Mn salt and then ammonia buffer is used to adjust the pH to 10 and the excess EDTA remaining after chelation, is back titrated with a standard Zn solution kept in burette usingEriochrome blackT as indicator. This method is analogous to back titration method in acidimetry. e.g.- ZnO

3. Replacement Titration

In this method the metal, which is to be analyzed, displaces quantitatively the metal from the complex. When direct or back titrations do not give sharp end points, the metal may be determined by the displacement of an equivalent amount of Mg or Zn from a less stable edetate complex.

$Mn^{+2} + Mg\ EDTA^{-2} \longrightarrow Mg^{+2} + Mn\ EDTA\text{-}2$

Mn displaces Mg from Mn EDTA solution. The freed Mg metal is then directly titrated with a standard EDTA solution. In this method, excess quantity of Mg EDTA chelate is added to Mn solution. Mn quantitatively displaces Mg from Mg EDTA chelate. This displacement takes place because Mn forms a more stable complex with EDTA. By this method Ca, Pb, Hg may be determined using Eriochrome blackT indicator.

4. Indirect Titration

This is also known as Alkalimetric titration. It is used for the determination of ions such as anions, which do not react with EDTA chelate. Protons from disodium edetate are displaced by a heavy metal and titrated with sodium alkali.

$M^{n+} + H_2X^{-2} \longrightarrow MX^{(n-4)} + 2H^+$

E.g. - Barbiturates do not react with EDTA but are quantitatively precipitated from alkaline solution by mercuric ions as 1:1 complex.

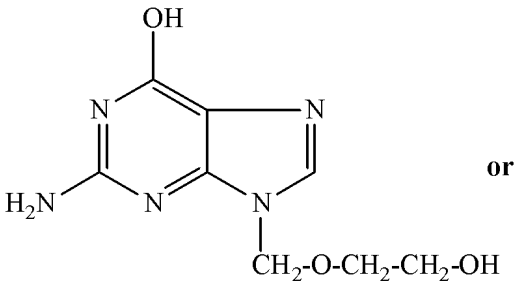
f) Define & classify Anti-Viral agent with examples. Write the structure, chemical name and popular brand name of Acyclovir. Mention the uses of Remdesivir & Favipiravir.

Antiviral drugs are a class of medication used for treating viral infections. Most antivirals target specific viruses, while a broad-spectrum antiviral is effective against a wide range of viruses.

Classification of Anti-Vira agents: According to treatment protocol, anti-viral agents are classified as follows.

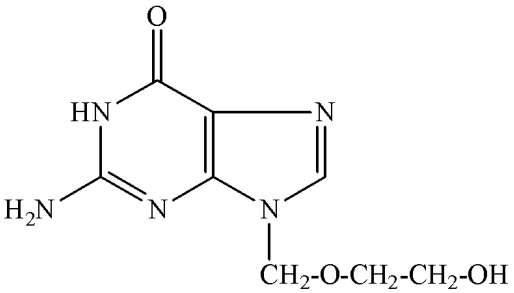
1. Treatment of influenza virus: Amantadine, Rimantadine
2. Treatment of herpes virus:
    a. Purine nucleotides: Acyclovir, Ganciclovir, Vidarabine
    b. Pyrimidine nucleotides: Trifluridine, Idoxuridine
    c. Phosphorus derivatives: Foscarnet
3. Treatment of retrovirus
    a. Reverse transcriptase inhibitors: Didonosine, Zidovudine, stavudine, Nevirapine
    b. Protease inhibitors: Saquinavir, Indinavir, Ritonavir
    c. Integrase inhibitors: Zintevir
4. Non-selective antiviral drugs: Ribavirin, Lamivudine, Interferon α

Acyclovir



2-amino-9-((2-hydroxyethoxy)methyl)-9*H*-purin-6-ol

or



2-amino-9-((2-hydroxyethoxy)methyl)-1*H*-purin-6(9*H*)-one

Popular Brand names: ZOVIRAX, Cymex Ultra, Virasorb.

Uses of Remdesivir:

1. Remdesivir injection is used to treat coronavirus disease (COVID-19) in hospitalized patients.
2. It is also used to treat mild to moderate COVID-19 in non-hospitalized patients who are at high risk for progression to severe COVID-19.

Uses of Favipiravir:

1. Favipiravir, is an antiviral medication used to treat influenza.
2. Favipiravir has been investigated for the treatment of life-threatening pathogens such as Ebola virus, Lassa virus, and now COVID-19.

g) Define Hypertension and anti-hypertensive agents. Classify Antihypertensive agents with examples. Mention the structure and chemical name of (i) Propranolol and (ii) Captopril.

Usually, hypertension is defined as blood pressure above 140/90 and is considered severe if the pressure is above 180/120. High blood pressure often has no symptoms. Over time, if untreated, it can cause health conditions such as heart disease and stroke.

Antihypertensive agents are a class of drugs that are used to treat hypertension. Antihypertensive therapy seeks to prevent the complications of high blood pressure, such as stroke, heart failure, kidney failure and myocardial infarction.

Classification of anti-hypertensive agents:

1. **Diuretics:**
    a. Loop diuretics: Bumetanide, ethacrynic acid, furosemide, torsemide
    b. Thiazide diuretics: Hydrochlorothiazide, chlorothiazide, Bendroflumethiazide
    c. Potassium-sparing diuretics: Amiloride, triamterene, spironolactone, eplerenone
2. **Calcium channel blockers:** Amlodipine, cilnidipine, felodipine, nifedipine, nimodipine, nisoldipine, Verapamil
3. **Angiotensin-converting enzyme inhibitors:** Captopril, enalapril, lisinopril, ramipril
4. **Angiotensin II receptor antagonists:** Azilsartan, losartan, Olmesartan, telmisartan

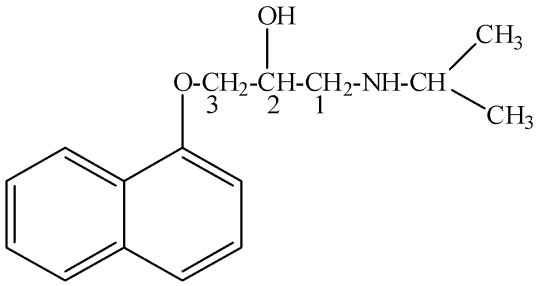
5. Adrenergic receptor antagonists:

a. Beta blockers: Acebutolol, atenolol, labetalol, metoprolol, propranolol, timolol

b. Alpha blockers: Doxazosin, chlorpromazine, phentolamine, phenoxybenzamine, prazosin, terazosin

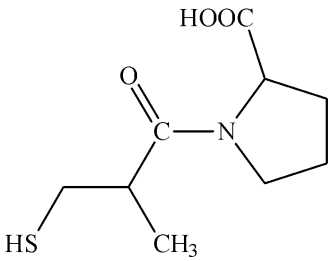
c. Mixed blockers: Bucindolol, carvedilol, labetalol, clonidine

(i) Propranolol



1-(isopropylamino)-3-(naphthalen-1-yloxy)propan-2-ol

(ii) Captopril



1-(3-mercapto-2-methylpropanoyl)pyrrolidine-2-carboxylic acid

2. Answer any ten questions

a) Distinguish between determinate and indeterminate error.

Ans: Determinate errors or systemic errors are those errors that are known and controllable errors e.g instrument errors, personal errors, etc. Determinate are known and avoidable.

Eg. - Instruments not being properly cleaned or calibrated.

A determinate error can also be a human error of not knowing how to properly use a lab instrument or making a mistake with measurements and calculations.

Indeterminate error or Random Error caused by uncontrollable variables, which cannot be defined/eliminated.

For example, air fluctuations occurring as students open and close lab doors cause changes in pressure readings

b) Write a brief note on any three Metallochromic Indicators ?

Ans: Classification of metallochromic indicators

- Triphenyl methane dyes – Crystal violet
- Phthalein and substituted phthaleins - Phenolphthalein
- Azo dyes - Eriochrome Black-T/ Mordant Black II
- Phenolic compounds – Trion

**** The student may write about any three of the following

Sr. No.	Name of the Indicator	Colour change	pH range	Metals detected
	Mordant black II			
1.	Eriochrome black T	Red to Blue	6-7	Ca, Ba, Mg, Zn, Cd, Mn, Pb, Hg
	Solochrome black T			
2.	Murexide or Ammonium purpurate	Violet to Blue	12	Ca, Cu, Co
3.	Catechol-violet	Violet to Red	8-10	Mn, Mg, Fe, Co, Pb
4.	Methyl Blue	Blue to Yellow	4-5	Pb, Zn, Cd, Hg
	Thymol Blue	Blue to Grey	10-12	
5.	Alizarin	Red to Yellow	4.3	Pb, Zn, Co, Mg, Cu
6.	Sodium Alizarin sulphonate	Blue to Red	4	Al, Thorium
			1-3	Bi, Thorium
7.	Xylenol range	Lemon to Yellow	4-5	Pb, Zn
			5-6	Cd, Hg

c) Calculate the equivalent weight of $KMnO_4$ in Acidic, Neutral & Alkaline Media ?

In acidic medium :

$MnO_4^- + 8H^+ + 5e^- = Mn^{2+} + 4H_2O$

$\therefore$ Equivalent weight $= \frac{M_{MnO_4^-}}{5} = \frac{158}{5} = 31.6 gmol^{-1}$

In neutral or feebly alkaline medium,

$MnO_4^- + 2H_2O + 3e^- \rightleftharpoons MnO_2 + 4OH^{(-)}$

$\therefore$ Equivalent weight $= \frac{158}{3} = 52.68 gmmol^{-1}$

In strongly alkaline medium :

$MnO_4^- + e^- = MnO_4^{2-}$

$\therefore$ Equivalent weight $= \frac{158}{1} = 158 gm/mol$

$\therefore$ Equivalent weight of $MnO_4 =$ in acidic, basic and neutral medium is $5 : 1 : 3$

d)) Define protective and mention of chemical formula, storage & uses of Talc ?

Protectives are the topical agents which tend to form a protective coating over the skin and protect the exposed skin or mucous membrane from irritation and burning.

Ideal requirements for protectives:

1. Must be insoluble and chemically inert.
2. Must be an efficient adsorbent: This decreases mechanical friction and prevent bacterial growth.
3. Must have decreased particle size : This will offer larger surface area so that they adher better to the surface of the skin.
4. Must be devoid of any biological activity.

Talc

Chemical Formula: $3MgO.4SiO_2.H_2O$

Storage: Keep container tightly closed. Store in original container. Store in a dry place. Protect from moisture.

Uses:

1. Used as a topical protective

2. Dusting powder in cosmetic preparation

3. Filtering media

e) Define Acidifiers, mention it types and write a note on uses of Muriatic Acid ?

Acidifiers are the inorganic chemicals that either produce or become acid. These are the drugs that are able to increase the acidity in GIT. Thus, decreasing the stomach pH. Some of these drugs are used to increase metabolic acidosis, whereas some of these are used to increase the gastric hydrochloric acid to treat achlorhydria. Although they are used as a gastric acidifier, however, they can also be used to alter the pH of other body fluids.

1. Gastric acidifiers: used to temporarily restore the acidity of the stomach in patients suffering from hypochlorhydria.

2. Urinary acidifiers: used to control pH in urine.

3. Systemic acidifiers: used to control pH in the overall body.

Muriatic acid:

Hydrochloric acid, also known as muriatic acid or spirits of salt, is an aqueous solution of hydrogen chloride with the chemical formula HCl(aq). It is a colorless solution with a distinctive pungent smell. It is classified as a strong acid.

Uses:

1. It is used to temporarily restore the acidity of the stomach in patients suffering from hypochlorhydria.
2. Kills microorganisms in the ingested food.
3. Acidifiers also improve the digestibility of nutrients and increase the absorption of minerals.
4. Hydrochloric acid is used to dissolve many metals, metal oxides and metal carbonates.

f) Write down the uses, storage & incompatibility of light kaolin ?

Kaolin is a layered silicate mineral with the chemical composition Al_2O_3 $2SiO_2$ $2H_2O$. Light Kaolin is nothing but a finely divided form of kaolin, which is lighter and is used for internal administration. It occurs as white or yellowish-white soft powder free from grittiness. It has a clay-like earthy taste. It is insoluble in water but soluble in certain organic solvents

Uses:

Protective and adsorbent

In the form of dusting powder it acts as a protective for wounds.

It is also used as filler in tablets

Used in ceramics (it is the main component of porcelain)

Used in toothpaste

Used in cosmetics

Storage: Storage Keep containers tightly closed in a dry, cool and well-ventilated place. The purpose of doing this is to keep the kaolin clay's moisture content stable because if it is poorly stored, kaolin clay will be dried out, making it hard to be utilized.

Incompatibility: Stable under normal conditions. Incompatible with excess heat and strong oxidizing agents.

g) Write down the role of Ostwald's ripening process in gravimetric analysis?

Ans: Ostwald ripening is the phenomena in which smaller particles in solution dissolve and deposit on larger particles in order to reach a more thermodynamically stable state wherein the surface to area ratio is minimized.

Ostwald ripening is an observed phenomenon in solid (or liquid) solutions which describes the evolution of an inhomogenous structure over time. The phenomenon was first described by Wilhelm Ostwald in 1896. When a phase precipitates out of a solid, energetic factors will cause large precipitates to grow, drawing material from the smaller precipitates, which shrink.

In chemistry, the term refers to the growth of larger crystals from those of smaller size which have a higher solubility than the larger ones. In the process, many small crystals formed initially slowly disappear, except for a few that grow larger, at the expense of the small crystals. The smaller crystals act as fuel for the growth of bigger crystals. The process of

Ostwald ripening is fundamental in modern technology for the solution synthesis of quantum dots. Ostwald ripening is also the key process in the digestion of precipitates, an important step in gravimetric analysis. The digested precipitate is generally purer, and easier to wash and filter.

h) Discuss the chemical formula, synonym, storage condition & uses of Bleaching Powder.

Chemical Formula: $Ca(OCl)_2$

It is a white solid, although commercial samples appear yellow. It strongly smells of chlorine, owing to its slow decomposition in moist air.

Synonyms: chlorinated lime, calcium oxychloride.

Storage conditions: stored in an air-tight container so that it does not come in contact with air. If it is left open in the air, it reacts with CO_2 and forms $CaCO_3$ and Chlorine. Keep away from sunlight and combustible materials. Always keep the bag on wooden pallets.

Uses:

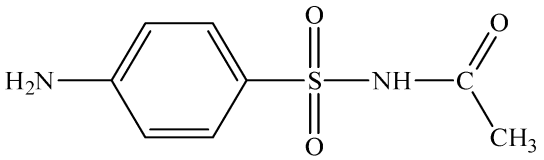
Used for disinfection of drinking water.

Used for bleaching washed clothes in the laundry.

Used for bleaching wood pulp in the paper manufacturing industry.

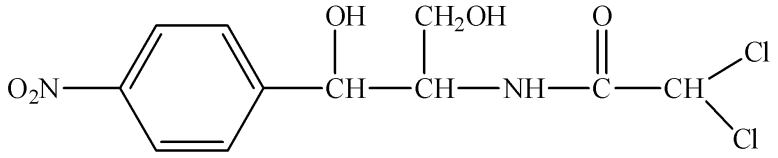
i) Define Sulfonamide. Write the structure, chemical name of Sulfacetamide and chloramphenicol?

Sulfacetamide:



N-((4-aminophenyl)sulfonyl)acetamide

Chloramphenicol:



2,2-dichloro-*N*-(1,3-dihydroxy-1-(4-nitrophenyl)propan-2-yl)acetamide

k) Define Narcotic Antagonists with examples. Briefly discuss its uses and storage condition?

Narcotic antagonists are a group of drugs that block the euphoric effects of opiates. They have clinical applications in the diagnosis of addiction, prophylactic treatment of narcotic abuse, and emergency treatment of narcotic overdosage.

There are several types of opioid receptors in our body. The three major groups are the μ (mu), Ƙ (kappa), and δ (delta) receptors. Opioid antagonists block one or more of the opioid receptors in the central or peripheral nervous system. Opioid antagonists mainly work on mu receptors.

Classification

1. Pure antagonist: Naloxone, Naltrexone, and Nalmefene
2. Mixed agonist-antagonist (produce some weak opioid partial agonist effects): Nalorphine, Pentazocine, Butorphanol, Nalbuphine

Naloxone:

Use: Naloxone comes in intravenous, intramuscular, and intranasal formulations and is used in opioid overdose and the reversal of respiratory depression associated with opioid use.

Storage: According to the Product Monograph, injectable naloxone hydrochloride (i.e., vials of injectable naloxone) should be stored between 15°C and 30°C and protected from light.

Naltrexone:

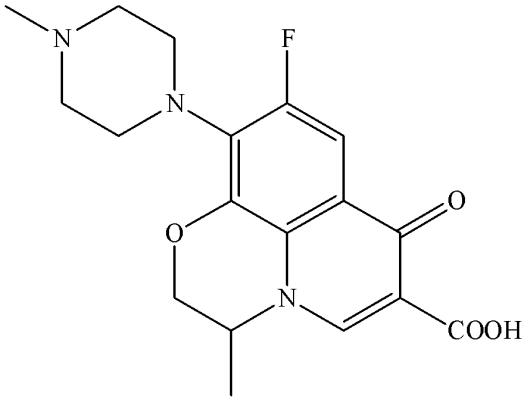
Use: Naltrexone is available in both oral and long-acting injectable formulations and is used to treat alcohol dependence and the blockade of the effects of exogenously administered opioids. Also used to prevent relapse to opioid dependence after opioid detoxification.

Storage: Store naltrexone tablets at 20° to 25°C.

Store the entire carton containing a naltrexone injection in the refrigerator (2 °C to 8 °C). Unrefrigerated naltrexone microspheres can be stored at temperatures not exceeding 25 °C (77 °F) for no more than 7 days prior to administration. Do not expose unrefrigerated products to temperatures above 25 °C (77 °F). Do not freeze.

k) Write the structure, chemical name & uses of Ofloxacin and Pretomanid.

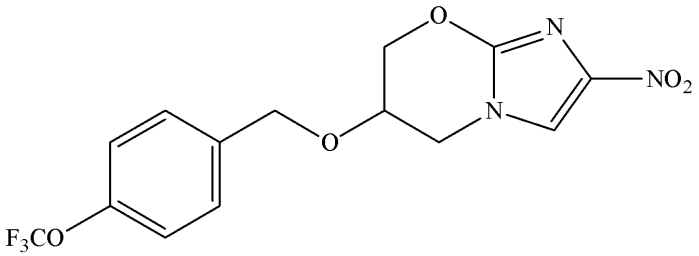
Ofloxacin:



9-fluoro-3-methyl-10-(4-methylpiperazin-1-yl)-7-oxo-3,7-dihydro-2*H*-[1,4]oxazino[2,3,4-*ij*]quinoline-6-carboxylic acid

Uses: Ofloxacin is used to treat certain infections, including pneumonia and infections of the skin, bladder, reproductive organs, and prostate. Also used to treat diarrhoea and dysentery.

Pretomanid:



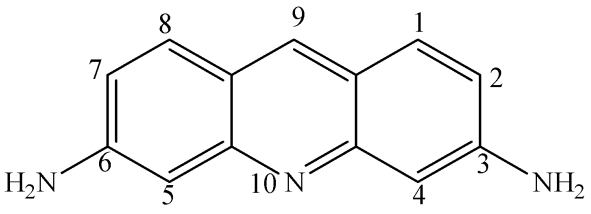
2-nitro-6-((4-(trifluoromethoxy)benzyl)oxy)-6,7-dihydro-5*H*-imidazo[2,1-*b*][1,3]oxazine

Uses: Used to treat multi-drug resistant tuberculosis.

3.(A) Write down the structure of one drug for each of the following Heterocyclic ring with its name and numbering.

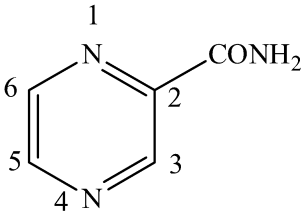
i) Acridine ii) Pyrazine iii) Thiophene iv) Pyrrole v) 1,4-benzodiazepine

i) Acridine



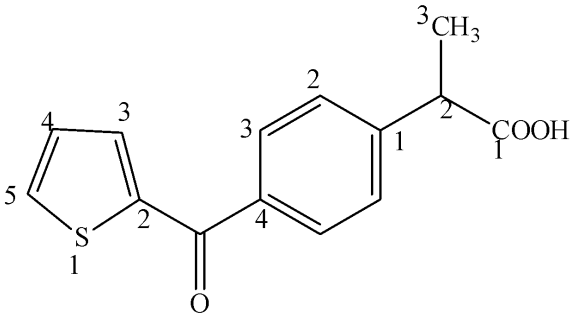
Proflavin

ii) Pyrazine



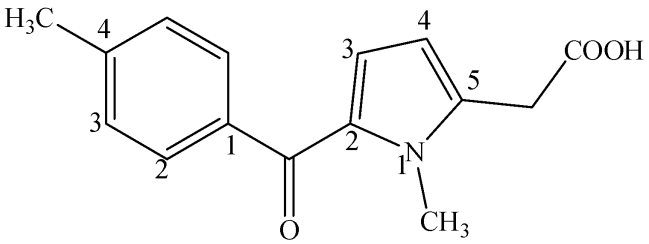
Pyrazinamide

iii) Thiophene



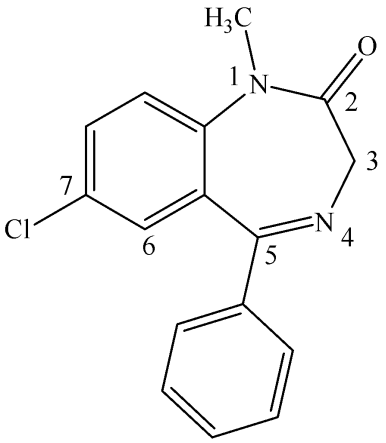
Suprofen

iv) Pyrrole



Tolmetin

v) 1,4-benzodiazepine

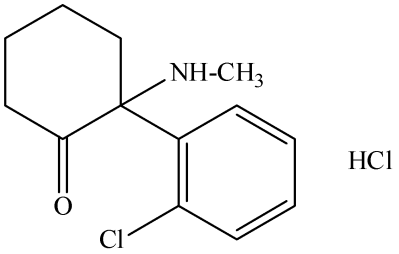


Diazepam

(B) Write down the structure & uses of the following compounds :

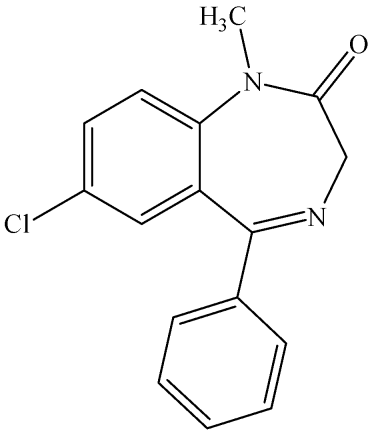
i) Ketamine Hydrochloride ii) Diazepam iii) Glibenclamide iv) Ibuprofen v) Mefloquine

i) Ketamine Hydrochloride



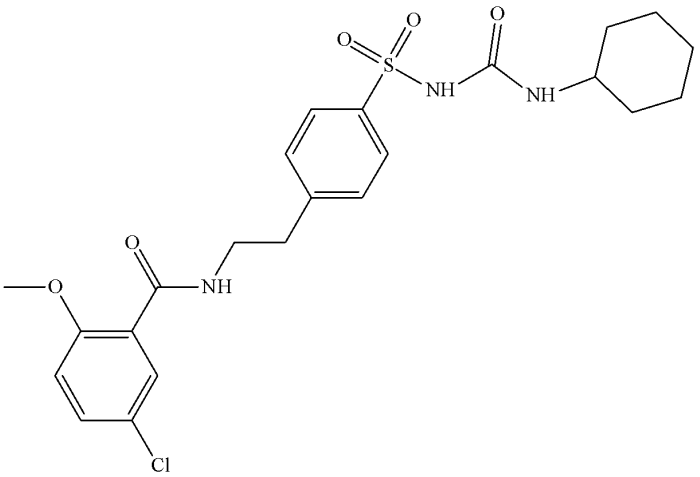
Uses: Ketamine is an anesthetic, used to induce a loss of consciousness and relieve pain.

ii) Diazepam



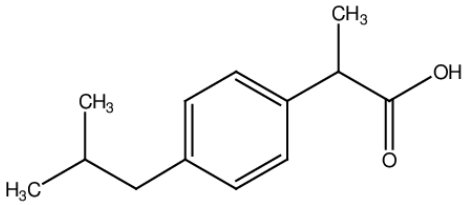
Uses: Used to treats seizures, muscle spasms or twitches. It may also be used to treat anxiety. It is also used to treat alcohol withdrawal symptoms.

iii) Glibenclamide



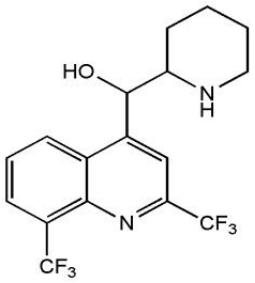
Uses: Glibenclamide is used to lower the blood sugar level in patients with type 2 diabetes mellitus.

iv) Ibuprofen



Uses: Ibuprofen is a NSAID used to reduce fever and to relieve pain from headaches, muscle aches, arthritis, menstrual periods, the common cold, toothaches, and backaches.

vi) Mefloquine

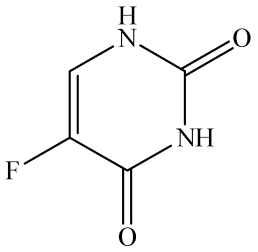


Uses: Mefloquine is used to treat malaria.

(C) Write the structure & IUPAC name of the following compounds : (1x5)

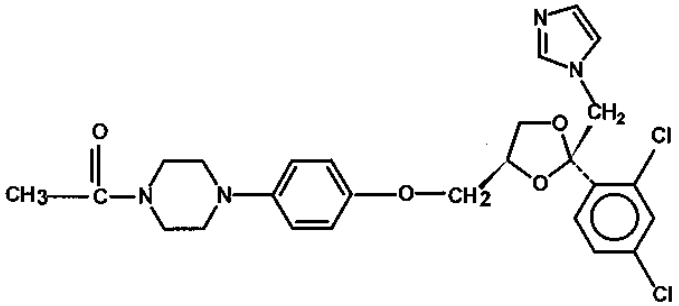
i) Fluorouracil ii) Ketoconazole iii) Dopamine iv) Phenytoin Sodium v) Haloperidol

i) Fluorouracil



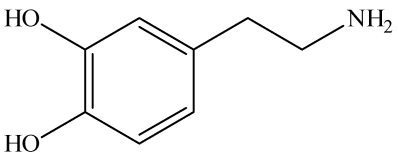
5-fluoropyrimidine-2,4(1*H*,3*H*)-dione

ii) Ketoconazole



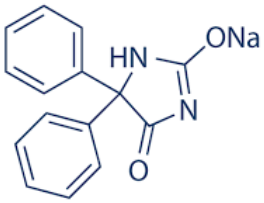
1-acetyl-4-[4-[2-(2,4-dichlorophenyl)-2-(1H-imidazole-1-ylmethyl)-1,3-dioxolan-4-ylmethyl] phenyl]piperazine

iii) Dopamine



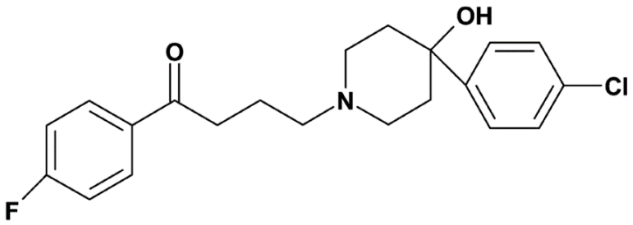
4-(2-aminoethyl)benzene-1,2-diol

iv) Phenytoin Sodium



Sodium 5,5-diphenylimidazolidine-2,4-dione

v) Haloperidol



4-[4-(4-Chlorophenyl)-4-hydroxypiperidin-1-yl]-1-(4-fluorophenyl)butan-1-one

(D) Define the followings: (1x5)

i) Primary standards ii) Masking agents & demasking agents iii) Osmotic Purgatives iv) Iodimetry v) Levelling Solvents & differentiating Solvents

i) Primary standards: A primary standard is an ultrapure compound that serves as the reference material for titration or for another type of quantitative analysis. Examples: sodium carbonate, potassium hydrogen iodate, potassium dichromate, oxalic acid etc.

ii) Masking agents & demasking agents: A masking agent is a reagent used in chemical analysis that reacts with chemical species that may interfere with the analysis. Example: EDTA (Ethylenediamine tetraacetic acid). Demasking agents are chemical reagents that are useful in introducing the impurities that were masked before the reaction mixture. During the demasking process, the masked substance regains its ability to enter into the desired chemical reaction. Example: triethanolamine.

iii) Osmotic Purgatives: Osmotic purgatives are nonabsorbable or poorly absorbable salts or polymers that osmotically draw water into the stool, resulting in softer stools and making bowel movements easier. Examples: polyethylene glycol (PEG), milk of magnesia, and lactulose.

iv) Iodimetry: Iodimetry is a technique that involves titrating free iodine with a reducing agent. As a result, iodine decreases to iodide and oxidizes other species. Iodimetry is used for the quantitative determination of various reducing agents in analytical chemistry, including sulfite, thiosulfate, and ascorbic acid.

v) Levelling Solvents & differentiating Solvents: In a differentiating solvent, various acids dissociate to different degrees and thus have different strengths. Weak bases are differentiating solvents for acids

In a leveling solvent, several acids are completely dissociated and are thus of the same strength. One of the most common examples of leveling solvents is water (H_2O).

ODISHA STATE BOARD OF PHARMACY

Model answer for Pharmaceutics (Theory)

2022 Special Examination (E.R.2020)

1. a) Classification of powders based on use

Based on use, pharmaceutical powders can be classified as powders for internal use or powders for external use. These are briefly described as follows:

i. Pharmaceutical powders for internal use

Pharmaceutical powders for internal use are preparations consisting of solid, loose, dry particles of varying degrees of fine particle size that contain one or more active substances, with or without excipients. Powders for internal use can be taken orally (e.g., Oral powders), administered through the nose as snuffs, or blown into a body cavity as an insufflation.

ii. Pharmaceutical powders for external use

Topical powders also known as powders for cutaneous application or powders for external use are preparations consisting of solid, loose, dry particles of varying degrees of fineness. They contain one or more active substances, with or without excipients and, if necessary, appropriate coloring matter. Powders for external use can be applied to compromised areas of the body. Highly sorptive powders should not be used for topical powders that are to be applied to oozing wounds, as a hard crust may form.

2. Classification of powders based on particle size

After preparation powders are classified according to their particle size. In order to qualify the particle size of a given powder, the USP uses the following descriptive terms:

i. **Very coarse (No. 8) powder:** All particles pass through a No. 8 sieve (2.38 mm) and not more than 20% pass through a No. 60 sieve.

ii. **Coarse (No. 20) powder:** All particles pass through a No. 20 sieve (0.84 mm) and not more than 40% pass through a No. 60 sieve.

iii. **Moderately coarse (No. 40)** powder: All particles pass through a No. 40 sieve (0.42 mm) and not more than 40 % pass through a No. 80 sieve.

iv. **Fine (No. 60) powder:** All particles pass through a No. 60 sieve (0.25 mm) and not more than 40% pass through a No. 100 sieve.

v. **Very fine (No. 80) powder:** All particles pass through a No. 80 sieve (0.18 mm). There is no limit to greater fineness.

3. Classification of powders based on dispensing

Pharmaceutical powders are classified based on dispensing or by the way they are presented to the user into bulk or divided powders.

a. Bulk powders

Bulk powders refer to a mixture of all the materials (usually non-potent drugs), packed into a properly designed bulk containers, such as a tight, wide-mouthed glass or plastic bottle, and are intended for either internal or external administration. The major problem of bulk powders is the inaccuracy of dose.

The dose of bulk powders can be affected by many factors, including

1. the measuring device (spoon)
2. storage humidity
3. degree of settling and
4. patient factors.

The dose of bulk powder may vary for patients using differently sized spoons, or even those using the same spoon according to their technique. In addition, drugs present in the bulk powders are better suited, if they have a wider therapeutic window, a large dose, and pleasant taste.

Among the bulk powders available in prepackaged amounts are

1. antacids (e.g., sodium bicarbonate) and laxatives (e.g., psyllium [Metamucil]), which the patient takes by mixing with water or other beverages before swallowing;
2. douche powders (e.g., Massengill powder), dissolved in warm water by the patient for vaginal use;
3. medicated powders for external application to the skin, usually topical anti-infectives (e.g., bacitracin zinc and polymyxin B sulfate) or antifungals (e.g., tolnaftate); and
4. brewer's yeast powder containing B-complex vitamins and other nutritional supplements.

b. Divided powders

Divided powders, or chartulae, are single doses of powdered drug mixtures individually enclosed in paper, plastic laminates, or metallic foil wrappers or packets. Chartula, which is abbreviated as chart, is the Latin word for powder paper.

The divided powder is a more accurate dosage form than bulk powder because the patient is not involved in measurement of the dose.

A number of commercially prepared premeasured products are available in folded papers or packets, including headache powders (e.g., BC powders), powdered laxatives (e.g., psyllium mucilloid, cholestyramine resin), and douche powders (e.g., Massengill powder packets).

Liquid Mixing :

Liquid mixing may be divided into following two subgroups:

1. Mixing of liquids and liquids

a) Mixing of two miscible liquids

b) Mixing of two immiscible liquids

2. Mixing of liquids and solids

a) Mixing of liquids and soluble solids

b) Mixing of liquids and insoluble solids

1. (a) Mixing of two miscible liquids (homogeneous mixtures e.g. solutions) Mixing of two miscible liquids is quite easy and occur by diffusion. Such type of mixing does not create any problem. Simple shaking or stirring is enough but if the liquids are not readily miscible or if they have very different viscosities then electric stirrer may be used.

1. (b) Mixing of two immiscible liquids (heterogenous mixtures e.g. emulsions) - Two immiscible liquids are mixed to effect transfer of a dissolved substance from one liquid to another. When two immiscible liquids are mixed together in the presence of an emulsifying agent an emulsion is produced. - For the production of a stable emulsion, the mixing must be very efficient i.e. continuous without ceasing because the components tend to separate out if continuous work is not applied on them.

2. (a) Mixing of liquids and soluble solids (homogeneous mixtures e.g. solutions) - In this case soluble solids are dissolved in a suitable liquid by means of stirring. - It is a physical change i.e. a soluble solid is converted to a solution.

2. (b) Mixing of liquids and insoluble solids (heterogeneous mixtures e.g. suspensions) When insoluble solids are mixed with a liquid, a suspension is produced which is an unstable system. The ingredients of a suspension separate out when allowed to stand for sometime. Thus a suspending agent is required to produce a stable suspension. On small scale, suspensions may be prepared in a pestle and mortar

Mixing mechanisms for fluids Mixing mechanisms for fluids fall essentially into four categories:

Bulk transport

Turbulent flow

Laminar flow

Molecular diffusion

LIQUID MIXING EQUIPMENT

Propeller mixers

Paddle mixers

Turbine mixers

In-line mixers

b) Glass packaging Materials:

Different Types of Glass:
Type I = Borosilicate glass
Type II = Treated soda lime glass
Type III = Regular soda lime glass
Type IV = General purpose sodalime glass

Advantages:

1. Versatile & attractive: Glass is used in every type of the parentral dosage form mostly it is used in ampoules, vials, saline bottles etc. Different coloured glass are used as packing materials of parenterals and make it attractive.
2. Moulded into different shape, size & colour: Glass used in the parenterals can be easily moulded into different types shapes, size and colour.
3. High Transparency: It has high transparency which allows easy inspection of its content.
4. Protection: Glasses used in the parenterals is coloured to protect the light sensitive materials and to prevent the degradation of API.
5. It is chemically resistance to most of the medicinal product.
6. Sealed: Glasses used in the parenterals can be used to sealed hermetically as a result preventing the passage of air, oxygen and makes its airtight.
7. It is suitable for sterilization at various temperature & pressure.
8. It can be easily recycle & reused and it can be cost effective.
9. They are not deteriorate with age. It is economical & easily available. It can be easily labelled.
10. It is having rigidity & protective quality so that's why it is used in parenterals preparation.

Disadvantages:

1. Fragile: Glass used in parenterals packing are fragile in nature so that it can be easily break by the small force or pressure.
2. Glasses are relatively heavy & difficult to transport.
3. Glasses are harder to decompose.
4, It is expensive to manufacture.
5. During its heat sterilization some type of glass container have the tendency of shedding, some part of the silica into the formulation.
6. Hermetic seal that is more easily compromised.
7. It has vulnerability to fracture from the thermal shock (like rapid temperature changes) & physical shock.

C. Vaccine:

A **vaccine** is a biological preparation that provides active acquired immunity to a particular infectious or malignant disease. The safety and effectiveness of vaccines has been widely studied and verified. A vaccine typically contains an agent that resembles a disease-causing microorganism and is often made from weakened or killed forms of the microbe, its toxins, or one of its surface proteins. The agent stimulates the body's immune system to recognize the agent as a threat, destroy it, and to further recognize and destroy any of the microorganisms associated with that agent that it may encounter in the future.

BCG Vaccine:

BCG is prepared from a strain of the attenuated (virulence-reduced) live bovine tuberculosis bacillus, *Mycobacterium bovis*, that has lost its ability to cause disease in humans. It is specially subcultured in a culture medium, usually Middlebrook 7H9. Because the living bacilli evolve to make the best use of available nutrients, they become less well-adapted to human blood and can no longer induce disease when introduced into a human host. Still, they are similar enough to their wild ancestors to provide some degree of immunity against human tuberculosis. The BCG vaccine can be anywhere

from 0 to 80% effective in preventing tuberculosis for a duration of 15 years; however, its protective effect appears to vary according to geography and the lab in which the vaccine strain was grown.

A number of different companies make BCG, sometimes using different genetic strains of the bacterium. This may result in different product characteristics. OncoTICE, used for bladder instillation for bladder cancer, was developed by Organon Laboratories (since acquired by Schering-Plough, and in turn acquired by Merck & Co.). A similar application is the product of Onko BCG of the Polish company Biomed-Lublin, which owns the Brazilian substrain M. bovis BCG Moreau which is less reactogenic than vaccines including other BCG strains. Pacis BCG, made from the Montréal (Institut Armand-Frappier) strain, was first marketed by Urocor in about 2002. Urocor was since acquired by Dianon Systems. Evans Vaccines (a subsidiary of PowderJect Pharmaceuticals). Statens Serum Institut in Denmark markets BCG vaccine prepared using Danish strain 1331. Japan BCG Laboratory markets its vaccine, based on the Tokyo 172 substrain of Pasteur BCG, in 50 countries worldwide.

According to a UNICEF report published in December 2015, on BCG vaccine supply security, global demand increased in 2015 from 123 to 152.2 million doses. To improve security and to [diversify] sources of affordable and flexible supply," UNICEF awarded seven new manufacturers contracts to produce BCG. Along with supply availability from existing manufacturers, and a "new WHO prequalified vaccine" the total supply will be "sufficient to meet both suppressed 2015 demand carried over to 2016, as well as total forecast demand through 2016–2018."

D. Extraction:

Extraction refers to processes for the isolation of the active ingredients from drug material. This may be by physical means or by dissolving in a suitable menstruum (liquid solvent eg. water or alcohol). It involves the separation of medicinally active portions of animal or plant tissues from the inactive components through the use of selective solvents.

MACERATION

Principle:
In this process solid ingredients are placed in a stoppered container with the whole of the solvent and allowed to stand for a period of at least 3 days (3 – 7 days) with frequent agitation, until soluble matter is dissolved. The mixture is then strained (through sieves / nets), the marc pressed and the combined liquids clarified (cleaned by filtration) or by decantation, after standing.
N.B.
Stoppered container is generally taken to reduce the loss of solvents by evaporation. If the volume of solvent is reduced by evaporation then the extract may become concentrated, which may not be desired.
The drug is allowed to stand for few days
i) to help the solvent to penetrate the cells of the drugs,
ii) to provide the time for partitioning the active ingredient into the solvent and
iii) to transfer the drug out of the cells into the bulk of the solvent.
Frequent agitation is required to reduce the localized concentration around the cells and tissues.
As indicated in the pharmacopoeia the process consists of the following:
 Placing the solid materials with whole menstruum in the closed vessel and allowed to stand for 7 days shaking occasionally.
 Strained, pressed the marc and the liquid is obtained.
 Liquid (i.e the extract) is clarified by subsidence or filtration.
The process is normally used for the preparation of tinctures or extracts and menstruum is usually alcoholic, hydroalcoholic (in case of tinctures) or may be aqueous.
1. Simple maceration - a process for tinctures made from organized drugs e.g. roots, stems, leaves etc.

1. Maceration with adjustment - a process for tinctures made from unorganized drugs such as oleo-resins and gum resins.
1. Multiple maceration - a process to prepare concentrated extract. It includes ‘Double maceration’ and ‘Triple maceration’.

SIMPLE MACERATION

Organized drugs having specific cell structures like roots, stems, leaves, flowers etc. are extracted by this procedure.

Apparatus

A wide mouthed bottle or any other container which can be well stoppered can be used for maceration process. A closed container is essential to prevent the evaporation of menstruum which is mostly concentrated alcohol. Otherwise this may lead to variation in strength as no adjustment in volume is made.

Method

Water or alcohol is used as menstruum and the drug menstruum ratio is 1 : 10.

 The drug is placed with the whole of the menstruum in a closed vessel for seven days. During this period shaking is done occasionally.
 After 7 days the liquid is strained and marc is pressed.
 The expressed liquid is mixed with strained liquid.

It is then filtered to make a clear liquid.

 The final volume is not adjusted.

Explanation

1. Shaking of the drug during maceration is essential in order to replace the saturated layers around the drug with fresh menstruum.
2. After straining, the marc is pressed in a filter press, hydraulic press or hand press etc. The marc can be squeezed out of a fine muslin piece, when then quantity of the drug is very small.
3. The pressed liquid is mixed with the strained liquid and then filtered. No final adjustment is made, since the volume of pressed liquid is likely to vary with the process of pressing the marc. If the final adjustment in volume is made, it will give variation in the concentration of active principle although the volume of the final preparation may be the same.
4. Filtration is necessary to remove insoluble cell contents obtained during the pressing of marc.

Examples: The tinctures made by simple maceration process are-

1. Tincture of Orange
2. Tincture of Lemon
3. Tincture of Squill

MACERATION WITH ADJUSTMENT

The process is used for unorganized drugs.

Apparatus: Same as simple maceration.

Method:

 In this process the unorganized drug is placed with 4/5 th of the menstruum in a closed vessel for a period of 2-7 days. During this period, shaking is done occasionally .
 After the stated period, the liquid is filtered and the volume is made up by passing the remaining 1 / 5 the of the menstruum through the filter.
 The marc is not pressed.

Explanation

1. The period of maceration is reduced from 7 to 2 days in some cases, because the unorganized drugs behave like simple chemicals that dissolve in the solvent very easily and quickly.4/5th of the menstruum is used to keep the drug in contact with it in order to take into account the increase in volume after dissolving the soluble matter of the drug. The volume is made up at the end with 1/5th of the menstruum remained.The marc left is a compact gummy matter. It does not retain the menstruum and hence it is not necessary to press the marc.The final volume is made up because all the active constituents of drug get dissolved in the menstruum. Marc is not pressed. hence, there is no change in the concentration of the preparation in case the final volume is made up. Example: Tincture of tolu Compound tincture of benzoin.

MULTIPLE MACERATION
Double and triple maceration.

e. Granulation Process of Tablet Manufacturing:

Materials intended for compaction into tablets must possess two characteristics:
(1) fluidity and (2) compressibility.
Good flow properties are essential for the transport of the material through the hopper, into and through the feed frame into the dies. Tablet materials should therefore be in a physical form that flows uniformly and smoothly. The ideal physical form is sphere, since spheres offers minimum contact surface between themselves and with the walls of the machine parts. Unfortunately, most materials do not easily form spheres; however shapes approaching spheres improve flowability. hence flow properties of powder materials are improved by forming sphere like regular shaped aggregates called granules.
WET GRANULATION

Step-I Milling of the drug and excipients
 Milling of the active ingredients, excipients etc. are milled to obtain a homogeneity in the final granulation.
 If the drug is given in solution then during drying it will come up to the surface. To avoid this problem drug is mixed with other excipients in fine state.
Step-II Weighing
 Weighing should be done in clean area with provision of air flow system.
 In the weighing area all the ingredients must not be brought at a time to avoid cross-contamination.
Step-III Mixing
Commonly used blenders are: (a) Double cone blender
(b) V – blender
(c) Ribbon blender
(d) Planetary mixer
Any one of the blender may be used to mix dry powder mass.
Step-IV Wet Massing
Wet granulation forms the granules by binding the powders together with an adhesive.
Binder solutions can be added in two methods:

Method-I
Drug + Diluent
Dry binder is added
Blended uniformly
Suitable solvent is added to activate the dry binder

Method-II
Drug + Diluent
Binder Solution is added
Blended in a Sigma - mixer or Planetary mixer till properly wet mass is formed

 The powder must be moist and not paste.
 Blending may take 30 mins to 1 hour.
N.B.
 To determine the proper moistening, the moist mass is balled in a palm, pressed by two fingers, if fragments of granules are formed and not powder then the blending is stopped.
 Since, in general, the mass should be moist rather than wet or paste, there is a limit to the amount of solvent that may be incorporated.
Therefore, when (i) a small quantity of solvent is permissible, method-I is adopted and
(ii) a large quantity of solvent is required method-II is adopted.

 However, method-II will give more cohesiveness than method-I if the amount of binder remains constant.
 If granulation is over-wetted, the granules will be hard, requiring considerable pressure to form the tablets, and the resultant tablets may have a mottled appearance.
 If the powder mixture is not wetted sufficiently, the resulting granules will be too soft, breaking down during lubrication and causing difficulty during compression.

Step-V Wet Screening
Wet screening process involves converting the moist mass into coarse, granular aggregates by
(i) passage through a hand screen (in small scale production) or,
(ii) passage through an oscillatory granulator of hammer mill equipped with screens having large perforations (# 6 – 8 mesh screen).
Purpose: (i) Increase particle contact point. (ii) Increase surface area to facilitate drying.

Step-VI Drying
 Drying is usually carried out at 60 0 C. Depending on the thermolabile nature of the drug the temperature can be optimized.
 Drying is required in all wet granulation procedures to remove the solvent, but is not dried absolutely because it will pose problems later on. Hence, certain amount of moisture (1 – 4 %) is left within the granules – known as the residual moisture.
Methods: Drying can be carried out
1. Tray dryers – it may take 24 hrs of drying
1. Truck dryers – the whole cabinet can be taken out of the dryer
1. Fluid-bed dryer – dried for 30 mins.
The total surface of the granules are dried uniformly but in tray dryer the lower surface of the granules may not be dried uniformly. Case hardening may some time occur in tray dried products.
N.B. In case hardening the outer surface of the lumps of the wet powder will be dried quickly and become hard (forming a hard crust), while the inner part will remain wet. This phenomenon is called case hardening.
Step-VII Dry Screening
After drying, the granule size is reduced by passing through smaller mesh screen.
 For drying granules the screen size to be selected depends on the diameters of the punch.

Step-VIII Lubrication of granules
 After dry granulation, the lubricant is added as a fine powder. It usually, is screened onto the granulation through 60 or 100 mesh nylon cloth to eliminate small lumps as well as increase the covering capacity of the lubricant.
 The lubricant is blended very gently using tumbling action to maintain the uniform granule size.
 Too much fine powder is not desirable because fine powder may not feed into the die uniformly causing variation in weight and density.
 Since, the very nature of lubricant produce hydrophobic surface on the particle hence over blending prevents the inter granule bonding that takes place during compression.

DRY GRANULATION

Dry granulation is followed in situations where
(i) the effective dose of a drug is too high for direct compaction,
(ii) if the drug is sensitive to heat, moisture or both, which precludes wet granulation.
e.g. many aspirin and vitamin formulations are prepared for tableting by compression granulation.
Steps of granulations
Milling Weighing Screening Blending Slugging Granulation (Dry) Lubrication

Compaction

Slug:

Slug may described as poorly formed tablets or, may be described as compacted mass of powdered material.
Purpose: To impart cohesiveness to the ingredients, so as to form tablets of desired properties.
Method: It is done either by (i) by high capacity heavy duty tablet press
(ii) of by Chilsonator roller compactor.
(i) By high capacity tablet press large tablets are made because
(a) fine powders flow better into large cavities, and
(b) large slugs reduces production time
 The punches are flat faced
 Sufficient pressure should be applied.
 Powdered materials contains a considerable amount of air; under pressure this air is expelled and fairly dense piece is formed. More time is allowed for this air to escape.
 The compressed slugs are comminuted in desired mesh screen.
 Lubricant is added twice : i.e.
1. During blending with other powders and
2. added to the granulations
 The lubricant is blended gently with the granulation and is compressed into tablets
(ii) Chilsonator roller compactor
 Chilsonator consists of two grooved rollers. Powder is flowed into the grooves and compressed mass is produced as the rollers rotates.
 Distance between two rollers can be adjusted.
 By the impeller always the air is removed from the powder mass.
 By using oscillatory granulator granules are prepared and lubricant is blended with the granules and compressed into tablets.

1. Dry granulation involves less steps and hence less time is required than that of wet granulation.
2. Less steps requires less working space and energy.
Since popularity of wet granulation is more that dry granulation because former will meet all the physical requirement for the compression of good tablets.
Example of dry granulation: Preparation of Aspirin tablets

DIRECT COMPRESSION

Steps:

Milling

Weighing

Sieving

Blending

Compression

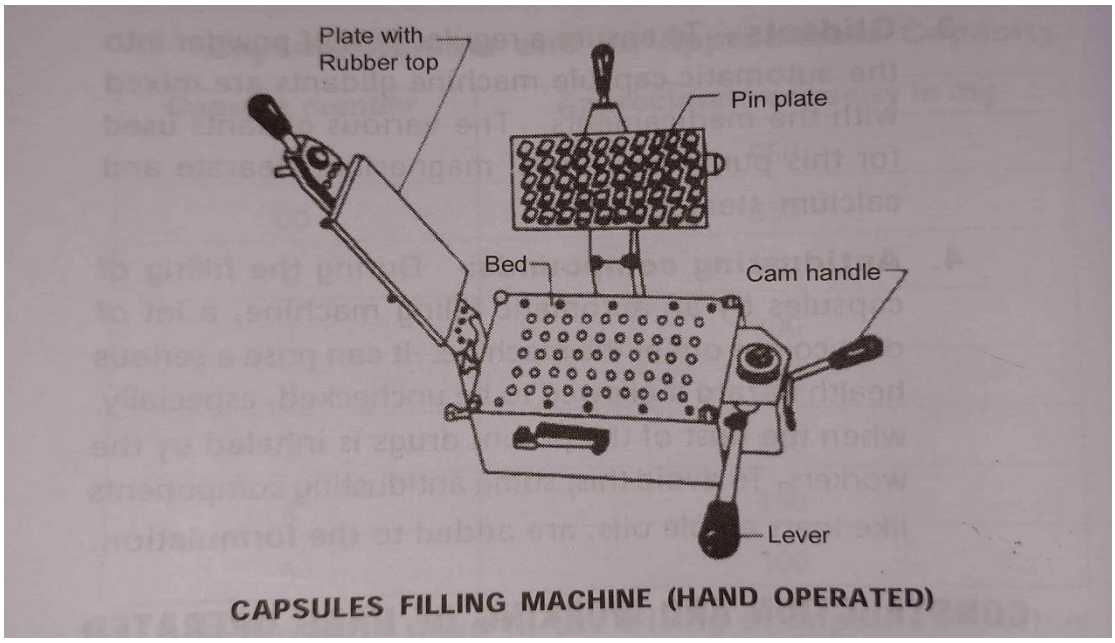
Advantages: (i) It is much more quicker than any of the previous process

(ii) Minimum number of steps are required.

Modified diluents, binders etc. are available in the market which assure spherical shape of the granules to modify flow property. However, they are not used extensively.
1. If active medicament is less in amount then there will be no problem but in case of high dose large amount of active ingredient is to be replaced by specially treated vehicles to improve flow property or compressibility.

f. Hard & Soft gelatin Capsule:

1. Soft gelatin capsules, also called as soft-gels are sealed hermetically as 1-piece capsules that contain a semi-solid or liquid fill, whereas hard gelatin capsules shell consists of two parts namely a body and a cap.
2. Hard gelatin capsules are cylindrical in shape while soft gelatin capsules are available in round, oval and tube-like shapes.
3. Soft gelatin contains gelatin, plasticizers, preservatives, colouring agents, sugars, flavouring agents, and opacifying agents, whereas hard gelatin capsules are prepared from gelatin, titanium dioxide, colouring agents and plasticizers.
4. The ratio of plasticizer and gelatin is more in a soft gelatin capsule (0.8 : 1) than in hard gelatin capsule (0.4 : 1).
5. Hard gelatin capsules are sealed after they are filled to ensure that the medicines do not come out of the capsule due to rough handling. Filling and sealing of soft gelatin capsules are done in a combined operation on machines.



CAPSULES FILLING MACHINE (HAND OPERATED)

g. Suppositories:

Different types of suppositories

Type	Site of use	Size	Length	Shape
Rectal Suppositories	Rectum	1-2g	2.5 cm	Bullet-, cone-shaped
Vaginal Pessaries	Vagina	4-8g	2-4 cm	Cone, rod and wedge in shape
Urethral bougies	Urethra-Male	4g	10-15 cm	Long, thin, cylindrical rounded at one end
	Urethra-female	2g	6-7.5 cm	Long, thin, cylindrical rounded at one end
Nasal bougies	Nostril	1g	9-10 cm	Long, thin, cylindrical rounded at one end
Ear cone	Ear cavity	<1g	1-2 cm	Small, thin, cylindrical

Suppository base:

Suppository bases are used to prepare suppositories, so that they can retain its shape and firmness during storage and administration. They either melt, disperse or dissolve in cavity fluid. Ideal properties suppositories bases:
1. Melt at body temperature and dissolve or disperse at body fluids.
2. Non-toxic, non-irritant and non-sensitive.
3. Compatible with large variety of drugs.
4. Stable on storage.
5. It should be easily moulded.
6. It should release medicament.
7. It should not adhere to the mould by pouring or by cool compression.
8. It should be stable if it is heated above its melting point.
9. It should keep its shape while handling.
10. These have wetting and emulsifying properties.
11. If it is vegetable or animal fat, following standard must comply. Acid values less than– 3; Iodine value less than –7; Saponification value – 200-275
12. It has a wetting and emulsifying property.
13. Melting and solidification points should be closed.
Suppositories base: These are classified into three types they are
1. Oily bases: designed to melt at body temperature.
A. Cocoa Butter: It is also known as theobroma oil. It is obtained from crushed and roasted seeds of theobroma cocoa.
Properties:
1. Melting point lies between 30-350C.
2. It is composed of mixture of glyceryl esters of stearic, palmitic, oleic and other fatty acids.
3. It has smell and taste like chocolate.
4. It is a yellowish white solid.
5. Cocoa butter melts at body temperature and releases them.
6. It shows the phenomena of polymorphism, when melted and cooled, Cocoa butter solidifies into different crystalline form:
1. α form: It melts at 240C, obtained by sudden cooling of cocoa butter at 9 0C.
2. β 1 form: It crystallizes out from liquefied cocoa butter by stirring at 18-230C. Its melting point lies between 28-310C.
3. β-form: It changes slowly in form which melts between 34 – 350 C.
4. ϒ-form: Its melting point is 180C is obtained by pouring a cooled cocoa butter at 2 0C into a container, cooled at deep freeze temperature.
Advantages:
1. Solid at even high room temperature but melt quickly at body temperature.
2. It is very stable.
3. It is chemically inert.
4. It is non-reactive.
5. Miscible with many ingredients.
Disadvantages:
1. Over heating changes its physical characters because of polymorphism.
2. Melt in warm weather.
3. Adherence to mould.
4. It can rancidity.
5. Deterioration during storage due to oxidation.
6. Poor water absorbing base.
7. It is costly.
8. Leakage of melted base.
9. It melting is lowered by overheating and by incorporation of substances like camphor, phenol. B. Hydrogenated oil: It is used as a substitute for theobroma oil. It is obtained by hydrogenation of various vegetable oils, such as Arachis oil, cotton seed oil, coconut oil, palm oil etc. It is used as a substitute for theobroma oil. These have certain advantages over theobroma oil.
1. Resistant to oxidation.

2. Good emulsifying and water absorbing capacities.
3. Lubrication of mould is not necessary.

2. Water soluble or water miscible base:
I) Glycerol-gelatin base: It is also known as glycerine suppositories. It is a mixture of glycerine and water which is made stiff by the addition of gelatine. Suppositories prepared from this base are translucent gelatinous solids. This base is hydrophilic in nature slowly dissolves in the aqueous secretions and release the medicaments slowly and continuously. This base may be used to prepare all types of suppositories but it is particularly used as a base in vaginal suppositories. These suppositories if required to be stored, must have preservatives like methyl paraben and propyl paraben. To avoid incompatibility reactions suitable type of gelatin is used two grades of gelatin are available.
1. Pharmagel A (Type A): It is acidic in nature and used for acidic drugs. Its iso-electric point lies between 7 to 9.
2. Pharmagel B (Type B): It is alkaline in nature and used for alkaline drugs. It iso-electric point lies between 4-7.5
Advantages:
1. Dissolves in secretion and release drug slowly.
2. Suitable for drugs like boric acid, chloral hydrate, bromide, iodide, iodoform, opium.
Disadvantages:
1. They are more difficult to prepare and handle.
2. A physiological effect: osmosis occurs during dissolving in the mucous secretions of the rectum, producing a laxative effect.
3. Can cause rectal irritation due to small amount of liquid present.
4. They are hygroscopic therefore they must be stored in well closed containers.
5. Unpredictable solution time
6. Gelatin is incompatible with many drugs. Ex-Tannic acid, $Fecl_3$.
7. They support bacterial and mould growth. Formula: Gelatin- 14% ; Glycerin- 70% ; Water- 16%

II) PEG or Macrogol base:
They are widely used for preparing suppositories. They are chemically stable and physiologically inert. They do not support bacteria and mold growth. Poly ethylene glycols are available in different physical forms.
1. Molecular weight 200-1000 is liquids.
2. Molecular weight higher than 1000 are wax like soft solids.
Advantages:
1. They melt at 42 degree Celcius, hence no cool storage is required.
2. Satisfactory for use in hot climate.
3. Dissolve and miscible with body fluid.
4. No lubricant is required.
5. Leakage is not a serious problem
6. These are non-irritant and chemically stable.
7. These absorb water and have excellent solvent property.
8. Products have a clean smooth appearance.
Disadvantage:
1. High solubility of PEG leads to supersaturations which in turn makes crystals and fracture the product on storage.
2. They are hygroscopic and hence require special storage conditions to store them.
3. They are incompatible with certain drugs like tannins and phenol etc.
4. May irritate imflammed tissue, hence dipped in water prior to use.
5. Because of good solvent property, may not release drug quickly Formula: PEG 4000 - 33% ; PEG 6000 - 47% ; Water - 20%

III) Soap glycerine base:

It is mixture of gelatin and sodium stearate. It contains 95% of glycerine. The soap is generally produced by interaction of stearic acid and Na2CO3. The suppository is usually hard. It is very hygroscopic and require protection from atmosphere and wrapped in waxed paper or tin foil.
Formula: Glycerin - 90g ; NaCO3 - 4.5g ; Stearic acid- 7.5g 3.

Emulsifying bases: These are synthetic bases. They contain mono-glycerides as emulsifying agent forming w/o type emulsion. They can absorb very easily.

I) Witepsol: They consist of triglycerides of saturated vegetable fatty acid with varying percentage of partial esters. A small amount of beeswax is added for use in hot climate. It should not be cooled rapidly as it become brittle and fracture. Lubrication is required.

II) Massa Estarinum: It is a mixture of mono, di and triglycerides of saturated fatty acids . It is a white, brittle, almost odourless and tasteless solid. It has a m.p. 33.5 to 35.50 C.

III) Massuppol: It consists of glyceryl esters mainly of lauric acid to which small amount of glyceryl monostearate has been added to improve its water absorbing capacity.

Advantages:
1. Lubrication of mould is not required
2. Non-irritant and resistant to oxidation.
3. Over-heating does not affect solidifying points.
4. These solidify rapidly
5. Their emulsifying and water absorbing capacities are good.

Disadvantages:
1. They should not be cooled in refrigerator because they become brittle.
2. They are less viscous on melting which results in sedimentation of other substances.

Q.2.a) Organoleptic additives:

Organoleptic additives promote appearance and palatability of pharmaceutical dosage forms. If the product does not have acceptable colour, flavor and taste the patient would try to avoid using it.

Flavouring agents used in pharmaceuticals: Vanillin, Apple, Banana, Cinnamon, Grape, Pineapple, Lemon, Anise, Peppermint, Mango, Caramel, Ginger, Raspberry, Strawberry etc.

Colouring agents used in pharmaceuticals: Tartrazine, Brilliant blue FCF, Amaranth, Sunset yellow, Erythrosine, Carmine, Turmeric, Carbon Black, Titanium dioxide, Iron oxide etc.

b) Excipient used in Tablet manufacturing.

An excipient is an inactive substance other than the active pharmaceutical ingredient(s) used in the formulation of pharmaceutical product to bring functionality to the formulation.

1. **Diluents:** essential excipients for tablets to increase the weight or volume.
2. **Binders:** vital excipients for tablets to facilitate the agglomeration of powder into granules.
3. **Disintegrants:** essential excipients for tablets to assist dosage form's breakup or disintegration into small units/fragments.
4. **Lubricants:** vital excipients for tablets to reduce the frictional forces between particle-particle as well as particles and metal-contact surfaces.
5. **Glidant:** to promote the flow properties of tablet granules or power materials.
6. **Coloring agent:** to give a color or identification of the tablets as either pigment or coating materials.
7. **Flavoring agent:** used only in some types of tablets such as chewable tablets or dispersible tablets or in coating suspension for bad smelled tablets.
8. **Sweetener or Sweetening agent:** especially used in the chewable, dispersible, sublingual tablet.
9. **Surfactant:** used for low solubility tablets to improve wetting and deaggregation of drug particles to get a rapid and improved dissolution.
10. **Release-Modifying Agents:** especially used to control drug release in modified-release formulations (prolonged-release or controlled-release tablet).
11. **Coating materials:**

- Film former which may be enteric or non-enteric
- Solvent
- Plasticizer
- Colorant
- Opaquant-Extender
- Miscellaneous coating solution components.

c. Definations

Gel:

Pharmaceutical gels are semisolid preparations that contain one or more medicines in a hydrophobic and hydrophilic base. Gels are made using suitable gelling agents, and may also contain antioxidants, preservatives, and stabilizers.

Sera: A serum is a liquid that is injected into someone's blood to protect them against a poison or disease . antiserum. blood serum containing antibodies against a specific antigen , used to treat or provide immunity to a disease. buona sera.

Suspension: A pharmaceutical suspension may be defined as a coarse dispersion containing finely divided insoluble material suspended in a liquid medium or available in dry form to be distributed in the liquid when desired. Sterile suspensions are intended for injection or for ophthalmic use.

d. Steps of Sugar Coating Process:

1. STEP 1: Sealing. The first step involves applying a thin layer of sealing material to the tablet.
2. STEP 2: Subcoating. ...
3. STEP 3: Smoothing. ...
4. STEP 4: Coloring. ...
5. STEP 5: Polishing. ...
6. STEP 6: Printing (Optional)

e. Excipients used for processing of capsules:

(1) Diluents: Improve the physical properties of the contents and increase the volume, and they often have a certain compressibility. Commonly used diluents are mannitol, microcrystalline cellulose, lactose, pregelatinized starch 1500, corn starch and the like.

(2) Lubricants: Prevent the adhesion of powder to metal materials. Common materials include magnesium stearate, glyceryl monostearate, stearic acid, talc, and the like.

(3) Glidants: Improve the fluidity of the contents. Commonly used glidants are micro-silica gel and talcum powder.

(4) Disintegrants: Ensure the disintegration of the contents. Common disintegrants include crosslinked cellulose, corn starch, cross-povidone, pregelatinized starch 1500, and the like.

(5) Wetting agents: Increase the wettability of the drug and the dissolution medium to ensure the efficacy of the preparation. Polysorbate 80, sodium lauryl sulfate, and the like are common.

(6) Adhesives: The adhesive binds the drug powder together at the time of granulation, such as starch slurry, CMC-Na, HPC, and so on.

f. Mottling:

Mottling is defined as an unequal distribution of color on a tablet with light and dark areas. Different causes for mottling are drug color different from other components, dye migration to either the small or large granules during the granulation process, uneven distribution of color when using a colored adhesive gel solution.

Causes	Remedies
The unequal particle size of the coloring agent or pigment.	Sieved before use to make equal size particles.
A colored drug used along with colorless or white-colored excipients.	Use appropriate colorants.
A dye migrates to the surface of granulation while drying.	Increase dry mixing time during granulation. Use a proper and fine binder. Use a smaller particle-sized dye.
Improperly mixed dye, especially during 'Direct Compression'.	Mix properly and reduce the size if it is of a larger size to prevent segregation. Use microfine lake dye. Increase blending time. Mill lake dye with 5% excipient.
Too small amount of colorant.	Increase the quantity of colorant.
Preferential absorption of soluble dye by component of mix.	Replace soluble dye with microfine lake pigment.

g. Difference in Lotion & Liniment.

LOTION	LINIMENT
(I)It is a liquid preparation. (ii) Applied to the skin without friction. (iii)Used as local agent for cooling shooting or protective purpose.	It is liquid or semi liquid preparation. Applied to the skin with friction and rubbing of the skin. Used for analgesic, rubefacient, soothing counter irritant or stimulating properties.

h. Application of membrane filter:

- The purpose is to remove viable and nonviable particles in order to clarify or sterilize the solution. Particles may be retained by sieving, entrapment, or electrostatic attraction. The largest pore size that will yield a sterile filtrate is 0.2 microns. Membrane filters are either hydrophobic or hydrophilic.
- These systems utilize membranes with specific pore sizes to separate and purify the desired drug molecules from impurities, contaminants, and other unwanted particles.
- Generally, the membrane processes used to purify the water of pharmaceutical industry are based on the size of pollutants, i.e., is used for the separation of bacteria while for macromolecules and viruses, UF is utilized and NF is used for divalent ions and RO for monovalent ions separation.

i. Bacterial Vaccine:

Bacterial vaccines contain killed or attenuated bacteria that activate the immune system. Antibodies are built against that particular bacteria, and prevents bacterial infection later. An example of a bacterial vaccine is the Tuberculosis vaccine.

j. Double cone blender:

Working Principle:

Double Cone Blender can perform homogenously dry mixing of free-flowing powders, granules requiring low shearing force, Mixing and Blending of particles with rapid intermixing of particles irrespective of varying specific gravities. The material is loaded into the double cone blender drum.

Working of Double Cone Blender:

The powder is filled up to 2 or 3rd of the volume of the blender to ensure proper mixing. The rate of rotation should be 30 to 100 RPM, and on rotation, mixing occurs due to the tumbling motion. The Finally mixed Material is discharged from the bottom of the equipment.

Application:
The double cone blender is used to produce homogeneous solid-solid mixture. Mixing is a common process step in the manufacture of products for industries such as food, cosmetics, pharmaceutical, chemical, detergents, fertilizers and plastics.

k. Creaming of Emulsion:

The rise of dispersed particles to the surface of an emulsion is referred to as creaming, which occurs due to density differences between the dispersed particles and the serum phase.

The creaming rate can be reduced by increasing the effective volume fraction of droplets (i.e., droplet concentration) in emulsions. For instance, mayonnaize has higher stabilization against creaming than salad dressings due to its higher volume fraction of the dispersed phase.

3. A)

i) Monophasic and Biphasic Liquid dosage form:

Monophasic liquid dosage form is a liquid preparation containing two or more components in one phase system. It is represented by a true solution. • A true solution is a clear homogenous mixture that is prepared by dissolving solute in a suitable solvent. • The component of the solution which is present in a large quantity is known as "SOLVENT" where as the component present in small quantity is termed as "SOLUTE".

Biphasic Liquid Dosage Form Contain 2 Phases. This Includes Undissolved Drug and The Solvent System(Vehicle). Undissolved Phase Is Distributed Throughout A Vehicle And Intended For Oral Administration. In This Preparation This phase Is Called 'Dispersed phase' And The Vehicle Is called 'Dispersed Medium'. It's also Called Internal Phase Or External Phase Respectively.

ii) Oral Tablet and Sublingual Tablet:

These tablets are to be placed in the side of the cheek (buccal pouch) where they dissolve or erode slowly and are absorbed directly in the buccal cavity without passing into the alimentary canal.Therefore, they are formulated and compressed with sufficient pressure to give a hard tablet e.g.Progesterone tablets.

These tablets are to be placed under the tongue where they dissolve or disintegrate quickly and are absorbed directly without passing into GIT e.g. tablets of nitroglycerin, isoproterenol hydrochloride or erythrityl tetranitrate.

iii) Sterilization of Rubber container:

Pharmaceutical closures used in aseptic environments must be introduced in a sterile state. The most common methods to sterilize rubber closures (e.g., stoppers) are autoclaving (saturated steam) and gamma irradiation.

iv) Classify Extraction Process:

There are mainly six types of extraction processes. Maceration, Infusion, Digestion, Decoction, Percolation and Soxhlet Hot Continuous Extraction.

v) Disadvantages of Plastic:

1. Plastic containers have poor physical stability due to adsorption, absorption lightness and/or interactions between the formulation and the container

2. They have low heat resistant and poor ductility.

3. Most plastic containers are usually not as clear as glass, and, therefore, inspection of the contents is impeded.

B. Define:

i) Tablet: Tablets may be defined as the solid unit dosage form of medication with suitable excipients. It comprises a mixture of active substances and excipients, usually in powder form, that are pressed or compacted into a solid dose. Tablets are prepared either by moulding or by compression.

ii) Elixir: Elixirs are sweetened hydro-alcoholic (water and alcohol) liquids for oral use. Typically, alcohol and water are used as solvents when the drug will not dissolve in water alone. In addition to active drug, they usually contain flavouring and colouring agents to improve patient acceptance.

iii) Ointment: Ointments are semisolid preparations that are applied externally to the skin or mucous membranes. Ointments soften or melt at body temperature; they should spread easily and should not be gritty. Creams are opaque, soft solids or thick liquids for external application.

iv) Toxoid: Toxoid, bacterial poison (toxin) that is no longer active but retains the property of combining with or stimulating the formation of antibodies. In many bacterial diseases, the bacteria remain sequestered in one part of the body but produce a poison (exotoxin) that causes the disease manifestations.

v) Cream: Creams are semisolid dosage forms containing more than 20% water or volatile components and typically less than 50% hydrocarbons, waxes, or polyols as vehicles. They may also contain one or more drug substances dissolved or dispersed in a suitable cream base.

vi) Emulsions: These are biphasic liquid dosage forms that are separated into two components. When two or more liquids are emulsified as droplets, they become miscible when together, but the dispersion is accomplished with emulsifying agents.

vii) Eye drops: These are a type of medication that are administered directly into the eye. They are used to treat a variety of conditions such as dry eyes, allergies, infections, and glaucoma.

viii) Capping and lamination: Capping is a common mechanical defect in tablet manufacturing, exhibited during or after the compression process. Predicting tablet capping in terms of process variables (e.g. compaction pressure and speed) and formulation properties is essential in pharmaceutical industry.

Lamination of tablets happens when the product separates into horizontal layers. Lamination is very similar to capping, but occurs in the main body of the tablet, not at the top, and it can occur immediately after compression or during the storage period.

ix) Coloured Glass: Coloured glass is obtained by the addition of small amounts of metal oxides, chosen according to the desired spectral absorbance. Neutral glass is a borosilicate glass containing

significant amounts of boric oxide, aluminium oxide, alkali metal oxides and/or alkaline earth oxides in the glass network.

x) Levigation: It is the process of decreasing the particle size of powders via triturating them with a mortar and pestle along with a small amount of liquid wherein the substance is insoluble to.

xi) Gelatin: It is a natural, water-soluble protein that is transparent and colorless. It is obtained through the controlled and partial hydrolysis of collagen from animal skin, bone, and tissue. The collagen itself is a fibrous protein that is composed of three intertwined polypeptide chains.

xii) Creaming: It is the separation of dispersed droplets having different density than the continuous phase under the influence of gravity to form a layer of more concentrated emulsion, the cream.

xiii) Drying: Drying is the process of removing the presence of solvents (i.e. water or other liquids) in a formulation with the presence of heat. The final product of this unit operation is a dry solid mass or powders.

xiv) Lyophilization: Lyophilization transforms a drug product from a liquid to a stable solid by removing water or other solvents. Drug developers are increasingly interested in this technique as it can to extend the shelf life of both small and large molecule drugs.

xv) Condensation: Condensation is the process where water vapour is changed into liquid form. This change is brought about by a change in the pressure and temperature of the substance.

ODISHA STATE BOARD OF PHARMACY

13/09/2023

D. Pharm Part - II **E. R. 1991** **2022 Special examination**

DO NOT WRITE ANYTHING ON YOUR QUESTION PAPER EXCEPT YOUR ROLL NO.
QUESTION PAPER CONTAINING ANYTHING WOULD BE TREATED AS MAL-PRACTICE
ANSWER THE QUESTIONS SERIALLY AND CONTINUOUSLY

Subject: HOSPITAL & CLINICAL PHARMACY (Theory)

Full Mark -80 **Time -3 Hrs.**

(Answer any five questions including question No. 1)

1. **A) Define the followings :** **(5x1)**

   i) Teratogenicity ii) Bio-availability
   iii) Hospital pharmacy iv) Drug tolerance v) Patient compliance

   B) Define the following abbreviations **(15x1)**

i) ADME	ii) BAL	iii) BTCT	iv) CHF	v) CHD	vi) CPR
vii) DIC	viii) ELISA	ix) FBS	x) GABA	xi) ICU	xii) MRI
xiii) PTC	xiv) RBS	xv) SGPT			

2. a) Write about the facilities and requirements of sterile manufacture. **(8+7)**
   b) Discuss the layout of sterile product area.

3. Define Hospital formulary & explain in detail the guiding principle of Hospital formulary. **(3+12)**

4. Write the pathophysiology and manifestation of **($7\frac{1}{2}$ x 2)**
   a) Peptic ulcer b) Hepatitis

5. Define & classify ADR. Explain in detail on predictable adverse drug reaction. **(2+3+10)**

6. Define Drug interaction & classify the mechanism of drug interaction. Describe the Pharmacokinetic drug interaction **(2+3+10)**

7. Define IN-PATIENT. Briefly discuss about drug distribution for **IN-PATIENT** in a hospital. **(2+13)**

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ODISHA STATE BOARD OF PHARMACY 11/09/2023

D. Pharm Part - II **E. R. 1991** **2022 Special examination**

DO NOT WRITE ANYTHING ON YOUR QUESTION PAPER EXCEPT YOUR ROLL NO.
QUESTION PAPER CONTAINING ANYTHING WOULD BE TREATED AS MAL-PRACTICE
ANSWER THE QUESTIONS SERIALLY AND CONTINUOUSLY

Subject: DRUG STORE & BUSINESS MANAGEMENT (Theory)

Full Mark -80 **Time -3 Hrs.**

(Answer any five questions including question No. 1)

1. **a) Define the following terms** **(10x1)**

i) Scrap ii) Overdraft iii) Capital iv) Petty Cash book
v) Ware house vi) Revenue vii) Bank vii) Insurance
ix) Free Samples x) Window Display

b) Write the difference between the following questions. 2x5

i) LIFO & FIFO ii) Journal & Ledger iii) Cash discount & Trade discount
iv) Fixed capital & working capital v) Advertisement & Sales Promotion

2. Write short notes on **any three** of the following questions. **(3x5)**

a) Balance sheet b) Internal trade
c) Levels of management d) Functions and objectives of inventory Control
e) Manufacturing Industry

3. a) Define & discuss the salient features of partnership business. **(2+8)**
b) Explain the partnership business basing on liability of partners. **(5)**

4. a) Define finance and its planning. **(3)**
b) Discuss about various sources of finance. **(12)**

5. Write short notes on **any two** of the following questions. **($7^1/_2$x2)**

a) EOQ b) Trial Balance
c) Joint Stock Company d) Layout of a pharmacy

6. a) What do you mean by sales promotion and what are its objectives ? **(4+6+5)**
b) Discuss various techniques of sales promotion used to improve sales.

7. a) Write rules of debit and credit basing on class of accounts **(3)**
b) Journalise the following transactions and post them into concerned ledger.

i) Mr. X started business with cash	Rs.85,000	**(12)**
ii) Cash deposited in bank	Rs. 6,000	
iii) Purchased goods for cash	Rs. 3,000	
iv) Paid telephone bill	Rs. 800	
v) Bought medicines from M/s. Lal & Co.on credit	Rs. 5,000	
vi) Interest on capital	Rs. 500	
vii) Goods sold on cash	Rs.12,000	

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ODISHA STATE BOARD OF PHARMACY 07/09/2023

D. Pharm Part - II **E. R. 1991** **2022 Special examination**

DO NOT WRITE ANYTHING ON YOUR QUESTION PAPER EXCEPT YOUR ROLL NO.
QUESTION PAPER CONTAINING ANYTHING WOULD BE TREATED AS MAL-PRACTICE
ANSWER THE QUESTIONS SERIALLY AND CONTINUOUSLY

Subject: PHRMACEUTICAL JURISPRUDENCE (Theory)

Full Mark -80 **Time -3 Hrs.**

(Answer any five questions including question No. 1)

1. **(A) Define the followings** **(1x10)**

i) Schedule J ii) Schedule "O" iii) Denatured Alcohol
iv) Landed Cost v) Coca Derivative vi) Free Reserve vii) CLAA
viii) DPCRC ix) Drug x) Medicinal Preparation.

(B) Answer the followings **(2x5)**

i) Define adulterated drug
ii) Write the penalties where no punishment is defined in breach of Medicinal & Toilet (ED) Act.
iii) Define R-W Coefficient.
iv) Write the penalties for obstructing a drug inspector while discharging his/her duties.
v) Define misbranded drugs

2. a) Write the objectives of MTP Act 1971 & Rule 1975. Discuss the experience or training required for a RMP in case of termination of pregnancy. **(10)**
b) Discuss the procedure of possession and import of poison. **(5)**

3. a) Define Advertisement. Discuss regarding different classes of exempted advertisement. **(10)**
b) Define Non-bonded laboratory. Discuss about exemption from duty on medicinal preparations supplied from bonded laboratory. **(5)**

4. Answer **any three** **(5 x 3)**

a) Controlling authority b) Sampling procedure for retailer
c) DPEA d) Labelling procedure of ophthalmic preparation

5. a) Define the objective of the D&C Act. Discuss about the qualification of Licensing authority. **(5)**
b) Write the functions of DTAB. Discuss the nominated & elected members of DTAB. **(10)**

6. Write short notes on **(answer any three)** **(5x3)**

a) New Drug b) Customs Collector
c) Education regulations d) Restricted Licenses

7. a) Discuss the offences and punishments laid down on contravention of NDPS act ? **(8)**
b) Describe about the constitution and functions of State Pharmacy Council ? **(7)**

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ODISHA STATE BOARD OF PHARMACY 04/09/2023

D. Pharm Part - II **E. R. 1991** **2022 Special examination**

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QUESTION PAPER CONTAINING ANYTHING WOULD BE TREATED AS MAL-PRACTICE
ANSWER THE QUESTIONS SERIALLY AND CONTINUOUSLY

Subject: PHARMACOLOGY & TOXICOLOGY (Theory)

Full Mark -80 **Time -3 Hrs.**

(Answer any five questions including question No. 1)

1. **Define the following terms :** **(1x20)**

i) Pinocytosis	ii) Iontophoresis	iii) Detoxification
iv) Additive effect	v) Cummulation	vi) Blood dyscrasias
vii) Drug dependence	viii) Sedatives & Hypnotics	ix) Analeptics
x) Local anaesthetics	xi) Antibiotics	xii) Mydriasis
xiii) Mucolytic agents	xiv) Fibrinolytic agent	xv) Shock
xvi) Diuretics	xvii) Stomachics	xviii) Sequential pill
xix) Biological lag	xx) Cinchonism	

2. Define and classify antipsychotic drugs ? Discuss the pharmacological action, adverse effect and therapeutic uses of Chlorpromazine. **(2+4+4+3+2)**

3. Write short notes on **any three** **(5x3)**
   a) Antihelmintic drugs
   b) Antimalarial drugs
   c) Cotrimoxazole
   d) Antacids

4. a) Pharmacological action, uses and adverse reactions of Glyceryl trinitrate **(5)**
   b) Pharmacological action, uses and adverse reactions of Barbiturate **(5)**
   c) Pharmacological action, uses and adverse reactions of antihistaminics **(5)**

5. a) Classify drugs used in Angina Pectoris. Write down mode of action and adverse effect of Vasodilators. **(6)**
   b) Write short note on 5-Hydroxytryptamine **(5)**
   c) Define autacoids and explain triple response **(1+3)**

6. Define & classify opioid analgesics. Discuss the pharmacological action, uses and adverse effect of Morphine. **(2+3+5+2+3)**

7. Write short notes on **any three** **(5x3)**
   a) Methods of prolonging drug action
   b) Beta adrenergic blocking agents'
   c) Antitussive & Expectorants
   d) ACE inhibitors.

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ODISHA STATE BOARD OF PHARMACY 01/09/2023

D. Pharm Part - II **E. R. 1991** **2022 Special examination**

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QUESTION PAPER CONTAINING ANYTHING WOULD BE TREATED AS MAL-PRACTICE
ANSWER THE QUESTIONS SERIALLY AND CONTINUOUSLY

Subject: PHARMACEUTICAL CHEMISTRY-II (Theory)

Full Mark -80 **Time -3 Hrs.**

(Answer any five questions including question No. 1)

1. **(A) Write the Structure of the heterocyclic ring with numbering and give suitable example : (1x 10)**
i) Aziridine ii) Pyridine iii) Indole vi) Pyrolidine
v) Piperidine vi) Pyrazine vii) Tetrahydro furan viii)Pyrimidine
ix) Purine x) Pyrazole
(B) Write the chemical structure and use of following medicinal agents : **(2x5)**
i) Haloperidol ii) Metronidazole iii) Procaine
iv) Piperazine v) Phenformin

2. (A) Classify diuretics on chemical basis with suitable examples. **(4)**
(B) Write the physical and chemical properties, stability and storage and uses of Furosemide and Urea. **(4x2)**
(C) What are high ceiling diuretics ? Write the structure of one high ceiling diuretic. **(2+1)**

3. (A) Define tranquilizers ? Classify them with suitable examples. Write down uses of tranquilizers. **(2+4+2)**
(B) Write a brief account on different phenothiazine class of tranquilizers. **(7)**

4. (A) Define sympathomimetic and adrenolytic drugs. Write their uses. Classify adrenergic drugs chemically with examples. **(4+2+4)**
(B) Write the structure, chemical name, uses, pharmaceutical formulations and popular brand name of Isoprenaline. **(5)**

5. Define analeptics. Classify them. Write the structure, nomenclature, popular brand name, uses of (i) Theophylline (ii) Caffeine (iii) Coramine **(2+4+3+3+3)**

6. (A) Define analgesic, antipyretic & anti-inflammatory agent. **(3 x 2)**
(B) Write the structure, chemical name & uses of following drugs. **(3 x 3)**
i) Phenylbutazone ii) Paracetamol iii) Pethidine

7. What do you mean by Tuberculosis ? Classify Antitubercular drugs. **[2+3+1+ (3x3)]**
Why combination therapy is preferable for treatment of tuberculosis ? Write the structure Nomenclature, popular brand name & uses of the followings :
i) INH ii) PAS iii) Ethambutol

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ODISHA STATE BOARD OF PHARMACY 29/08/2023

D. Pharm Part - II **E. R. 1991** **2022 Special examination**

DO NOT WRITE ANYTHING ON YOUR QUESTION PAPER EXCEPT YOUR ROLL NO.
QUESTION PAPER CONTAINING ANYTHING WOULD BE TREATED AS MAL-PRACTICE
ANSWER THE QUESTIONS SERIALLY AND CONTINUOUSLY

Subject: PHARMACEUTICS - II (Theory)

Full Mark -80 **Time -3 Hrs.**

(Answer any five questions including question No. 1)

1. A) Define the following terms : **(1 x 15)**

i) Liquefaction	ii) Pyrogen	iii) Co-solvency	iv) Proof Spirit
v) Effervescence	vi) Zeta-potential	vii) Liniments	viii) Snuffs
xi) Synergism	x) Wafer capsule	xi) Linctus	xii) Tachyphylaxis
xiii) Emulsifying agent	xiv) Inscription	xv) Purgatives	

B) Translate the following into English **(1 x 5)**

i) mitte tales ii) auris laevus iii) dolore urgent
iv) jentaculum v) post cibo

2. What is Suppository, Classify different bases of suppository. Describe briefly each base. **(2+3+10)**

3. What are mixtures ? Classify different types of mixtures. Describe the methods of dispensing of mixture containing. **[2+3+(5x2)]**
   a) Indiffusible solids b) Precipitate forming liquids.

4. Write short notes on **any two** of the following **($7^1/_2$ x 2)**
   i) Evaluation of parenteral preparations.
   ii) Formulation of Eye drops
   iii) Various additives used in the preparation of shampoo.

5. (a) What do you mean by Incompatibility ? Describe different types of Incompatibility. Discuss regarding alkaloidal incompatibility and their methods of correction. **(2+1+8)**
   (b) Describe on Geometric dilution of powders. **(4)**

6. Define suspension. Explain different types of additives used in the formulation of suspension. Differentiate between flocculated and non-flocculated suspension. **(2+9+4)**

7. Differentiate between : **(5 x 3)**
   a) Ointment & Paste
   b) Simple powder and Compound powder
   c) Type-I glass & Type-II glass
   d) Cold cream & vanishing cream
   e) SVP & LVP

****

Model Answer

Subject Name: Hospital and Clinical Pharmacy (E.R.91)

Q1 A) **Define the following:**

i.Teratogenicity: It is defined as the abnormalities cause to the foetus by an exogenous agent when administered to the mother at any stage of pregnancy. Ex-Thalidomide

ii.Bioavalability: The point at which a chemical or medication is totally accessible to its designated biological destination(s)

iii.Hospital pharmacy: Hospital pharmacy is define as the health care service, which comprises the art, practice, and profession of choosing, preparing, storing, compounding, and dispensing medicines and medical devices, advising patients, doctors, nurses and other healthcare professionals on their safe, effective and efficient use.

iv.Drug Tolerance: It is define as drug insensitivity, is a reduced reaction or diminished response to a drug. This can occur when a drug is used repeatedly. The body gets adapted to its continual presence.

v.Patient Compliance: Pharmacy compliance is defined as the adherence to prescribers instructions by the patient.

B) Define the following abbreviations

I. ADME: Absorption, Distribution, Metabolism, and Excretion
II. BAL: British Anti Lewisite
III. BTCT: Bleeding Time and Clotting Time
IV. CHF: Congestive heart failure
V. CHD : Coronary heart disease
VI. CPR : Cardiopulmonary Resuscitation
VII. DIC : Drug information centre
VIII. ELISA : Enzyme-Linked Immunosorbent Assay
IX. FBS : Fasting blood sugar

X. GABA : Gamma-amino butyric acid

XI. ICU : Intensive care unit

XII. MRI : Magnetic resonance imaging

XIII. PTC : Pharmacy and therapeutic Committee

XIV. RBS : Random blood sugar

XV. SGPT : Serum Glutamic Pyruvic Transaminase

Q3.*Facilities for sterile manufacturing:-*

1. Clean areas should be clearly separated from rest rooms, and eating areas.

2. Sufficient space to allow for proper conduct of all manufacturing operations.

3. Areas should be designed to achieve efficient flow and control of materials, products, and personnel within the areas. The location of equipment in the areas should also be carefully planned to minimize crossing of personnel, products, and materials flows.

4. Material handling procedures or fixed depots should be efficient in preventing a mix-up between clean and dirty or sterilized and non-sterilized apparatuses and utensils.

5. Facilities should be designed to facilitate ease of cleaning, maintenance, and operations and periodically. Particular consideration should be given to seals and packing of interior materials such as doors, walls, ceilings in order to keep processing rooms tightly closed. Insulation materials to prevent dew drops should be maintained to work well.

6. Ceilings should be effectively sealed.

7. Installation of irregular surfaces and horizontal frames around windows and doors should be avoided to reduce collection of particulate matter and microorganisms and to avoid disturbance of airflow

8. Adequate space should be provided for gowning, storage of gowns, and disposal of used gowns and other materials.

9. Transparent windows or video cameras should be installed in the APA to facilitate observation and supervision from non-aseptic areas.

10. Layout of equipment in the APA should be designed to minimize environmental exposure of open containers or finished products and facilitate easy access of personnel to these items during processing or maintenance.

11. Equipment not essential for processing in the critical area should be installed in non-critical areas.

12. When parental and other sterile drug products are manufactured simultaneously in the same room, manufacturing equipment for preparation, filling, and sealing of drug products should be dedicated and should be closed system for those operation.

13. The working areas for preparation, filling, and sealing of sterile drug products and sterile API should be separated from the areas for processing non-sterile drug and non-sterile API.

14. Facilities should be structurally designed to be efficient in preventing or minimizing risks of cross contamination if used for processing highly pharmacologically active substances, pathogenic substances, highly toxic substances, radioactive substances, live viruses, or bacteria & easily cleanable and durable against cleaning agents and disinfectants.

15. Drains and sinks should be prohibited in the APA.

16. Clean areas should be supplied with air filtered through an appropriate filter, e.g. a high-efficiency particulate air (HEPA) filter, to maintain

17. Temperature and relative humidity in clean areas should be controlled within ranges.

18. Environmental temperature and relative humidity should be controlled within specified limits and, wherever feasible, monitored continuously.

19. Air pressure in clean areas should be maintained higher level.

Requirements:-

1. Personnel should wear an APA-specific gown and shoes before entering the processing areas for sterile pharmaceutical products. Basic garments include a sterilized or disinfected gown, shoes, overshoes, gloves, goggles, and mask.

2. It is a changing room located before the entrance of the APAs should be separated or partitioned from the de-gowning room to avoid cross-contamination, procedure should be displayed in the gowning room of the APA used for manufacturing sterile pharmaceutical products by a sequence of pictures to aid in understanding of gowning procedures and that a mirror be installed to facilitate checking of proper gowning.

3. Gowns and other stuff to be worn in the APA for sterile pharmaceutical products should be highly functional and suitable for working in the APA and free of generating or discharging particulate matter into the environment.

4. Personnel entering the APA should not expose any body surfaces to the environment while working in the APA.

5. Cleanliness of gowns and other staff should be managed by internal control standards, including frequency of change and sterilization methods and conditions, established and implemented to maintain the cleanliness as required.

6. Sterile gowns and other stuff worn in the APA should be changed each time entering the area, as a rule. If gowns and other stuff are permitted by the internal control standards to be reused without disinfection or sterilization, the validity of the reuse should be verified with experimental data. Even if the reuse is supported by data, gowns and other stuff worn for more than one day or worn during microbiological sampling should not be reused without disinfection.

7. Personnel should adhere to SOPs for the prevention of microbiological contamination of the APA.

8. Personnel should check to see if the gowns and other stuff fit properly and are not torn or defective. If a gown or gloves are found to be defective, necessary counteractions such as changing or layering of new garments over the defective ones should be immediately taken.

9. Personnel should refrain from speaking after gowning and should avoid direct contact with the wall, floor, or sanitized surfaces unless necessary.

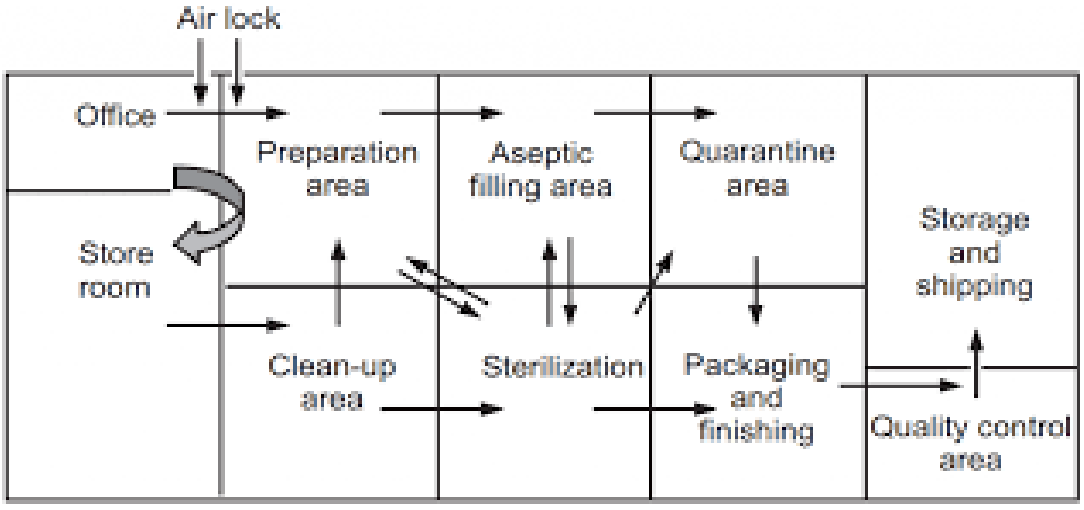
10. Applicable SOPs should include a provision that restricts unnecessary personnel movement, such as touching of materials and walls, while staying in the APA.

11. Personnel operating in indirect support areas should not be permitted to enter critical or direct support areas or rooms if they do not change gown and other stuff or are not adequately trained on proper gowning procedures.

12. The number of personnel operating in the APA should be set at a minimum for each shift of manufacturing operations, including the preparatory stage. Personnel handling sterile pharmaceutical products, containers, or closures and those engaging in operations

in an environment where sterile pharmaceutical products, containers, or closures are exposed should be identified and recorded.

2(b)



The sterile area can be divided into the following;

i.Clean up area:-

- ✓ It has walls & ceilings with film coatings
- ✓ Should have no holes or corners
- ✓ All incoming air should be passed through filters with an efficiency of 95%

ii.Preparation area or compounding area:-

- ✓ Formula is compounded
- ✓ Cabinets & counters are generally made up of stainless steel

iii.Aseptic area:-

- ✓ The ceilings, walls & floors must be sealed for easy wash
- ✓ The corners are made such a way that the dirt particles shouldn't deposited.

iv.Quarantine area::-

- ✓ Batches are stored physically segregated from one another

v.Finishing or packing area:-

- ✓ Packaging of finished products done

Q3) Hospital formulary is a method in which the PTC & medical staff of a hospital select and evaluate medical agents and their dosage form that are not use useful in patient care.

Principles of Hospital Formulary:

I. PTC is composed of physician and pharmacist which will prepare the hospital formulary system.

II. The policy and procedures shall afford guidance in the appraisal, selection, procurement, storage, distribution, use, safety procedures and other matter relating to drug in the hospital and shall be published in the hospital's formulary or other media available to the member of medical staff.

III. The medical staff in the governing body shall sponsor and outline the purpose, organization function and scope of the hospital formulary system it should adopt the principle as per the need of particular hospital.

IV. To ensure the maintenance of the responsibility and procreative of the physician in the exercise of his professional judgment.

V. The medical staff shall adopt the policy formula, and procedure for including drugs in the formulary by their non proprietary names even though proprietary names continue to being use in the hospital

VI. Physicians may be encouraged to prescribe drug under their non proprietary names, although nomenclature used in entirely a matter of individual practitioner's discretion.

VII. In the absence of written policies approved by the medical staff related to the operation, the hospital shall make it certain that the nursing personnel are informed in written though its system of news of communication that there exits the formulary system in the hospital and the procedure governing its operations.

VIII. In the formulation of policies and procedure the term substitute or substitution should be avoid since these term is used to imply the unauthorized dispensing of entire different drug ,neither of which takes place under a properly operated hospital formulary system.

IX. The medical staff should be informed about the changes in the working in the hospital formulary system or in the content of the hospital system

X. Provision shall be made for the appraisal of the member of the medical staff for the use of the drug not include in the formulary or the investigational drugs.

XI. The pharmacist with the advice and guidance of the PTC , shall ascertain the quantity and source of supply of all drugs, chemical, biological and pharmaceutical preparation used for diagnosis and treatment of patient.

XII. The labeling of drug and medicine container with non proprietary name of the content always should be proper. The use of proprietary name other than that describing the actual content is not correct and proper if it is used in a manner that can be taken as description of the content.

4.A) a) Peptic ulcer *:*

It is an "ulcer" is an open sore. The word "peptic" means that the cause of the problem is due to acid. It may be defined as acute or chronic disorder. The two most common types of peptic ulcer are called "gastric ulcers" and "duodenal ulcers".

- Gastric ulcers that occur on the inside of the stomach
- Duodenal ulcers that occur on the inside of the upper portion of your small intestine (duodenum)

Peptic ulcers result from either Helicobacter pylori and/or NSAID

PATHOPHYSIOLOGY

Helicobacter pylori: bacteria colonize in the stomach mucosa that induces an inflammatory response in the host that leads to an epithelial response, degeneration, and injury, known as gastritis. This damages the antral somatostatin release, which leads to an increase in gastric secretion, which stimulates increased acid production. Parietal cells of the more proximal gastric body still have full production capabilities preventing ulcer genesis in this area. A common bacterial virulence factor is the production of cagA, which leads to more cytokine cell destruction and mucosal damage.

NSAID medication: Patients who use these medications have more risk for developing gastric ulcers. The drugs are weak acids when exposed to gastric acid they remain in the epithelial cells and lead to increased cellular permeability, which leads to physical cellular injury. NSAID decrease prostaglandin synthesis which inhibits the cyclooxygenase-1 enzyme, which in turn leads to gastric bicarbonate secretion, mucus barrier formation, increased mucosal blood flow, and accelerated epithelial cell restitution and repair after injury or cell death

MANIFESTATION

- Burning stomach pain
- Feeling of fullness, bloating or belching
- Intolerance to fatty foods
- Heartburn
- Nausea
- severe signs or symptoms such as:
- Vomiting or vomiting blood which may appear red or black
- Dark blood in stools, or stools that are black or tarry
- Trouble breathing
- Feeling faint
- Nausea or vomiting
- Unexplained weight loss
- Appetite changes

4 b) Hepatitis:

Hepatitis is an inflammatory condition of the liver. It disturbs various metabolic processes such as bile production, excretion, and fat and protein metabolism, activation of enzymes and synthesis of proteins.

PATHOPHYSIOLOGY

Virus enter by ingestion and multiplies in intentional epithelium by homogeneous spread it reaches the liver.

Viruses enter the blood stream and spread to the liver. They infect the hepatocytes and multiply. They change the antigen structure on the virus site. The body begins to use self-mediated immune response attempting to damage the hepatocytes

Symptoms

- Asymptomatic
- Myalgia
- Fever
- Nausea and/or vomiting
- Anorexia

- Abdominal pain
- Fatigue
- Jaundice

Signs:-

- Right upper quadrant pain
- Hepatomegaly
- Jaundice
- Fever

Q5) An adverse drug reaction is a "response to a drug which is noxious and unintended and which occurs at doses normally used in man for prophylaxis, diagnosis, or therapy of disease or for the modification of physiologic function."

Types

- Dose-related (Augmented)
- Non-dose-related (Bizarre)
- Dose-related and time-related (Chronic)
- Time-related (Delayed)
- Withdrawal (End of use)
- Failure of therapy (Failure)

Classification of Adverse Drug Reactions:-

1. Excessive pharmacological effect
2. Secondary pharmacological effect
3. Idiosyncrasy
4. Allergic drug reactions
5. Genetically determined toxicity
6. Toxicity following drug withdrawal

PREDICTABLE ADVERSE DRUG REACTION

Drug Induced Hematologic Disorders

1. Aplastic anemia: The antibacterial drug chloramphenicol is the most common cause of Aplastic anemia. It causes bone marrow toxicity.
2. Agranulocytosis: It occurs due to destruction of granulocytic leucocytes by the antibodies and the responsible drugs are sulfonamides, penicillin etc.
3. Thrombocytopenia: It is the reduction in thrombocytes due to the bone marrow suppression and destruction of platelets by the drugs like chloramphenicol, sulfonamides etc.
4. Hemolytic anemia: It occurs due to genetic abnormality or acquired immunological abnormality and haemolysis. Drugs like methyldopa, levodopa are responsible for this.

DRUG INDUCED LIVER DISORDERS

Liver is the primary metabolic and excretion site for drugs. These drugs cause liver damage by directly damaging the hepatocytes or by hypersensitivity reaction. Hypersensitivity reactions are the allergic conditions causing rash, fever etc. These are two types i.e., hepatitis and cholestatic. Cholestatic reactions are due to chlorpromazine.

DRUG INDUCED GASTROINTESTINAL DISORDERS

1. Nausea and Vomiting: frequent to all oral administered drugs
2. Constipation: antihistamines

DRUG INDUCED RENAL DISORDERS

1. Acute renal failure: NSAIDs
2. Kidney stone: Sulphonamides

DRUG INDUCED PULMONARY DISORDERS

The most common drug induced pulmonary disorders of lungs are bronchoconstriction and asthma. β- adrenoreceptor agonists and antagonists cause acute asthma.

DRUG INDUCED SKIN DISORDERS

1. Alopecia- Bromides
2. Eczema- warfarin

DRUG INDUCED OCCULAR DISORDERS

1. Glaucoma: Atropine
2. Cataract: corticosteroids

DRUG INDUCED NEUROTOXICITY

This is the damage to the nervous system by drugs. It is of two types: Extra pyramidal reactions by reserpine, methyldopa etc. and Myasthenia reactions by antibiotics

DRUG INDUCED OTOTOXICITY

It is of two types: Vestibular toxicity due to streptomycin, tetracycline and cochlear toxicity due to salicylates.

Q6) The condition where drug substances affects the drug activity by either increase or decrease effect or produce a new effect that does not produce on its own is called drug interaction.

MECHANISM:

The 2 major mechanisms are:

Pharmacokinetic Interactions: In this Absorption, Distribution, Metabolism and Excretion of object drug are altered.

Pharmacodynamic Interaction: In these activities of the object drug are altered at the site of action by precipitant. It may be Direct or Indirect.

The three consequence of Direct Interaction are:

Antagonism: Ex. Acetylcholine and Nor-Adrenaline show opposing effect

Addition /Summation: Ex. CNS Depressants

Synergism/Potentiation: Ex. Alcohol enhance analgesic activity of aspirin

PHARMACOKINETIC INTERACTION:

In this Absorption, Distribution, Metabolism and Excretion of object drug are altered by precipitation which result in alter of plasma concentration of the drug. The reason for interaction may be due to

- **Gastrointestinal Absorption**: Chelation, Alter mobility by the drug, Increase Gastric PH enhances /reduces absorption of drug.

EX. Tetracycline absorption is reduced with antacids or milk due to chelation of calcium ions

- Aspirin & antacid:-Absorption of antacid ill decrease
- **Alteration of Distribution**: It occurs when two drug compete to bind at same site of plasma proteins which increase the concentration of unbound or free drug and enhance activity

e.g, Phenylbutazone increases the anti–coagulant activity of Warfarine by displacing it from plasma protein

- **Alteration of Metabolism**: when drug induce hepatic enzyme the t1/2 of drug is decreased and when they inhibit enzymes vice versa.

  e.g, Barbiturates increase the metabolism of microsomal enzyme in liver which increases metabolism of drug as a result the effect of drug is reduced

- Alteration of Excretion: Excretion of many drug depend on urine PH.

  e.g,. Amphetamine is excreted more in acidic urine

Q7. The In-patient is defined as those who were admitted, and spend at least one night in the hospital & sometimes more depending on their conditions like surgery, illness, childbirth, or traumatic injury etc.

TYPES OF DRUG DISTRIBUTION SYSTEMS:

There are four different systems in use for drug distribution in hospitals:

- Individual prescription order system
- Complete floor stock system
- Combination of individual prescription and floor stock system
- Unit dose system

- INDIVIDUAL PRESCRIPTION ORDER SYSTEM:

It is a type of drug distribution system wherein physician writes the prescription for individual patient who obtains the drugs prescribed from any medical store or hospital dispensary by paying own charges. This system is generally used by the small and/or private hospitals because of the reduced man power requirements and desirability for individualized service.

Advantages:

All medication orders are directly reviewed by pharmacist.

It provides the interaction of pharmacist, doctor, nurse & the patient. It provides clear inventory control.

Disadvantages: Wrong errors, illegible writings of the physicians, Physician may write high economic drugs in the prescription or cost effective drugs.

- FLOOR STOCK SYSTEM: Drugs are given to the patient from the nursing station & the pharmacy supplies from the drug store.

  The way of floor-stock distribution includes 2 types such as

  1) Charged floor-stock system

  2) Noncharged floor-stock system

  - Charged floor stock system: In this method medicines which are stocked in the nursing stations all the times & charged to the patients account after administered to them. The patient is charged for every single dose administered to him. Once the floor-stock list is prepared it is the responsibility of the hospital pharmacist to make the drugs available.
  - Noncharged floor-stock system: This system includes the medicaments placed in the nursing station that are used by all the patients on the floor. There shall be no direct charge from the patients account.

COMBINATION OF INDIVIDUAL PRESCRIPTION AND FLOOR STOCK SYSTEM:

Falling into this category are those hospitals which use the prescription order system as their primary means of dispensing and also utilize a limit floor stock. This system is followed by all government hospitals and also private hospitals those run on the basis of no -profit and no loss. This combination system is most commonly used in hospitals today.

- Selection of charge floor stock drugs: The drugs should be placed under the category of 'charge' drugs depending on pharmacy and therapeutic committee (PTC).The committee will concerned with the availability of therapeutically effective drugs and their immediate use for diagnosis or symptomatic treatment.

- Selection of Non-charge floor stock drugs: A list of non-charge floor stock is prepared on the basis of following criteria:
    - The cost of preparation
    - The frequency of use
    - The quantity use
    - The hospital budget
    - UNIT DOSE SYSTEM:

Unit dose dispensing: - are defined as those medications which are ordered, packaged, handled and administered and charged in the multiples of single dose units containing a predetermined amount of drug or supply sufficient for one regular dose, application or use. The pharmacist is held responsible for unit dose dispensing system.

Example: Single dose disposable syringes of medications and single unit foil or cellophane wrapped capsules and tablets.

Advantage of unit dose dispensing:

- Better financial control.
- It prevents the loss of partially used medications.
- It does not require storage facilities at the nursing station.

It eliminates labeling errors

- There is a accurate medication charge
- Two methods of dispensing unit doses are:

a. Centralized unit-dose dose dispensing (CUDD):
   All in-patient drugs are dispensed in unit doses and all the drugs are stored in central area of the pharmacy and dispensed at the time the dose is due to be given to the patient.
   Drugs are transferred from the pharmacy to the indoor patient by medication cards.
b. Decentralized unit dose dispensing (DUDD): This operates through small satellite pharmacies located on each floor of the hospital. Patient profile card containing full date, disease, and diagnosis is prepared. Prescription is sent directly to the pharmacist who then entered in the patient profile card. Pharmacist checks medication order. Patient profile card and prescription order is filled by pharmacy technicians. The nurses administer the drugs and make the entry in their records
   - Advantages:

- Easy for the administration staff.
- Accounting becomes easier in certain cases.
- Better stability of the products.

- Disadvantages:
  - High cost.
  - Consumes more time and doubtful.
  - Occupy more space for storing.
  - Ledger posting and inventory control problem

ODISHA STATE BOARD OF PHARMACY

E.R. 1991

D.PHARM PART- II

Subject: DRUG STORE AND BUSINESS MANAGEMENT

(SPECIAL EXAMINATION)

MODEL ANSWER PAPER

1. a) **Define the following terms (10x1)**
   - i. **Scrap**- Residual materials after expiry of life / main use or left over materials as waste in the process of completion of recommended operation cycle due to wear and tear.
   - ii. **Overdraft**- The additional amount of money allowed by the bank to overdraw which more than available amount in the customer's current account.
   - iii. **Capital**- The capital of a business is the money it has available to pay for its day-to-day operations and to fund its future growth.
   - iv. **Petty cashbook**- A petty cash book is maintained to record small expenses such as postage, stationery, and telegrams. A separate column is used for each type of expenditure.
   - v. **Ware house**- Warehousing removes hindrance of time in trade by storing the goods which may be supplied to the consumers as and when required.
   - vi. **Revenue**- it is the financial gain through sales or services rendered, A business's revenue is its gross income before subtracting any expenses.
   - vii. **Bank**- Bank definition goes to a financial institution authorized to accept deposits and provide credits. These institutions may also give economic assistance such as: capital management. foreign exchange. Safe deposit boxes are commonly known as locker services.
   - viii. **Insurance**- Insurance removes the hindrance of risks. Any business activity entails various types of risks. Eg: fire, accidents, theft.
   - ix. **Free Samples**- It is a usually small and packaged portion of merchandise distributed free especially as an introduction to potential customers.
   - x. **Window Display**- Window display acts as a silent salesman for promoting sales. It attracts the customers or passersby; it makes a drug store decorative & attractive by showing the sessional products as well as the new products of store.

   b) **Write the difference between the following questions**. (2x5)

i. **LIFO**- Last in first out. The products procured last will be dispensed first. It allows companies operating in an inflationary situation to reflect costs more accurately and gain profit

FIFO- First in first out. The products procured first will be dispensed first. It is an easier method to follow, and it reduces the risk of expiry.

ii. **Journa**l- It is the book of original entry where the transactions are recorded in systematic manner. The process of recording entries in the journal is called 'Journalising'.

Ledger- It is the book of secondary entry. The process of recording entries in the ledger is called 'Posting'. From the ledger, the trial balance is drawn and then financial statements are prepared from it.

iii. **Cash discount**- A cash discount which is also called a purchase discount or sales discount is a decrease in the purchase price of goods due to early payment of cash o. In other words, the seller of goods is agreeing to decrease the price of the goods if the buyer agrees to pay for the goods earlier than the due date. These discounts have to be shown in ledger as the invoice will be prepared on the market price.

Trade discount- Trade discount refers to the decrease in list price in the name of discount, allowed by a supplier to the consumer while selling the product usually in greater quantities his discount is usually allowed by the sellers to attract more customers and receive the order in bulk, which is to increase the number of sales. Also, no record is to be maintained in the books of accounts of both the buyer and seller.

iv. **Fixed capital**- Fixed capital consists of tangible and durable assets that are necessary for production and are used for a long time. Fixed capital includes items such as machinery, vehicles, and equipment, as well as plants, buildings, and other structures. Fixed capital is generally illiquid since it cannot be quickly converted to cash

Working capital- Working capital is the money needed to run a business on a daily basis. Working capital is made up of short-term assets and liabilities, may be converted into cash quickly.

v. **Advertisement**- Advertising is a technique of driving public attention towards a product or service, through paid network. Its objective is to Build brand image and boosting sales. It is a Long term Promotional strategy.

Sales promotion- Sales Promotion refers to the set of activities that communicate the merits of a product, service or brand to persuade target customers to buy it. It is one of the four elements of the marketing mix. It is a way of attracting, inducing and creating awareness among the people to initiate the purchase.

2. Write short notes on **any three** of the following questions. (3x5)

a) Balance sheet

- The balance sheet, also called the **statement of financial position**, is the expanded expression of the accounting equation. Remember that the basic accounting equation states that assets equal the sum of liabilities and owners' equity. Liabilities and owners' equity are the sources from which the firm has obtained its funds. The listing of assets shows the way that the firm's managers have put those funds to work.

Assets = Liabilities + Owners' Equity

Grouping of Assets and Liabilities:

All assets and liabilities of a business enterprise can be shown either in an order of

(a) Liquidity or (b) Permanence.

(a) Order of Liquidity or According to Time: In case of order of liquidity, an enterprise first shows the asset which is more readily convertible into cash followed by the asset which cannot be so easily converted into cash as compared to the previous one. In the same manner, the liabilities which can be paid immediately are shown first and the liabilities which are to be paid later are mentioned after that. In short, the principles which are followed to arrange the items are from liquidity to rigidity.

(b) Order of Permanence or According to Purpose: In case of order of permanence, an enterprise first records those items of assets which are more permanent and thereafter less permanent items on the assets side of the balance sheet. In the same manner, long term liabilities are mentioned first, thereafter medium term liabilities and after that short term liabilities are to be recorded on the liabilities side of the balance sheet.

b) **Internal trade**

- **TRADE**

  Trade means buying, selling and exchange of goods or services for money or money's worth.Trade may be described as the nucleus of commercial activity. Dealers or distributors for the distribution of goods from the production unit to the consumers at far off places are known as traders.

  Internal/ Domestic trade

  It is also known as home trade and consists of sale and exchange of goods within the boundaries of a country. Internal trade may be local trade, state trade or interstate trade. Internal trade is further classified into:

  Wholesale trade: wholesalers buy the goods in large quantities directly from the manufacturers and sell them in smaller quantities to retailers who are in direct contact with the consumers

  Retail trade: When the goods are distributed in small quantities to the consumers it is known as retail trade.

c) Levels of management

- The word "management" denote the process of conducting and managing various business activities. Management is principally a task of planning,

coordinating, motivating and controlling the efforts of others towards a specific objective.

Level of management

i. Top level management
ii. Middle level management
iii. Lower level management

i. Top level management

It consists of the board of directors and managing director. Top management is the ultimate source of authority which frame the policies for the enterprise. They are mostly involved in activities like laying down the overall objectives and broad policies of the enterprise, organizing the business into various department and divisions, appointing department manager, issuing guidelines for head of the department, making plan for the long term stability of the business.

ii. **Middle level management**

It generally consists of head of the department. In small enterprises, there is one layer of middle management but in big enterprises, there may be senior middle level managers and junior middle level managers.

iii. **Lower level management**

The level includes supervisors, foremen, superintendents, sale officers, accounts officers etc.They issue orders and instruct and guide day to day activities. Evaluate operating performance. Maintain close personal contact with workers to ensure discipline and team work. Functions of management are Planning, Organizing, Staffing, Directing, Controlling, and Coordinating.

d) Functions and objectives of Inventory Control

- Inventory means all the raw materials, spare parts, tools, fuels, lubricants, semi processed material and finished goods recorded in the book of organisation at any given point of time. For smooth working of organisation a sound inventory should be maintained which will neither be excessive nor inadequate.

Functions of Inventory Control

- To supply drug in time.
- To reduce investment in inventories and made effective use of capital investment.
- Efforts are made to procure goods at minimum price without bargaining the quality.
- To avoid stock out and shortage.
- Wastage are avoided

Objectives of inventory control

- Maximum customer service- High level of inventory ensures good customer service & production schedule are kept flexible to meet the changing demands.
- Minimum inventory investment- The inventory blocks the capital ,they generate storage cost, or become obsolete on storage.
- Low cost plant operation- The overall plant costs are kept low by stable production which is possible by having sufficient inventories.

e) Manufacturing Industries

- Engaged in production of goods wherein the raw materials or semi manufactured goods are converted into finished products.
  E.g. Pharmaceutical industry
- Manufacturing industries are further subdivided into :

1. **Based on functions**

i. **Analytical industries-** engaged in manufacturing of products by analyzing and separating different elements from the same material. For example, fractional distillation of crude oil refinery industries.

ii. **Synthetic industries-** Where two or more than two materials are mixed together in a manufacturing process to make a new product. Products like various chemicals, drugs, soaps, cosmetics, fertilizers are produced by synthetic industries

iii. **Processing industries-** Raw materials are processed through different stages of production to produce final product. For example drugs, pharmaceutical industries, paper, sugar industries etc.

iv. **Assembling industries-** Where the parts or components are assembled to make a useful product. For example production of cars, scooters, television, computers

2. **Based on size and investment**

i. **Light industries-** These industries involve a small capital investment and have a short duration production cycle. E.g. Industries involved in the production of collapsible tubes, rubber tubes, tin containers etc.

ii. **Heavy industries-**These industries need a big capital investment and also involve a longer production cycle. E.g. Iron and Steel industries.

3. **Based on capital employed**:

i. **Large scale industries-** Involves higher capital, large number of workers, machinery and tools.

ii. **Small scale industries-** Capital involved is not more than 10 lakhs in plant and machinery.

3. a) **Define & discuss the salient features of partnership business**. (2+8)

Partnership business

- A partnership is a form of business organisation in which two or more persons upto a maximum of twenty join together to undertake some form of business activity. The Indian Partnership Act, I932 defined partnership as "the relation between persons who have agreed to share the profits of business carried on by all or any of them acting Tor all".

Salient features of partnership business

- **Plurality of persons**: To form a partnership firm, there should-be at least two persons.The maximum limit on the number of persons is ten for banking business and twenty for other types of business.
- **Contractual relationship:** Partnership is created by an agreement between persons called 'partners'. In other words, a person can become a partner only on thc basis of a contract. This contract could be oral, written or implied.
- **Profit sharing:** There must be an agreement along the partners to share the profits and losses of the business of the partnership firm. This is onc of the

basic elements of partnership. If two or more persons jointly own some property and share its income, it is not regarded as partnership.

- **Existence of business:** The purpose of the agreement among the partners is to do some lawful business and share profits. If the purpose is something other than business, it should not be treated as partnership. For example, if the purpose is to carry some charitable work, it will not be treated as partnership.
- **Principal-agent relationship:** The business of the firm may be carried on by all or one or more partners acting for all the partners. Every partner is entitled to take part in the operations of the firm. In dealing with other parties, each partner is entitled to represent the firm and other partners in respect of the business of the firm. All partners are bound by his acts done in the ordinary course of business and in firm's name. In this sense a partner is agent of the firm and the other partners.
- **Unlimited liability:** In respect of business debts, each partner has unlimited liability. This means that if the assets of the firms are not sufficient to meet the colligations of the firm, the partners have to pay from their private assets. The creditors can even realise the whole of their dues from one of the partners. Thus, all the partners are jointly and severally liable for all business debts and obligations.
- **Good faith and honesty: A** partnership agreement rests on good faith among the partners. The partners must be honest to each other and trust each other. They must disclose every information about the business and present true accounts to one another.
- **Restriction on transfer of share:** A partner cannot transfer his share to an outsider without the consent of all the other partners.

b) Explain the partnership business basing on liability of partner. (5)

- **Active or working partner:** He takes an active part in the management of the firm's business and bears an unlimited liability for the debts of the firm. Like other partners, an active partner also contributor's capital to the firm.
- **Sleeping and inactive partner:** A sleeping partner does not take any active part in the management of the firm's business. He, however, contributes capital and shares the profits/losses of the firm. His liability for the debts of the firm is unlimited.
- **Nominal partner**: He only lends his name to the firm as a partner. He however, neither invests any capital, nor claims any share in the profits of the business. His liability for the firm's debt is unlimited.
- **Partner in profit only**: He invests his capital only with a view to earn a share in profits of the firm and has no liability as regards to any losses suffered by the firm. His liability for the firm's debt is, however unlimited.
- **Secret partner**: A partner who does not want the fact of he is being a partner to be known to outsiders, is known as a secret partner. However, his liability for the firm's debts is unlimited.
- **Minor partner**: A partner below the age of 18 being a minor, does not enjoy the rights of a full-fledged partner in a partnership firm since, in law, he is not competent to contract.

4. a) Define finance and its planning. (3)

- **Finance:** It can be defined as the "PROVISION" of money at any time when the business requires it. The purpose of financial planning is to ensure that

adequate funds are available to the business firm for its proper utilisation and administration

- **Planning:**
  - Estimating the amount of capital to be raised for smooth running of business.
  - Determining the form and the proportionate amount of funds to be raised.
  - Laying down effective policies for proper administration of financial plans.
  - Controlling and handling the activities of financial collection and repayment.

b) Discuss about various sources of finance. (12)

SOURCE OF FINACE:

- **Basically, there are two methods of raising capital for any business**
  i. **Owned Capital:** Owned Capital refers to the Capital collected by issuing various types of shares. It is ownership or owned capital. It is the permanent capital, as the company is not under obligation to repay the amount during its lifetime. It is mentioned in capital clause of memorandum of Association. Return on capital is paid in the form of dividend. It is not a liability for a company.
  ii. **Loan Capital:** Borrowed capital refer to the capital collected by issuing debentures, bonds, taking loans from banks Etc. It is debt or Loaned capital. it is necessary temporary capital as it is to be repaid after fixed period of time. It is not mentioned in Memorandum of Association. Return of capital is paid in the form of interest. It is a liability for a company.
- **The sources of finance can be classified into three parts on the basis of duration for which it is required by the business**
  i. **Long term finance**
    - It remains invested in the business for a period between 3 to 10.
      I. **Equity shares**: It represents the ownership capital of a firm. A public limited company may raise funds from public or promoters as equity share capital by issuing ordinary equity shares. Ordinary shareholders are those the owners of which receive their dividend and return of capital after the payment to preference shareholders. They undertake the risk of the company. They elect directors and have total control over the management of the company. These shareholders are paid dividends only when there are distributable profits. As equity shares are paid only on liquidation.
      II. **Preference shares:** Preference shares are those shares which get preference over the equity shares in the matter of

distribution of dividend as well as distribution of assets in case of company winding up of company.

III. **Debenture:** It may be defined as a document issued under the seal of the company in token of acknowledgment of debt due to the company.

IV. **Ploughing back of profits:** It is a policy of certain management that they do not distribute whole of the profit to its shareholders but retain certain amount of profit to be utilised for modernisation and expansion programmes and for meeting the fixed or working needs of the company.

V. **Financial institutions:** There are various financial institutions which have been setup by the centre and state government to provide long term and medium term finance to industrial concerns.

Ex- Industrial financial corporation of India (IFCI), Industrial development bank of India (IDBI), Industrial credit and Investment Corporation of India (ICICI).

ii. **Medium term finance**

- It remains invested in the business for a period between 3 to 10. This finance is generally used to complement expansion, extension or modernisation programmes of a business. It may be raised through preferences shares, debentures, and term loans from banks, financial institutions and public deposits.

I. **Public deposits:** The undertaking which intends to raise public deposits approaches the public through advertisements highlights the achievements of the company and its future plans and invites investors to deposit their savings.

II. **Mortgages:** It is a secured loan borrowed from bank, insurance company or any other similar agencies. The loan is sanctioned against mortgage or any other pledge of the property of the company. The same is returned back on payment of loan within the agreed time.

iii. **Short term finance**

- It is raised for a period of less than two years. The short term finance is used to meet seasonal or current expenditure, such as purchase of raw material, payments of wages and other recurring deposits.

I. **Trade credit:** It is the credit extended by the accounts payables. We would classify this credit into 2 types, free trade credit and paid trade credit. After a particular no. of days as per payment terms, the supplier charges interest on the delay of payment. So, the period before this is free trade credit and after that is paid trade credit. It depends upon the credit worthiness of the buyer, discipline maintained in payment commitments,

the bulk of the business, etc. Higher you rate on these factors; higher would be the free trade credit available to your business.

II. **Bank credit:** It is the total amount of credit available to a business or individual from a banking institution. It consists of the total amount of combined funds that financial institutions provide to an individual or business. A business or individual's bank credit depends on the borrower's ability to repay the loan and the total amount of credit available in the banking institution.

III. **Instalment credit:** It is a loan for a fixed amount of money. The borrower agrees to make a set number of monthly payments at a specific dollar amount. An instalment credit loan can have a repayment period lasting from months to years until the loan is paid off.

IV. **Customer advances:** Sometimes a firm meets its short term financial requirements through customer's advances. Such advances represent a part of the price and carry no interest. The period of such credit will depend upon the time taken to deliver goods.

5) Write short notes on **any two** of the following questions. (7.5x2)

a) **<u>EOQ</u>**

- It is Economic Order Quantity. This technique is used to find out how much of the inventory is to be ordered. The correct quantity to buy is the quantity at which the ordering cost and the inventory carrying cost will be minimum. EOQ method is beneficial to contain the right amount of products and save the ordering cost. With this method, companies determine the right number of products that should be in stocks depending on demands. If there is a product in high demand, companies order the same product when it reaches the minimum level in the stock. Thus, they can have control over time management and demand. The correct quantities are to be ordered is determined by the factors like ordering cost and inventory carrying cost.
- **Methods for Determination of EOQ**:
  i. **Tabular determination of EOQ**: A tabular arrangement of data relating to items of materials helps in the determination of an approximate EOQ. This arrangement may help the company to find out the orders that need to be placed weekly, monthly or yearly
  ii. **Graphic presentation of EOQ**: This graph is plotted between order quantity and cost to order and carry, The ideal point where the sum of both the costs is minimum, the point A is EOQ.

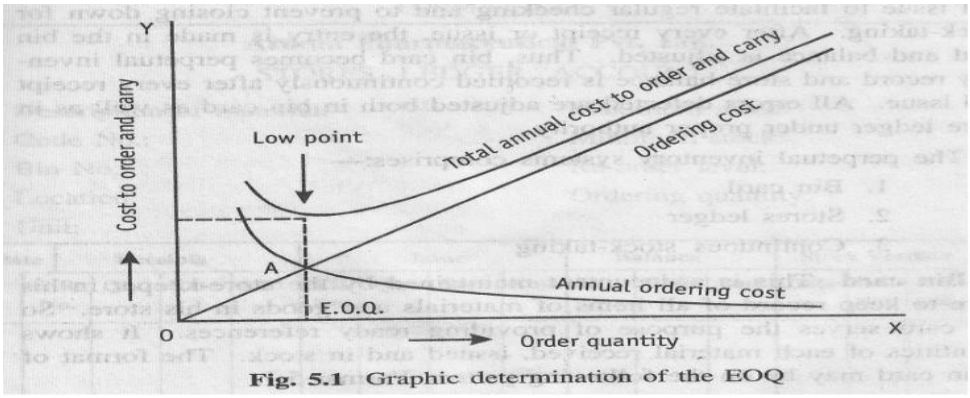


Fig. 5.1 Graphic determination of the EOQ

iii. **Determination of EOQ by algebraic formula**:

$$EOQ = \sqrt{\frac{2ab}{cs}}$$

Where,

a=Annual consumption

b=Buying cost per order

c=Cost per unit of material

s=Storage & other inventory carrying cost

b) <u>Trial Balance</u>

- A trial balance is bookkeeping or accounting report that lists the balances in each of an organization's general ledger accounts. (Often the accounts with zero balances will not be listed.) The debit balance amounts are listed in a column with the heading "Debit balances" and the credit balance amounts are listed in another column with the heading "Credit balances." The total of each of these two columns should be identical.

  Objectives:

  - It ensures that the posting from the ledgers is done correctly. If there are any arithmetic errors in the accounting then this will get reflected in the trial balance. And we can determine this when the total of the debit column and the credit column do not match.
  - It will also detect clerical errors, like a fault in posting, mixing up of figures, etc.
  - Trial balance will also help in the preparation of the final accounts. The balances for the financial statements are taken from the trial balance.
  - And the trial balance will also serve as a useful summary of all accounting records. It is a summary of all the ledger accounts of a firm. We will only refer to the individual ledger accounts if any details are needed. Otherwise, we rely on the trial balance.

  Limitations:

  - The trial balance is an important account for bookkeepers. But there are some limitations of a trial balance as well. One main limitation is

that it does not point out all types of errors. This means that even if we have a fully balanced trial balance it will not assure 100% accuracy of the accounts. There are many types of errors a trial balance does not draw attention too.

- A transaction that is completely missing was not even journalized.
- When the wrong amount was written in both the accounts.
- If a posting was done in the wrong account but in the right amount.
- An entry that was never posted in the ledger altogether.
- Double posting of entry by mistake.

Methods of Preparation:

i. **Total or Gross Trial Balance**: Under this method, the total amounts on the debit side of the ledger accounts and the total amounts on the credit side of the ledger accounts are ascertained and recorded in the trial balance. This method is not commonly used as it cannot help in the preparation of financial statements.

ii. **Balance or Net Trial Balance**: In this method, the balance of every ledger account either debit or credit, as the case may be, is recorded in the trial balance against the respective accounts. The balance method is widely used, as it helps in the preparation of financial statements.

iii. **Total and Balance method**: This method is a combination of both total method and balance method. Under this method, four columns are provided, namely, totals of debit side of the ledger accounts, totals of the credit side of the ledger accounts debit balances of ledger accounts and credit balances of the ledger accounts. This method is not in practice.

c) Joint Stock Company

- A joint stock company is a voluntary association of people who contribute money to carry on business. The company is formed by registration under Company Act 1956. The registration of the company is compulsory.
- Management and ownership is completely separate
- The liability of shareholders is limited.
- The public limited company can be formed by a minimum of seven persons (private company minimum of 2 members maximum of 50 members.
- The shares of it can be transferable.
- The resources of it are unlimited.
- The company is managed by board of directors.
- The audit of its account is compulsory.
- There are number of restrictions imposed by the

Advantages:

- Limited liability of the shareholders/promoter
- Can easily raise capital
- Have unlimited life

- Ease of transfer of ownership

Disadvantages

- Formation is not easy
- Excessive Government Regulation
- Subject to Corporate Tax and Dividend Tax (Double Taxation)
- Delay in Policy Decisions
- Control by a Group

Types

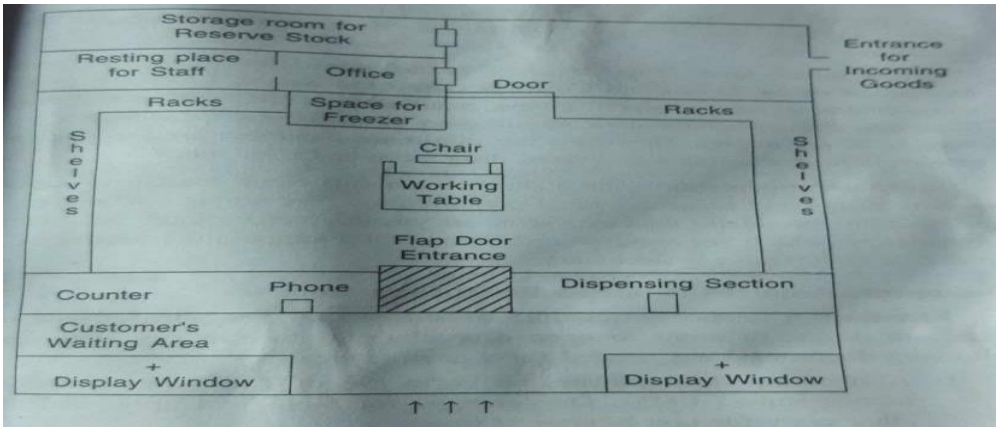
i. **Private company**:
   - Closely held by a few people.
   - Minimum 2 and maximum 50 shareholders
   - Stocks cannot be traded on exchanges and private equity cannot be raised Less regulations as compared to Public Companies

ii. Public company:
   - Stocks are held by a large number of people
   - Minimum 7 shareholders and no limit for maximum
   - Can be listed on stock exchange and can go public

d) **<u>Layout of a Pharmacy</u>**

Objectives of the layout design

I. To attract large no. of customers.
II. To increase the sale of the store.
III. To reduce selling expense to minimum.
IV. To give professional image to the store.
V. To minimize movement of the customers within the premises.
VI. To keep watch on the customers to reduce theft or pilferage.
VII. To have space for the reserve stock, office and resting space for the employees.
VIII. To have proper entrance for the incoming goods.
IX. To provide customer satisfaction.
X. To have best utilization of available space.
XI. To provide protection to medicines from any type of damage and to maintain their potency.



6. a) What do you mean by sales promotion and what are its objectives? (4+6)

Sales Promotion

- Sales promotion is any activity designed to increase sales. It includes the marketing activities other than personal selling, advertising & publicity that stimulates the customer to purchase the products such as window display, shows, demonstration etc. It is an attempt to provide added value or incentive to consumers, wholesalers, retailers or other organisational costumer to stimulate sales.

Objectives

- To increase the buying response at the customer level.
- To introduce new products and services.
- To remove customer dissatisfactions.
- To meet the competitions with other firms.
- To create brand image.
- To capture major share of sales in market.
- To attract new customers.
- To make people aware about new products and its advantage.

b) **Discuss various techniques used for sales promotion. (5)**

Techniques of sales promotion

I. **Free samples**: The M.R. gives free samples to the doctor. This method is useful for new products. It is expensive method.

II. **Trading stamp**: The stamps are issued in proportion to the purchase. The customers collect the stamps & exchange it for free product.

III. **Coupons**: Coupons entitles the holder to save certain amt on purchase of specific product. The coupons may be sent via post, magazine, newspaper or retailers. The retailers give discount to the customers. The firm reimburses the retailers for the same.

IV. **Premium or bonus offers**: In this the firm gives certain quantity of the product free of cost on purchase of a specified quantity of the product. They may be of three types with pack premium, reusable containers, free

in the mail premium. prize contest The contests are held where the best entry gets the first prize.

V. **Fair & exhibitions**: These can be organised in local, village, state, national or international levels, to introduce and demonstrate new products in market as well as to reach more people by means of advertising the company name and its products.

VI. Exchange scheme: It offers to exchange the old ones with new at a price lesser than the original market value.

7. a) Write rules of debit and credit basing on class of accounts. (3)

Classification of Accounts in Accounting

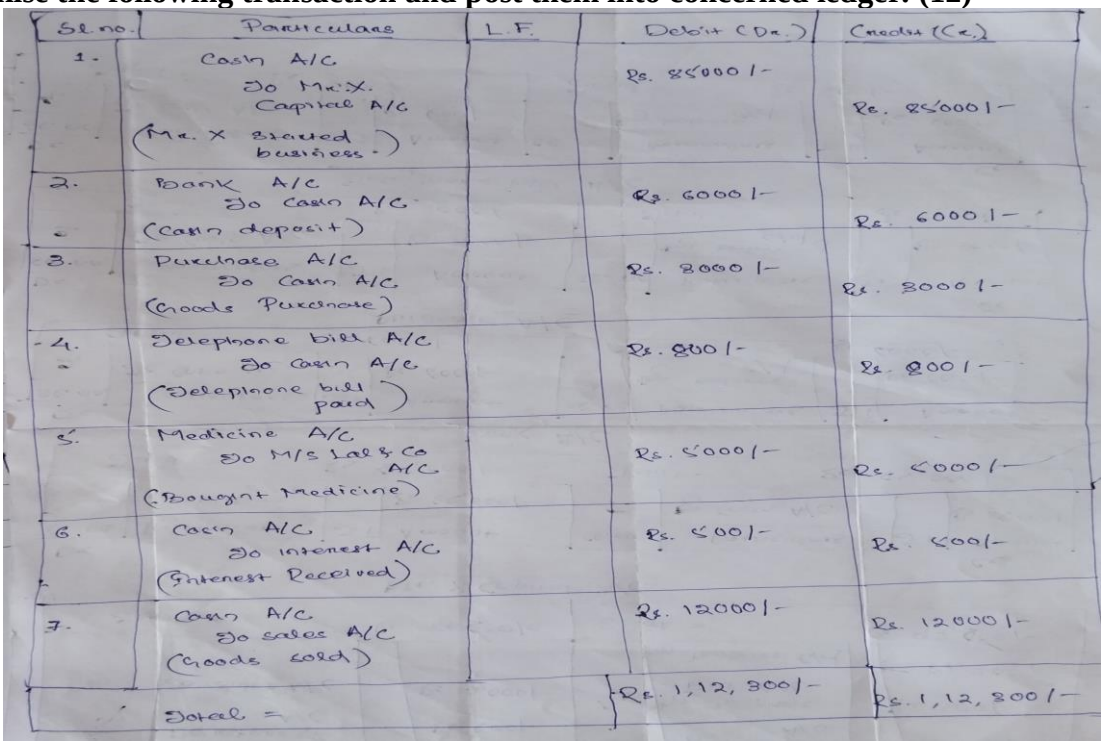
- Accounts are divided into 3 categories

I. **Personal account**: These accounts types are related to persons. These persons may be natural persons like Raj's account, Rajesh's account, Ramesh's account, Suresh's account, etc. These persons can also be artificial persons like partnership firms, companies, bodies corporate, an association of persons, etc.
Rule: Debit the receiver & Credit the Giver.

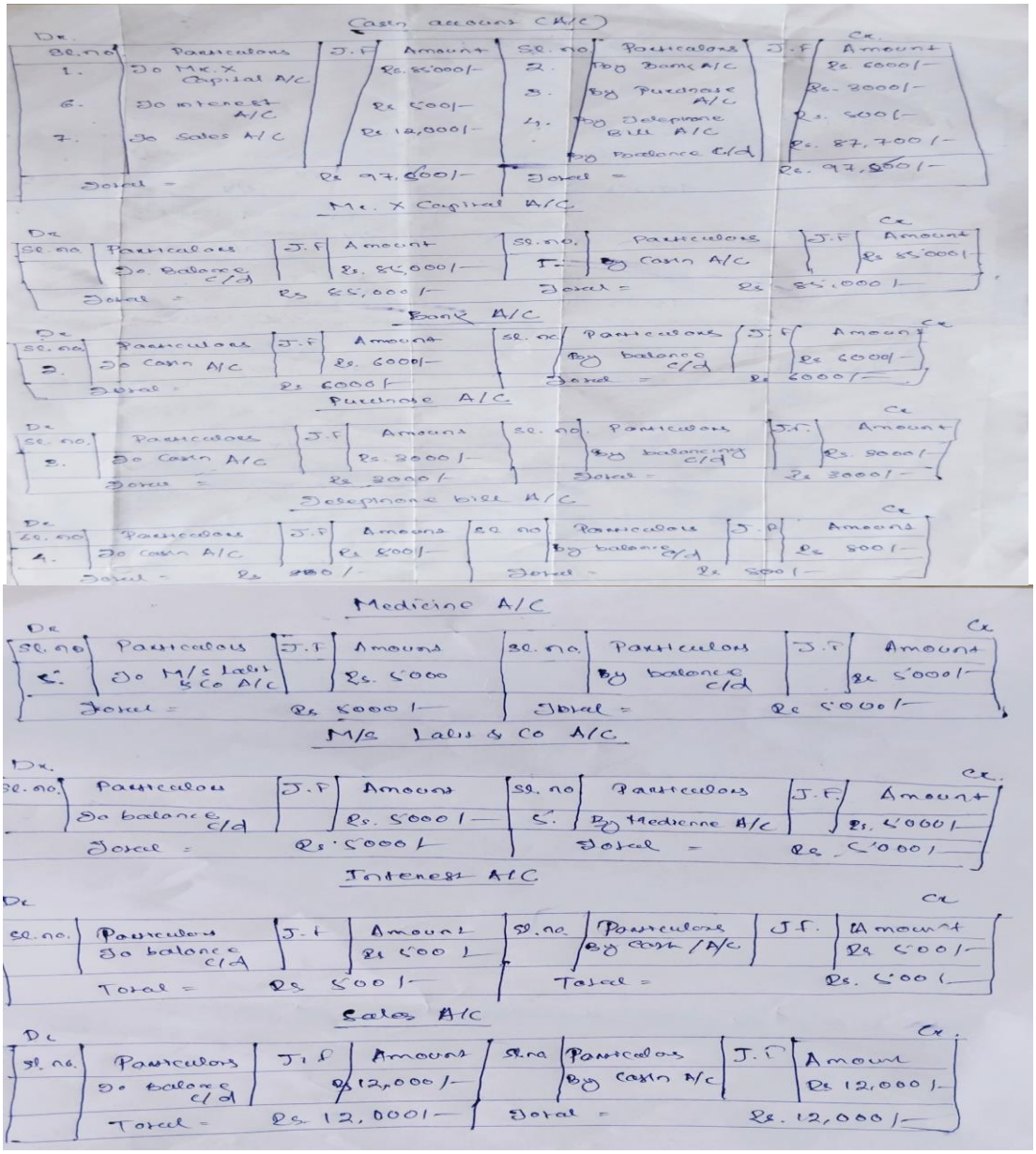
II. **Real account**: These account types are related to assets or properties. These include assets that have a physical existence and can be touched. For example – Building A/c, cash A/c, stationery A/c, inventory A/c, etc.
Rule: Debit what comes into the business & Credit what goes out of business.

III. **Nominal account**: These accounts types are related to income or gains and expenses or losses. For example: – Rent A/c, commission received A/c, salary A/c, wages A/c, conveyance A/c, etc.
Rule: Debit all the expenses and losses of the business & Credit the incomes and gains of business.

b) Journalise the following transaction and post them into concerned ledger. (12)



Sl no.	Particulars	L.F.	Debit (Dr.)	Credit (Cr.)
1.	Cash A/c To Mr. X. Capital A/c (Mr. X started business.)		Rs. 85000/-	Rs. 85000/-
2.	Bank A/c To Cash A/c (Cash deposit)		Rs. 6000/-	Rs. 6000/-
3.	Purchase A/c To Cash A/c (Goods Purchase)		Rs. 3000/-	Rs. 3000/-
4.	Telephone bill A/c To Cash A/c (Telephone bill paid)		Rs. 800/-	Rs. 800/-
5.	Medicine A/c To M/s Lal & Co A/c (Bought Medicine)		Rs. 5000/-	Rs. 5000/-
6.	Cash A/c To Interest A/c (Interest Received)		Rs. 500/-	Rs. 500/-
7.	Cash A/c To sales A/c (Goods sold)		Rs. 12000/-	Rs. 12000/-
	Total =		Rs. 1,12,300/-	Rs. 1,12,300/-



Cash account (A/c)

Dr. Sl.no	Particulars	J.F	Amount	Sl. no	Particulars	J.F	Cr. Amount
1.	To Mr. X Capital A/c		Rs. 55000/-	2.	By Bank A/c		Rs 60001-
6.	To Interest A/c		Rs 500/-	3.	By Purchase A/c		Rs. 20001-
7.	To Sales A/c		Rs 12,0001-	4.	By Telephone Bill A/c		Rs. 5001-
					By Balance c/d		Rs. 87,700/-
	Total =		Rs 97,5001-		Total =		Rs. 97,5001-

Mr. X Capital A/C

Dr Sl. no	Particulars	J.F	Amount	Sl. no.	Particulars	J.F	Cr Amount
	To Balance c/d		Rs. 55,0001-	1.	By Cash A/C		Rs 55,0001
	Total =		Rs 55,0001-		Total =		Rs 55,0001-

Bank A/C

Dr Sl. no	Particulars	J.F	Amount	Sl. no	Particulars	J.F	Cr Amount
2.	To Cash A/C		Rs. 60001-		By balance c/d		Rs 60001-
	Total =		Rs 60001-		Total =		Rs 60001-

Purchase A/C

Dr Sl. no.	Particulars	J.F	Amount	Sl. no.	Particulars	J.F	Cr Amount
3.	To Cash A/C		Rs. 20001-		By balancing c/d		Rs. 20001-
	Total =		Rs 20001-		Total =		Rs 20001-

Telephone bill A/C

Dr Sl. no	Particulars	J.F	Amount	Sl. no	Particulars	J.F	Cr Amount
4.	To Cash A/C		Rs 5001-		By balance c/d		Rs 5001-
	Total =		Rs 5001-		Total =		Rs 5001-

Medicine A/C

Dr Sl. no	Particulars	J.F	Amount	Sl. no.	Particulars	J.F	Cr Amount
5.	To M/s Lalu & Co A/C		Rs. 5000		By balance c/d		Rs 5000/-
	Total =		Rs 5000/-		Total =		Rs 5000/-

M/s Lalu & Co A/C

Dr. Sl. no.	Particulars	J.F	Amount	Sl. no	Particulars	J.F	Cr. Amount
	To balance c/d		Rs. 5000/-	5.	By Medicine A/C		Rs. 5000/-
	Total =		Rs. 5000/-		Total =		Rs. 5000/-

Interest A/C

Dr Sl. no.	Particulars	J.F	Amount	Sl. no	Particulars	J.F	Cr Amount
	To balance c/d		Rs 500/-		By Cash A/c		Rs 500/-
	Total =		Rs 500/-		Total =		Rs. 500/-

Sales A/C

Dr Sl. no.	Particulars	J.F	Amount	Sl. no	Particulars	J.F	Cr Amount
	To balance c/d		Rs 12,000/-		By Cash A/c		Rs 12,000/-
	Total =		Rs. 12,0001-		Total =		Rs. 12,000/-

MODEL ANSWER FOR D.PHARM PART-II SPECIAL EXAMINATION 2022(E.R-91)

SUBJECT: PHARMACEUTICAL JURISPRUDENCE

1) **(A)**

(i) **Schedule J**:- List of diseases or ailments, which a drug may not claim to prevent or cure.

(ii) **Schedule Q**:- Standards for disinfectant fluids.

(iii) **Denaturated Alcohol :-** Denaturated alcohol means alcohol of any strength which has been made unfit for human consumption by the addition of harmful substances approved by the Central Government or by the State Government with approval of the Central Government.

(iv) **Landed Cost:-** Landed cost means the cost import of formulation inclusive of customs duty & clearing charge.

(v) **Coca Derivative:-** Coca Derivatives means:

(a) Crude Cocaine
(b) Ecgonine & all its derivatives
(c) Cocaine & its salt
(d) all the preparations containing more than 0.1% of cocaine.

(vi) **Free Reserve:-** In companies Act 2013, free reserves means in the case of each company the amount of any open reserves increased or reduced by the balance of profit & loss amount existing at the beginning of any financial period.

(vii) **CLAA:-** CLAA means Central Licensing Approval Authority.

(viii) **DPCRC :** Drug Price Control Review Committee.

(ix) **Drug:** It includes:

(a) All medicines for internal or external use of human being or animals & all the substances intended to be used for or in the diagnosis, treatment, mitigation or prevention of any disease or disorder in the human being or animal.
(b) Such substances other than food, intended to affect the structure or any function of the human body or intended to be used for the destruction of vermin or insects which causes disease in human beings or animals.

(x) **Medical Preparations:** It includes the drug used remedy are preparations prepared for internal or external uses of human beings or animals & all substance intended to used for in treatment, mitigation pr prevention of diseases in human beings or animals.

(B) (i) **Adulterated Drug:-** A drug shall be deemed to be adulterated: -

(a) If it consists in whole or in part of any filthy or putrid or decomposed substance.

(b) If it is packed in the container composed of poisonous substances.

(c) If it contains a colour other than prescribed.

(d) If it has been prepared, packed or stored under insanitary conditions.

(e) If it contains any harmful or toxic substance which may render it injurious to health.

(ii) Write the penalties where no punishment is defined in breach of Medical & Toilet (ED) Act:

Breach of any of the rules made under the Medical & Toilet preparation Act (Where no penalty is separately provided) shall be punishable with fine up to Rs. 1000.00.

(iii)**R-W Coefficient:** The Rideal- Walker coefficient is a figure expressing the disinfecting power of any disinfectant.

- It is the ratio of the dilution of the disinfectant that kills a micro-organism to the dilution of phenol that kills the organism in the same time under identical conditions.

(iv)**Write the Penalties for Obstructing a Drug Inspector while discharging his/her Duties:** Whoever will fully obstructs an Inspector in the exercise of any power conferred on him by or under this act, or fails to produce on demand by an Inspector. Any registers or other documents in his custody kept in pursuance of this act or of any rules made there under and Inspector shall be punishable with imprisonment for a term which may extend 6 month or with fine which may extend to Rs10,000 or with both.

(v) **Misbranded Drug:** It means a drug which is:

(a) Coloured, Coated, powdered or polished so as to conceal the damage.

(b) If it is not labeled in the prescribed manner.

(c) If its label or container bears the statement which is false & misleading or makes the false claim.

2. (a) Write the Objectives of MTP Act 1971 & Rule 1975. Discuss the Experience or training required for a RMP in case of termination of Pregnancy:

Ans: Objectives of MTP Act:

(i) It aims to improve the maternal health scenario by preventing large number of unsafe abortions & consequent high incidence of maternal mortality & morbidity.
(ii) It legalizes abortion services.
(iii) It promotes access to safe abortion services to women.
(iv) It offers protection to medical practitioners who otherwise would be penalized under the Indian Penal Code.

Experience or training required for a RMP:

The Medical Termination of Pregnancy Rules 1975, prescribes the experience or training in gynaecology & obstetrics that a registered Medical Practitioner should have terminate any pregnancy.

(a) A Medical Practitioner registered in a state medical register immediately before the commencement of the Act, should have not less than 3 years experience in the practice of gynaecology & obstetrics.
(b) A medical practitioner registered in a state medical register on or after the date of the commencement can terminate the pregnancy:-
    i) If he/she has completed 6 months of house surgery in gynaecology & obstetrics.
    ii) If he/she has experience at any hospital for a period of not less than 1 year in the practice of gynaecology & obstetrics. Or
    iii) If he/she has assisted a Registered Medical Practitioner in the performance of 25 cases of medical termination of pregnancy in hospital established or maintained or a training institute approved by the Government for this purpose.
(c) In Case of registered Medical Practitioner who holds Post Graduate degree or Diploma in gynaecology & obstetrics, the experience or training gained during the course of such Degree or Diploma is considered.

(b) Discuss the Procedure of Possession & Import of Poison:

Ans: Procedure of Possession of Poison:

- The State Govt. has power to make rules regarding the possession of any specified Poison in local area where such occurrences are very frequent.
- Any break of this rule is punished with imprisonment up to 1 year or with fine up to Rs.1000.00 or both together with confiscation of the poison in respect of which the breach has been committed.

Procedure of Import of Poison: -

- Central Govt. regulates import of poisons in India.
- The import of poisons into India is permitted only under the authority of license issued by the Central Govt.
- The persons licensed to import poisons must observe the conditions of license.
- The person licensed to import poisons should import them across one of the defined customs frontiers & in accordance with the conditions of the license.

3. (a) Define Advertisement. Discuss regarding different classes of exempted advertisement:

Ans: Advertisement: It Means:-

i) Any notice, circular, label, wrapper or other document.
ii) Any announcement made orally or by means of producing or transmitting light, sound or smoke.

Classes of Exempted Advertisement:

The following classes of advertisements are exempted from the provisions of Drug & Magic Remedies Act:-

i) Any notice, signboard displayed by RMP on his premise including that the treatment is undertaken for disease.
ii) Any book or treatise dealing with matter relating to the disease or conditions & which is published from bonafide scientific or social standpoint.'
iii) Advertisement relating to drugs which are sent confidentially in the prescribed manner to the RMP.

Such advertisements are required to be sent confidentially & if sent by post then following matter should be written at the top, "For the use of registered medical Practitioner or Hospital."

iv) Advertisements relating to drugs which are printed or published by Govt. or by any other person with previous permission of government.
v) Any advertisements, labels or sets of instructions which are permitted under the drugs & cosmetics act & rules there under.
vi) Any advertisement which is prohibited under Act & Central Govt. feels that particular advertisement shall be in the interest of public, then it may be permitted by notification in the official gazette.

(b) Define Non-bonded Laboratory. Discuss about exemption from duty on medicinal preparations supplied from bonded laboratory:

Ans: Non-bonded Laboratory:-

Non-bonded laboratory means the premises approved & licensed for the manufacture & storage of the medicinal & toilet preparation containing alcohol, opium, Indian hemp & other narcotic drug on which duty has been paid.

Exemption from duty on medicinal preparations supplied from bonded laboratory:

- The preparations supplied to Govt. Hospitals, dispensaries & charitable hospitals & institutions which supply medicines to poor as certified by the district medical officer are exempted from payment of excise duties.
- Preparations are deemed to be manufactured in bond when are manufactured in a premise, licensed or approved for this purpose & on which excise duty is not paid until the finished products are removed licensed premises.
- Rectified spirit is issued for the purpose only if the manufacturer enters into a bond with sufficient security towards due payment of the duty & observance of the rules.

4.(a) Controlling Authority:-

Qualification:-

- He is graduate in pharmacy or pharmaceutical chemistry or in medicine with specialization in clinical pharmacology or micro-biology from University established in India by law.
- He has experience in the manufacture or testing of drugs or enforcement of the provisions of the Act for a minimum period of 5 years.

Duties of Controlling Authority:-

- All inspector of Central & State level are under their control.
- It has power to control Drug Inspector.

(b) Sampling Procedure for Retailer:

Whenever drug inspector takes any sample of drugs or cosmetic:-

i. He shall intimate the purpose of taking the sample in the prescribed form (Form-17).
ii. He shall tender a fair price of the sample, if the price is refused the inspector shall give receipt in the prescribed form (From-16)
iii. He shall divide the sample in 4 parts in the presence of the person whom the sample is taken & seal & mark each part. If manufacturer wants to sign & mark, he is also allowed to do so. However, if the sample is taken from manufacturing unit it shall be divided into 3 parts only.
iv. The four parts of sample shall be disposed off in the following manner:
    a) One part shall be sent to the government analyst for testing or analysis.
    b) One part shall be given to the person from whom sample is taken.
    c) One part shall be retained by the drug inspector or the production before court if legal proceedings are to be instituted.
    d) One part shall be sent to the warrantee, if any.

On the receipt of report from the government analyst drug inspector will decide whether further action in this matter is required or not. If the person is dissatisfied with the report of government analyst, it can be challenged within 28 days from the receipt of report. In such case the sample shall be sent to the central drug laboratory and the report supplied by director of CDL is considered to be final.

(c) DPEA:

- DPEA stands for Drug Price Equalization Account.
- DPEA was introduced under DPCO 1979.
- Basically the concept of DPEA was introduced to encourage production of bulk drugs indigenously & make the industry self sufficient.
- At the time of promulgation of DPCO 1979 most of the bulk drugs were imported.
- DPEA was a common account where all extra money earned by companies by sourcing raw materials at a price was expected to be remitted.
- A parliamentary panel has asked the Govt. to review & amend rules & regulations on DPEA to prevent indefinite delay in its recoveries due to prolonged litigation.
- Rules & regulations relating to this account should be reviewed & if need be amended to see that Govt. recoveries are not held up indefinitely due to prolonged litigation.

(d) Labeling procedure of ophthalmic preparation:-

Ophthalmic Solutions and Suspensions:

i) For external use only
ii) Not for injection
iii) Warning:
   (a) If irritation increases discontinue the use of drug & consult the physician.
   (b) Do not touch the tip of dropper or any other dispensing tip to any surface, since it may contaminate the solution.
   (c) Use the solution within 1 month after opening the container.

Ophthalmic Ointment:

i) For external use only.
ii) Warning: if irritation increases or persists discontinue the use of drug & consult the physician.

5. (a) Define the objectives of the D & C Act. Discuss about the qualification of licensing authority.

Ans: Objectives of the D&C Act:-

i) To regulate the import, manufacturing, distribution, sale of drug & cosmetic through licensing.
ii) Manufacturing, distribution, sale of drug & cosmetic by qualified person only.
iii) To prevent substandard in drugs.

iv) To regulate the manufacturing & sale of ayurvedic, siddha & unani drugs.
v) To establish Drugs Technical Advisory Board (DTAB) & Drug Consultative Committee (DCC) for allopathic & allied drugs & cosmetics.
vi) To issue licenses for the import, manufacture, sale & distribution of all standard drugs & cosmetics.
vii) To have regular inspection of licensed premises by Drug Inspectors.

Qualification of Licensing Authority:-

i) He is graduate in pharmacy or pharmaceutical chemistry or in medicine with specialization in clinical pharmacology or microbiology from a University established in India by law.
ii) He has experience in the manufacture or testing of drugs or enforcement of the provisions of the act for a minimum period of 5 years.

(b) Write the functions of DTAB. Discuss the nominated & elected members of DTAB:

Ans: Functions of DTAB:

i) To advise the Central Govt. & State Govt. on the technical matters arising out of the administration of the Act.
ii) To carry out such other functions as may be assigned to it by the Central Govt.

Nominated Members of DTAB:

The following members are nominated by Central Govt.

i) Two persons from among persons who are in charge of the drugs control in the state.
ii) One person from the pharmaceutical industry.
iii) Two Government analysts.

Elected Members of DTAB:

i) A teacher in pharmacy, pharmaceutical chemistry or pharmacognosy on the staff of an Indian University of an affiliated college elected by the executive committee of the pharmacy council of India.
ii) A teacher in medicine or therapeutics on the staff of an Indian University or an affiliated college, elected by the executive committee of the Medical Council of India.
iii) One pharmacologist elected by the Governing body of the Indian Council of Medical Research.
iv) One person elected by the Central Council of Medical Association.
v) One person to be elected by the council of the Indian Pharmaceutical Association.

6. a) New Drug:-

- New drug means the drug whose composition is generally not recognized as a safe for use under the conditions recommended or suggested in the label.
- It means the drugs whose composition is recognized as a safe but which have not been used to any large extent for any appreciable period of time.
- The application for manufacturing a new drug including their fixed dose combinations should be supplemented along with the data mentioned in schedule Y.
- Without the written permission of the Licensing Authority, no new drug can be imported.
- While applying for such permission, all documents & other evidence related to the standards of the quality, purity, strength etc, should be supplied to the Licensing Authority.
- All vaccines shall be new drugs unless certified otherwise by the Licensing Authority.
- A new drug shall be continue to be considered as new drug for a period of 4 years from the date if its first approval or its inclusion in the Indian Pharmacopoeia, whichever is earlier.

b) Customs Collector: -

- Some drugs may be imported under license. Those drugs which are imported without any permit or license. But before such drugs are imported into the country, the importers or manufacturers should submit a declaration to the customs Collector that they will comply with all the provision of the Drugs & Customs Act & Rules.
- The law relating to the customs & goods, import of which is prohibited is time being applicable for the drugs & cosmetics.
- The Customs Collector or any officer authorized in his behalf, may detain any imported package which he suspects to contain any drug or cosmetics import of which is prohibited any reports such detention to Drug Controller, India & if required forwards sample of such drug or cosmetics to CDL.

The Qualification of the Custom Collector is as following:

- He/she is a graduate in Pharmacy or Pharmaceutical Chemistry or Medicine with specialization in clinical Pharmacology or Micro- Biology from a recognized University.
- He/she has experience in the manufacture or testing of drugs or enforcement of the provisions of the Act for a minimum period of 5 years. Provided that the requirement as to the academic qualification shall not apply to Inspectors appointed under this Act & who are in position on the date of commencement of the drugs & cosmetics (Ninth Amendment) Rules, 1989.

Functions:-

- Import of Drugs & cosmetics is checked by the Customs Collectors.
- If the customs collector suspects about the imported drugs, he may take samples & forward them to the Central Drugs Laboratory, Kolkata or Central Research Institute, Kasauli for analysis. He may also detain such consignment until the analytical report is received.
- If the sample does not comply with the prescribed standards, the customs collector may direct the importer to send back the consignment within 2 Months of the receipt of information from the Customs Collector.

c) Education Regulations:-

- With the approval of central Government, may make regulations prescribing the minimum standards of education required for pharmacists. These standards are known as education regulations.

  These education regulations are:-

  i) Minimum qualification for admission to the course.
  ii) The nature & period of course of study.
  iii) The nature & period of practical training that shall be undertaken after the completion of regular course.
  iv) Subjects of the examination & standards to be attained in such examinations.
  v) Equipments & facilities to be provided for the student by the institution running approved course of study.
  vi) Conditions to be fulfilled by the institution giving practical training.
  vii) Conditions to be fulfilled by the authorities holding approval examination.
  viii) Latest education regulation is ER 2020. According to ER- 1991 a candidate shall be having appeared in diploma in Pharmacy Part- II examination in one or more of the following institutions:-
    i. Government hospitals/ dispensaries.
    ii. Other hospitals/ dispensaries recognized by the PCI.
    iii. Licensed Pharmacy, chemists & druggists shops.
    iv. Licensed drug manufacturing units.

  The Education Regulations, 1991 advises:-

  (i) The type & periods of theoretical study & practical training should not be less than 500 hours & 3 months, provided that not less than 250hours must be devoted to actual dispensing of prescriptions.
  (ii) The equipment & facilities to be provided for the students.

d) Restricted Licenses:-

- It is a license for the sale & distribution of drugs whose sale does not require the supervision of qualified person.
- It is issued to the travelling agents of the firms or vendors of drugs.

Conditions for the Grant of Restricted License-:

i) License shall have adequate arrangement for the proper storage of drugs.
ii) License shall deal only such drugs that can be sold without supervision of qualified person.
iii) The license shall be displayed at the prominent place of the open to the public.
iv) In case of vendors of drug they shall possess the license & should be produced on the demand of inspector.
v) Drugs should be sold in the original containers.

7. (a) Discuss the offences & punishment laid down on contravention of NDPS act?

Answer-:

OFFENCES	PUNISHMENTS
1) i) contraventions of provisions in the Act or rules there under in respect of poppy straw, opium poppy , coca plant & coca leaves, prepared opium, manufactured drugs & psychotropic substances.	Rigorous imprisonment for 10-20 years.
ii) Illegal import or export or external dealings in narcotic drugs or psychotropic substances iii) Allowing use of premises, vehicles, etc, for commission of an offence under the Act. iv) Embezzlement of opium by licensed cultivators. v) Contravention in respect of cannabis plant & cannabis other than ganja.	Fine between Rs. 1 to 2 Lacs or more.
2) Contravention in respect of cannabis plant & cannabis related to ganja.	Rigorous imprisonment for up to 5 years & fine of up to Rs 50,000.00
3) i) Failure to keep accounts or submit returns as required by law or keeping of false accounts or making of false statements.	Rigorous imprisonment for up to 5 years or fine or both.
ii) Failure to produce licenses permits, authorizations etc. on demand by authorized persons iii) Willful & deliberate indulgence in breach of any provision of the Act or Conditions of License etc, for which no penalty is otherwise imposed by the Act.	Rigorous imprisonment for up to 3 years or fine or both

OFFENCES	PUNISHMENTS
4) Illegal possession for personal consumption or consumption of cocain, morphine, diacetyl-morphine or any other narcotic drug or psychotropic substance specified in this behalf	Rigorous imprisonment for up to 1 years or fine or both.
5) i) Illegal possession for personal consumption or consumption of substances other than those mentioned under point 4 ii) Offences for which no punishment is separately provided.	Rigorous imprisonment for up to 6 Months or fine.
6) Abetment/attempt of above	Same punishment as for the main offence.

b) Describe about the constitution & functions of state pharmacy council?

Answer-:

- According to the pharmacy Act, a state pharmacy council is constituted under each state Government .
- This council maintains a register for the pharmacist of the state, as well as monitors their activities regarding the profession.

Constitution-:

The state Pharmacy council consists of the following members-:

Elected Member-:

- Six members elected amongst themselves by registered pharmacists of the state.
- One member elected by the medical council of the state from amongst its members.

Nominated members-:

- Five members nominated by the state Government of whom at least three persons should possessing a prescribed degree or diploma in pharmacy or pharmaceutical chemistry or be a registered pharmacists.

Ex-Officio Member -:

- Chief administrative medical officer of the state.
- The officer in charge of drugs control organization of the state; appointed under drugs & cosmetics Act 1940.

- Government Analyst appointed under Drugs & cosmetics Act 1940 or where there is more than one such Analyst, one may be appointed by the state Government.

- The elected member, nominated member & ex-officio member hold their positions for 5 yrs. From themselves a president is nominated by state Govt. & Vice-President is elected by themselves.

Functions-:

The functions of the state pharmacy council are-:

1) Maintenance of Registers.
2) Entry of name from the Register.
3) Removal of Name from the Register.
4) Printing of Registers.
5) Inspection by the state council.

D.PHARM PART (II) SPECIAL EXAMINATION -2022 MODEL ANSWERS
ER -1991
SUB: PHARMACOLOGY & TOXICOLOGY (T)

1.i) Pinocytosis- it is the process of cell drinking by which proteins and macromolecules are transported by this process.

ii)Iontophoresis-It is the process of passing a weak electrical current through the skin.It has a variety of uses in medicine.

iii)Detoxification-It is treatment is intended to remove poisonous or harmful substances from your body.

iv)Additive effect-The total pharmacological response produced by two drugs is equal to the sum of the individual effects. e.g. the effect of ephedrine and aminophylline in bronchial asthma.

v)Cummulation-Drugs like digitalis are excreted slowly. So repeated administration leads to accumulation in the body. So as to produce toxicity. This phenomenon is called as Cummulation.

vi)Blood dyscrasias-It is a medical condition affecting the blood, bone marrow, or lymphoid tissues. It can be malignant or benign, common or rare, and vary from mild to fatal. e.g. anemia and blood cancers, including lymphomas and leukemias. These condition may either cause blood coagulation or excessive bleeding.

vii) Drug dependence- It is defined as a psychic and physical state of the person characterized by behavioral and other responses resulting in compulsions to take a drug on a continuous or periodic basis on its withdrawal conditions.

viii) Sedatives and Hypnotics – Sedative are drugs which reduce excitements without producing sleep. Hypnotics are drugs which produce sleep resembling natural sleep.

ix) Analeptics-These are drugs which stimulate the CNS. They also stimulate respiration. In large doses they produce convulsion.

x) Local anaesthetic- These are agents which block conduction of impulses in nerves. When applied locally they produce loss of sensation in the desired area.

xi)Antibiotics-It is a chemical substances obtained from microorganisms, that kill or destroy other microorganisms. They are classified as narrow spectrum antibiotics and broad spectrum antibiotics.

xii) Mydriasis-The radial muscles are innervated by postganglionic sympathetic nerves arising from cells in the superior cervical ganglion. Stimulation of these nerves or injection of noradrenaline produces contraction of radial muscles. This leads to Mydriasis (dilation of the pupil).

xiii) Mucolytic agents- These are the agents which decrease the viscosity of the sputum. This helps in easy expectoration. Example-. Bromohexine, ambroxol, acetylecysteine, carbocysteine.

xiv)Fibrinolytic agent-All fibrinolytic agents currently in use act directly as plasminogen activators. They produce lysis of an already formed clot. So they are curative rather than prophylactic.

xv)Shock-It is an acute circulatory failure. So there is under perfusion of tissues. In shock, there are symptoms of sympathetic over activity such as pallor, sweating, cold extremities and tachycardia.

vi) Diuretics- The drug which increase the flow of urine. These drugs are mainly used for relief of edema. Also they are useful for the elimination of toxic product through urine.

xvii) Stomachics-It is otherwise known as appetizers. These are drugs used for the treatment of anorexia (loss of appetite). These appetizers induce appetite by increasing gastric secretion. The agents used in the treatment of anorexia are: Bitter, alcohol and insulin.

viii) Sequential pill- Oestrogen alone is given from the 5^{th} to 20^{th} day. From the 21^{st} day oestrogen progestin combination is given.

xix) Biological lag- It is the interval between administration of a drug and development of response.

xx) Cinchonism - It is an adverse effect of drug quinine (Antimalarial drug). It is characterised by nausea, headache, ringing ears (tinnitus) deafness, blurred vision, colour vision and photophobia.

2. Antipsychotic drugs are also called as neuroleptic drugs or antischzophrenic. These drugs are mainly used in schizophrenia, acute mania and other acute psychotic states.

Classification of antipsychotic drugs:

1.Phenothiazines Chlorpromazine, Fluphenazine, Thioridazine

2.Butyrophenones Haloperidol, Trifluperidol

3.Thioxanthines Flupenthixol

4.Miscellaneous Loxapine, Pimozide, Penfluridol

5.Atypical antipsychotics Clozapine, Risperidone, Olanzapine,

Pharmacological, action of chlorpromazine:

It is a phenothiazine derivative.

- CNS: It produces psycho motor slowing, emotional quietening, decreased initiative, decreased anxiety. It do not have an analgesic effect. But they potentiate the analgesic effect of morphine. They do not have anticonvulsant effect

- Antiemetic's action: It is a powerful antiemetic effect. This effect is produced by depressing the chemoreceptor trigger zone(CTZ)
- ANS: It has alpha blocking effect. It also blocks the actions of acetylcholine and 5-Hydroxytryptamine.
- CVS: It has a hypotensive, myocardial depressant and anti fibrillatory effect.
- Endocrine system: It produces inhibition of ovulation, amenorrhea and lactation in females. In males it produces loss of libido. These effects are produced by blocking the action of dopamine on hypothalamus and pituitary.
- Miscellaneous actions: Inhibition of hiccough, Local anesthetic effect, skeletal muscle relaxant effect

Adverse reaction:

- CNS effects like drowsiness, excitement, psychotic reaction.
- ANS effects like blurred vision, tachycardia and constipation
- Extrapyramidal symptoms of parkinsonism like tremor, muscle rigidity
- Haemopoietic effects like agranulocytosis, thrombocytopenia and aplastic anemia

Uses:

- In the treatment of major psychosis
- To control of aggressiveness in children
- As an antiemetic,
- In the treatment of hiccough,
- For Preanaesthetic medication.

3.a) **Anthelmintic drugs**:

These are drugs used in the treatment of worm infestation. Worm infestation may occur in the gastrointestinal tract (e,g. round worm, hook worm, tape worm) or in the tissues(e.g. filaria). Anthelmintic may act as:

Vermifuge Which expels the worms. Vermicide which kills the worm.

Classification of Anthelmintics:

1.Round worm Mebendazole, Albendazole, Pyrantel pamoate

2.Hook worm Mebendazole, Albendazole, Pyrantel pamoate

3.Thread worm Ivermycetin, Albendazole

4.Tape worm Albendazole, Praziquintel

5.Hydatid disease Albendazole, Mebendazole

Broad spectrum anthelmintic: These drugs are effective in wide varieties of helminths. Also, these are the ones which are in regular use. These drugs are mebendazole, albendazole and thiabendazole. These drugs belong to the group of benzimdazoles.

Mebendazole: It kills the eggs and larvae of the worms.

Mechanism action:

- It binds to β- tubulin of the parasite and inhibits the synthesis of microtubules. These microtubules are needed for several metabolic processes of the parasite.
- Also it inhibits glucose uptake by the parasite.

Adverse effect:

- No systemic toxicity due to poor absorption
- GI effects like nausea, vomiting, diarrhea, and abdominal discomfort.
- Skin rashes, itching and drug fever

NOT TO BE USED IN PREGNANCY AND CHILDREN BELOW 2 YEARS.

Uses: In round worm, hook worm, pin worm, and mixed worm infestations.

b) **Antimalarial drugs**:

Malaria is caused by parasitic protozoa which belongs to the genus Plasmodium. The symptoms of malaria are fever, rigor and splenomegaly.

Life cycle of malarial parasites: The life cycle of malarial parasite can be classified into:

1.An asexual cycle of which occurs in the infected host

2.A sexual cycle which occurs in the mosquito.

Classification of Antimalarial:(Chemical classification)

1.4 Aminoquinolines Chloroquine, Amodiaquine

2.8 Aminoquinolines Primaquine, Tafenoquine

3.Quinoline methanols Quinine Quinoline, Mefloquine

4.Artemesinins Artemesinin, Artemether

5.Arylacohol Lumifantrine

6.Antibiotics Doxycycline, Clindamycin

7. Naphthaquinone Atovaquone

Clinical classification:

1.Causal prophylactics (Tissue schizonticides) Primaquine, Pyrimethamine

2.Supppresives (Blood schizonticides) Chloroquine, Quinine

3.Radical curatives (Tissue schizonnticides) Primaquine, Tafenoquine

4.Gametocides Chloroquine, Quinine, Primaquine

Chloroquine- it is a 4-aminoquinoline derivative drug used in case of malaria. It is a rapidly acting erythrocyte schizontocide against all species of plasmodium (except chloroquine resistant plasmodium falciparum).

- Higher concentration of drug affects the RBCs.
- It accumulates in the acidic vesicles of the parasite raises the pH and interfere with degradation of hemoglobin by parasitic lysosomes.

Adverse effect-

- vision loss on prolong use, hearing loss, rashes, hepatotoxicity, myopathy, nausea, vomiting, anorexia, epigastric pain, itching.

Uses-

- Malaria
- Rheumatoid arthritis
- Amoebiasis
- Giardiasis
- Taeniasis

c) **Cotrimoxazole**:

It is fixed –dose combination of Sulphamethoxazole and trimethoprim (ratio 5:1).

Antibacterial activity: It is effective against several Gram positive and Gram negative organisms. They are Staphylococcus aureus, Meningococci, Proteus, Salmonella, Shigella etc.

Mechanism of action: Sulphamethoxazole and trimethoprim combination block sequential steps in the synthesis of folic acid. The combination is synergistic. Individual compounds are bacteriostatic, but the combination is bactericidal.

- Sulphamethoxazole inhibit the enzyme folic acid synthetase. So PABA is not converted to dihydrofolic acid.
- Trimethoprim inhibits the enzyme dihydrofolate reductase. So dihydrofolic acid is not converted to tetrahydrofolic acid.

Adverse effect:

- GI disturbances like nausea, vomiting glossitis and stomatitis.
- Skin rashes such as exfoliative dermatitis and erythema
- Megaloblastic anemia due to folic acid deficiency
- Bone marrow suppression causing leucopenia, thrombocytopenia, and neutropenia.

Uses:

- Urinary tract infection
- Respiratory tract infection
- Bacterial gastroenteritis
- Pneunmocytis jiroveci infection
- Chancroid
- Toxoplasmosis

d)**Antacids:**

Antacids are alkalies. They neutralize acid in GI tract and provide pain relief. Antacids are two types:

i)Systemic antacids -They are absorbed in the blood and cause systemic alkalosis. e.g. Sodium bicarbonate, Sodium citrate

ii)Locally acting antacids -They are not (or very poorly) absorbed and act in GI lumen. They are called as non-systemic antacids. e.g. Aluminium hydroxide, Aluminium trisilicate.

Mechanism of action - Antacids are alkaline in nature

↓

Neutralize acid in stomach

↓

Increased PH

↓

Pepsin is inactivated in higher PH.

Thus, these drugs reduce acid and pepsin and provide pain relief. Antacids act for around 1 hour after administration. Co-administration with food increases duration of action of these agents. Increase in tone of lower esophageal sphincter due to these agents reduces reflux of acid in esophagus. In higher dose they help in healing of ulcers.

Addition of alginic acid to antacids improves the attachment of antacids to mucosal cells and form frothy layer on gastric contents. Addition of dimethicone or simethicone or methylpolysyloxane reduces surface tension and small bubbles of froth are converted into large bubble and are easily passed, this reduces flatulence, a common side effect with antacids. Sometimes surface anesthetics like oxethazaline are added in antacids.

Uses:

- Hyperacidity

- Gastritis
- Gastric or duodenal ulcer
- Zollinger Ellison syndrome
- Gastroesophageal reflux

4.a) **Glyceryl trinitrate:**

Pharmacological action –

- Blood vessels-These compounds produce direct relaxant effect on arteries, veins and capillaries. There is no involvement of autonomic nerves or receptors. All blood vessels are not equally affected. Vasodilation is marked in coronary, cerebral and cutaneous vessels. Blood flow is increased. But decrease in blood pressure is minimal.
- Smooth muscle -It produces relaxation of smooth muscles like intestine, biliary tract, ureter and uterus.
- Eyes-These drugs dilate intraocular blood vessels. So intraocular pressure may be increased.
- Methemoglobin Formation-It convert haemoglobulin to Methemoglobin. It combines with cyanides to form nontoxic cyanmethemoglobin. So nitrates are useful in the treatment of cyanide poisoning.

Adverse effect -Headache, flushing of the face and hypotension leading to dizziness or fainting.

Uses- Angina pectoris

b) **Barbiturates:**

Pharmacological action-

1. C.N.S- depression, sedation, hypnosis and general anesthesia.

   Sleep-Barbiturates- induced sleep resembles natural sleep. Also there is hangover effect after awakening.

   a. Analgesic effect -It do not relieve pain but they enhance the analgesic effect of salicylates and para amino phenol derivative.
   b. Anesthetic effect – Thiobarbiturate and some ultra-short acting oxybarbiturates produces anesthesia on intravenous administration'
   c. Anticonvulsant effect- Phenobarbitone which have phenyl group at the 5^{th} carbon atom has anticonvulsant effect.
   d. Respiration-It is not affected at sedative or hypnotic dose. Large dose administered intravenously may produce death due to central respiratory paralysis.

2. G.I.T- Intestinal motility is not affected at a normal dose, but gastric secretion may be depressed.

3. Uterus- uterine contraction decreases at toxic dose

4. Kidney- No effect at normal dose, but anesthetic dose decrease urine output due to decrease in glomerular filtration and release of ADH.

5. Liver- - No effect at normal dose, but anesthetic dose may produce hepatic dysfunction.

Adverse effects-

- Nausea, headache, diarrhea
- Fetal respiration depression
- Drug automatism
- Tolerance because of increased inactivation in the liver
- Dependence and withdrawal symptoms

Uses-

- Sedative in case of anxiety or tension
- Hypnosis to relieve insomnia
- Anticonvulsant effect in case of tetanus or status epilepticus
- Pre-anesthetic medication
- Potentiation of analgesics like salicylates.
- Psychiatric practice and neonatal jaundice

c) **Antihistamines:**

Pharmacological action**:**

1.General effects-These conventional antihistamines (H_1 receptor antagonists) block all the actions of histamine on skin mucous membranes and plain muscles. They do not antagonize histamine induced gastric secretion. This blocked by H_2 receptor antagonists.

2.Sedation-It produces sedation of varying extent. So skilled work is not advisable after taking antihistamines.

3.Autonomic nervous system -It exhibit anticholinergic effects. As a result, they produce dryness of mouth. Some antihistamines exhibit an adrenergic blocking effect.

4.Local anaesthesia-It possess a local anesthetic effect. Preparations of antihistamines meant for local application owe their effect to local aneasthetic effect.

5.Suppression of motion sickness- It suppress motion sickness caused by vestibular disturbances. They also prevent vomiting due to labyrinthine disturbances.

6.Depressant effect on heart- It have quinidine like effect on the heart. So they are useful in controlling fibrillation of the heart.

7.Drying of secretions - It produces dryness of mouth. They also produce drying of nasal secretions and hence the use as cold cures.

Adverse effect:

- GI disturbances like nausea, anorexia and epigastric pain
- Cardiovascular symptoms like hypotension and palpitation
- Blood dyscrasias like agranulocytosis, leucopenia and hemolytic anemia
- Dryness of nose, mouth and eyes
- Sedation and drowsiness

Uses:

- For symptomatic relief of allergic disorders like urticarial, hay fever and rhinitis.
- To prevent allergic reactions in blood transfusion.
- In the management of vomiting due to motion sickness.
- In common cold, to inhibit nasal discharge.

5. a) Angina Pectoris- Is a pain syndrome due to induction of an adverse oxygen supply /demand situation in a portion of the myocardium.

Classification: -

1.Nitrates - Glyceryl trinitrate, Isosorbide dinitrate

2.β Blocker - Propranolol, Metoprolol

3.Calcium channel blocker - Verapamil, Diltiazem, Nifedipine, Amlodipine

4.Potassium channel opener - Nicorandil

5.Others - Dipyridamole, Trimetazidine

Mechanism of action-

It dilates or prevent constriction of the blood vessels, which allow greater blood flow to various organs in the body. It leads to decreased peripheral resistance and fall in BP. Nitric oxide(NO) is a natural vasodilator in human body. It is produced by endothelial cells and is responsible mainly for dilation of veins. To some extents it also dilates arteries. These agents are classified as follows-

- Venodilators - Nitrates
- Arterial dilators - Calcium channel blocker, Potassium channel opener
- Acting on both veins and arteries - ACE inhibitors

Adverse effect-

Flushing, Throbbing head ache and nasal congestion, palpitation

b) 5-Hydroxytryptamine-

It is also called as serotonin. It is widely distributed in plants, animal tissue, mast cells and platelets. The highest concentration is present in pineal gland of mammals. Venoms of wasps and bees also contain 5-HT. It is also present in fruits like bananas, pineapples, tomatoes and plums.

Synthesis- Tryptophan

↓ Tryptophan – 5- hydroxylase

5- hydroxytryptophan

↓ 5- hydroxytryptophan decarboxylase

5-hydroxytryptamine

5-HT receptor like 5-HT_1,5-HT_2,5-HT_3 up to 5-HT_7.

Pharmacological action-

- Brain- 5-HT is a major neurotransmitter in brain that regulates sleep, temperature, mood variation, vomiting and pain.5-HT mediated vasoconstriction governs the initial stage of migraine. Cytotoxic drugs and radiotherapy induce vomiting through 5HT receptors in the brain.
- 5-HT, in platelets promote aggregation of platelets and clotting.
- Stimulation of 5-HT receptors in GI tract alter motility of intestines and improve peristalsis. Additionally, there is reduction in acid and pepsin.
- CVS -Effects of 5HT on CVS are complex. They are mediated by different mechanisms that are given below-
  - Vascular dilation through release of EDRF (Endothelium dependant relaxing factor)
  - Vasoconstriction through release of adrenaline from adrenal medulla
  - Vasoconstriction through action on autonomic ganglion
  - Sudden release of 5-HT causes vasospastic episodes
- Due to above mentioned actions a typical triphasic response is observed after IV administration of 5-HT
  - Initial reduction in BP
  - Immediate rise in BP
  - Sustained reduction in BP
- 5-HT is believed to be involved in allergy inflammation, schizophrenia and carcinoid tumour.

Uses-

5-HT is not used clinically.

c) Autacoids: (Meaning self-remedy) because of their self-regulation. They are also called tissue factor. They differ from hormones in that they are generally produced in the tissue and not by the endocrine glands.

- Triple response: On intradermal injection, histamine produces a" triple response" which consists of-
  - Local redness(flush) due to dilation of capillaries and venules.
  - Local arteriolar dilation(flare).
  - Local oedema (wheal)due to escape of fluid from the capillaries.

6. Opioid analgesics- These are the naturally occurring semi synthetic and synthetic drugs which have a morphine like action i.e relief of pain and depression of CNS.

Classification-

A. Natural opium alkaloids:

1. Phenanthrene derivatives- morphine, codeine, thebaine
2. Benzoisoquinoline derivatives- papaverine, noscapine

B. Semisynthetic derivative of opium alkaloids- Heroin, apomorphine

C. Synthetic substitutes of opium alkaloids- Pethidine, methadone

Pharmacological action of morphine-

- Analgesia- It relieves severe pain like visceral pain and pain of trauma.
- CNS- It produces euphoria in presence of pain, but in absence of pain produces dysphoria. with an increase dose it produces sleep.
- CVS- Normal dose of morphine produces no effect on heart or circulation. But hypertension may be produced at toxic dose.
- Respiration- It produces depression respiration by a) directly depressing the respiratory centre b) decreasing the sensitivity of respiratory centre to carbon dioxide.
- Pupil-Constriction of pupil (miosis). It is blocked by atropine. Morphine addicts have constricted pupil (pin point pupil).
- Emetic action- Small doses produces vomiting. But a large dose inhibits vomiting.
- Antitussive effect- it suppresses cough by depressing cough centre.
- ADH secretion -It produces release of ADH. This results in decrease of urinary output.
- G.I.T- It decreases peristaltic propulsive movements. It produces spasm of intestinal smooth muscles and sphincters. It also increases absorption of water. So, the faeces get dried. All these effects lead to constipation.
- Biliary tract -It produces spasm of sphincter of oddi. This produces increase in intrabiliary pressure. Atropine antagonises this effect.
- Other smooth muscle-i) It increases the tone of detrusor muscle of urinary bladder (this produces urinary urgency). But vesical sphincter is contracted.
  ii)constrict of bronchi is produced at large doses.
  iii) It increase tone of ureter and decreases its peristalsis.

Uses-

- As an analgesic for the relieve of severe pain
- For producing sedation and sleep.
- As pre-anaesthetic medication.
- In the treatment of acute left ventricular failure.
- For the treatment of diarrhoea.

- As an antitussive.

Adverse effect-

- Central effect like dysphoria and mental clouding.
- G.I.T symptoms like nausea, vomiting and constipation.
- Intolerance like tremor, delirium and skin rashes.
- Acute morphine poisoning- characterised by respiratory depression, pin point pupil, cyanosis, reduced body temperature, hypotension, shock and coma.
- Depression of foetal respiration
- Tolerance and drug dependence.

7.a. Methods of prolonging drug action:

The action of a drug can be prolonged by i) Decreasing absorption ii)Decreasing inactivation iii)Decreasing renal elimination iv)Increasing protein binding. An increase in the duration of action decrease the frequency of administration.

i)Decreasing absorption: Absorption of a drug can be decreased by:

1.Taking the drug in full stomach or in enteric coated forms.

2.Decrease the solubility e.g. penicillin with procaine.

3.Use of vasoconstrictors e.g. adrenaline with local anesthetics.

4.Administration of oily suspension e.g. adrenaline in oily injection

5.Combination of the drug with protein e.g. insulin with protamine.

6.Esterification of the drug e.g. esters of estrogen with benzoic acid.

7.Implantation of drug pellets e.g. desoxycorticosterone acetate (DOCA) pellets.

ii) Decreasing inactivation: Inactivation of drugs by microsomal enzymes of liver can be decreased by certain compounds. For example, the enzyme mono amine oxidase (MAO) can be inhibited by imipramine. Decreased inactivation increases the duration of action of a drug.

iii) Decreasing renal elimination: Tubular secretion of penicillin is decreased by probenecid. Combination of the two decrease the renal elimination of penicillin and prolongs its effect.

iv) Increasing protein binding: Suramin, a drug used in trypanosomiasis is highly protein bound. So it has a prolonged effect. Long acting Sulphonamides are also highly bond to plasma proteins.

b) Beta adrenergic blocking agents:

These drugs inhibit adrenergic responses mediated through β- receptors.

Classification:

1.First generation (Non selective) Propranolol, Timolol ,Nodolol, Pindolol

2. Second generation (β_1- selective) Atenolol, Aebutolol, Esmolol, Metoprolol

3.Third generation

(β- blockade with additional vasodilator effect) Labetolol, Carvedilol, Betoxolol

Pharmacological action:

Heart-No effect on normal heart. They prevent rise in heart rate and cardiac output produced by increased sympathetic tone. Myocardial oxygen requirements is decreased. This helpful in angina. They also improve exercise tolerance in angina pectoris.

Blood pressure: They reduce blood pressure by:

- Decrease cardiac output
- Decreasing peripheral vascular resistance.
- Reducing the release of renin from the kidney

Bronchi: They increase bronchial resistance by blocking β_2 receptors of bronchi. This is dangerous in asthmatic patients.

Eye: On topical application, β- blockers increase intraocular tension. This is due to increased secretion of aqueous humour.

Metabolic effects:

- Glycogenolysis is inhibited. So recovery from hypoglycemia is delayed.
- Warning symptoms of hypoglycemic are masked.
- Increase in plasma triglycerides and decrease in HDL cholesterol.

Adverse effects:

- CVS: Bradycardia, Arrhythmias and heart block
- CNS: Sleep disturbances, hallucination, fatigue and mental depression
- Bronchi: Sever bronchospasm in asthmatic patients. So contraindicated in asthma.

Therapeutic uses:

- Hypertension
- Angina prophylaxis
- Myocardial infarction
- Cardiac arrhythmias
- Congestive cardiac failure
- Pheochromocytoma
- Prophylaxis of migraine

- Thyrotoxicosis
- Chronic open angle glaucoma

c) Antitussive and expectorant:

· Antitussives are the drugs that act on CNS. They reduce the tussal impulses by raising the thresh hold of cough center. These are useful in case of dry unproductive cough.

· Antitussives are classified as:

1.Opioid antitussive: Codeine and pholcodeine

2.Non opioid antitussive: Noscapine, dextromethorphan

3.Antihistamine: Chlorophenaramine, diphenhydramine, promethazine

· Expectorants are the drugs which sooth the throat directly as well as by promoting salivation and reduce afferent impulses from the inflamed/irritated pharyngeal mucosa. These provide symptomatic relief in dry cough arising from throat.

· Expectorant (mucokinetics) are drugs believed to increase bronchial secretion or reduce its viscosity, facilitating its removal by coughing

· Sodium and potassium citrate are considered to increase bronchial secretion by salt action. Potassium iodide is secreted by bronchial glands and can irritate the airway mucosa.

· Mucolytic: These are the drugs which decrease the viscosity of the sputum. This helps in easy expectoration. Example-Bromohexine, ambroxol, acetylecysteine, carbocysteine.

d)**ACE inhibitors:**

It is a class of drugs that are widely used in variety of cardiovascular disorders as the first line therapy. Agent from this class are captopril, enalapril, Lisinopril, benazepril.

Kidney, heart, blood vessel, etc. contain a system called as renin angiotensin system.

Mechanism of action:

- These drugs inhibit angiotensin converting enzyme and prevent synthesis of Angiotensin II. This offers following advantages:
- Prevention of Angiotensin II (A II) mediated vasoconstriction reduces peripheral resistance and blood pressure.
- Prevention of AII mediated synthesis of aldosterone reduces Na and water retention. There is reduction in fluid overload.
- Reduction in central symptomatic activity reduces sympathetic over activity.
- Prevention of hypertrophy of heart and arterial walls.
- It produces improvement in kidney function and reduce microalbuminuria.

- Action of ACE inhibitors depend on activity of renin and plasma Na concentration. They produce maximum fall in BP when Na is depleted in Reno vascular hypertension.

Uses:

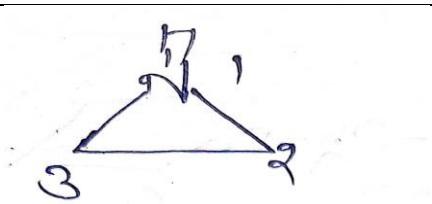
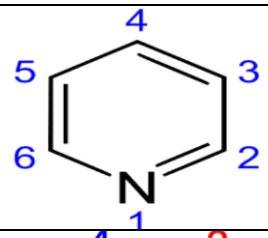
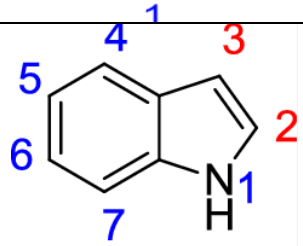
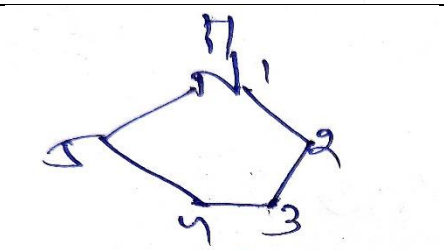
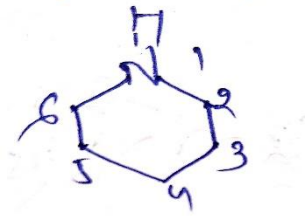
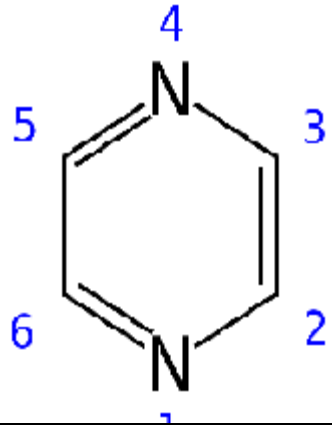
- Hypertension
- Heart failure
- Myocardial infarction

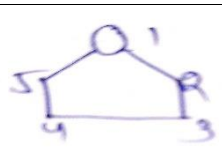
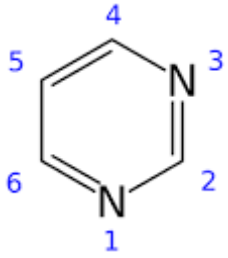
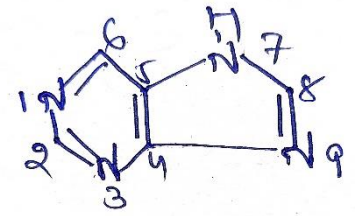
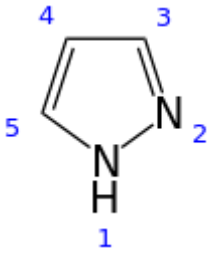
O.S.B. P, D. PHARM PART-II-2022 SPECIAL EXAM

SUBJECT: -PHARMACEUTICAL CHEMISTRY-II

MODEL ANSWER

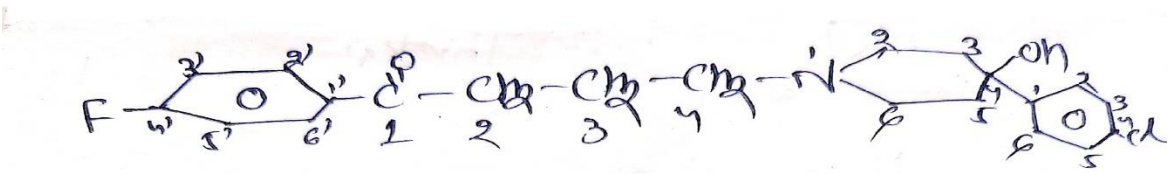
1.(A) Write the Structure of the heterocyclic ring with numbering and give suitable Example: [1x 10]

i) Aziridine		Thiotepa
ii) Pyridine		Isoniazid, Nicotinamide
iii) Indole		Indomethacin, Reserpine
iv) Pyrrolidine		Methosuximide, Pentolinium
v) Piperidine		Pethidine, Haloperidol, Benzhexol
vi) Pyrazine		Pyrazinamide, Amiloride

vii) Tetrahydro furan		Streptomycin
viii)Pyrimidine		Sulfadiazine, Thiamine
ix) Purine		Mercaptopurine
x) Pyrazole		Sulphaphenazole

(B) Write the chemical structure and use of following medicinal agents: **[2×5]**

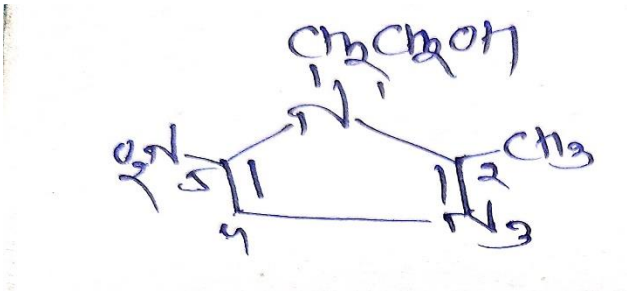
i) **Haloperidol Structure**



USES: - It is a Major Tranquilizers and used to treat the following disease like------

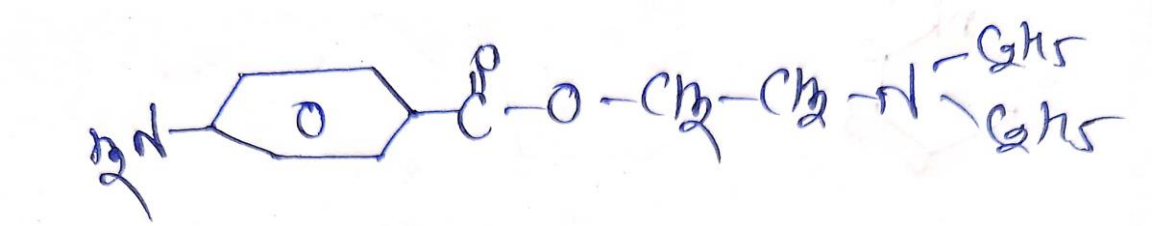
- Acute Schizophrenia, Mania, Hypomania & Behavioral Disturbances
- Treatment of Intractable Hiccups etc.

ii) Metronidazole Structure



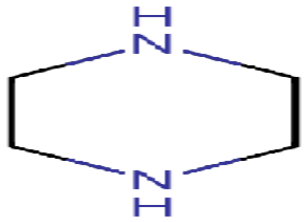
USES: - Used in treatment of Hepatic & Intestinal Amoebiasis, treatment of Trichomoniasis Vaginalis & treatment of Giardiasis & Septicemia etc.

iii) **Procaine Structure**



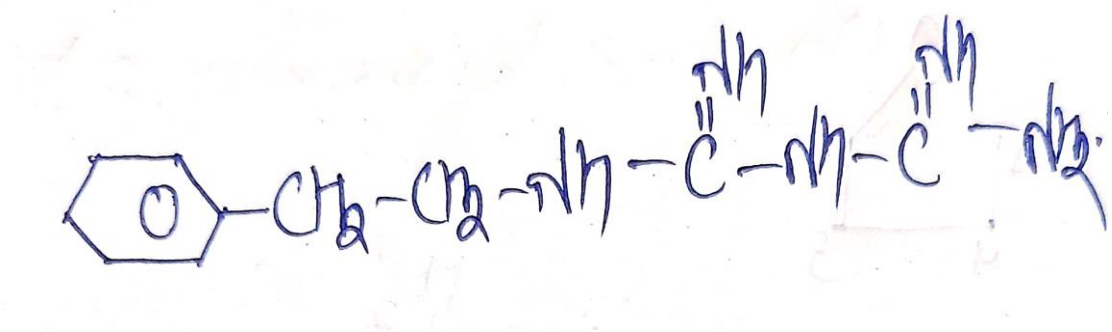
USES: - Used as local anesthetics, used for peripheral nerve block, and spinal nerve block etc.

iv) **Piperazine Structure: -**



USES: - Used to treat Roundworm and Pinworm Infestations etc.

v) **Phenformin Structure**



USES: - Used for the treatment of Type II Diabetes mellitus.

2. (A) Classify diuretics on chemical basis with suitable examples. [4]

Diuretics are the medications that increase the rate of formation & flow of urine (diuresis). These drugs work by removing sodium and chloride from the body thought urine. so, diuretics are used effectively for the treatment of hypertension.

Classification-

(a) **Cyclic Poly Nitrogen Compounds**

- Xanthine Derivatives: - Aminophylline, Theophylline
- Pteridine Derivatives: - Triamterine
- Pyrazine Derivatives: - Amiloride

(b) **Organomercurials: -** Mersalyl & Mercaptomerin

(c) **Sulphonamides**

- 1,3,4- Thiazole Derivatives: - Acetazolamide
- Sulfamoyl Benzoic Acid: - Frusemide
- Thiazide & Hydro thiazide Derivatives: - Hydrochlorothiazide, Chlorothiazide
- Miscellaneous: - Chlorthalidone

(d) **Steroidal Aldosterone Antagonists: -** Spironolactone

(e) **Phenoxy Acetic Acid Derivatives: -** Ethacrynic Acid

(f) **Acidifying Salt:** - Ammonium Chloride

(g) **Osmotic Agents**: - Urea & Mannitol

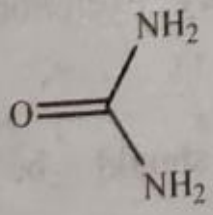
(B) Write the physical and chemical properties, stability and storage and uses of Furosemide & Urea

[4×2]

Urea

Urea is formed in the liver from ammonia produced when the amino acids undergo deamination. It is the major end product of protein catabolism and constitutes about one half of the total urinary solids.

Chemical Structure



Molecular Formula: NH_2CONH_2

IUPAC Nomenclature: Urea

Properties: Urea occurs as white coloured crystals or pellets with a characteristic odour and saline taste. It is very soluble in water and alcohol; and insoluble in benzene.

Uses: Urea is used for hydrating skin, accelerating fibrin degradation, breaking down keratin, and for decreasing the thickness of stratum corneum. It is used as an antipruritic, and in scaling conditions such as ichthyosis.

Stability and Storage Conditions: Urea is hygroscopic in nature, thus should be stored in closed or sealed bags on pallets in cool, dry, well-ventilated areas.

Types of Pharmaceutical Formulations: Creams, gels, and lotion.

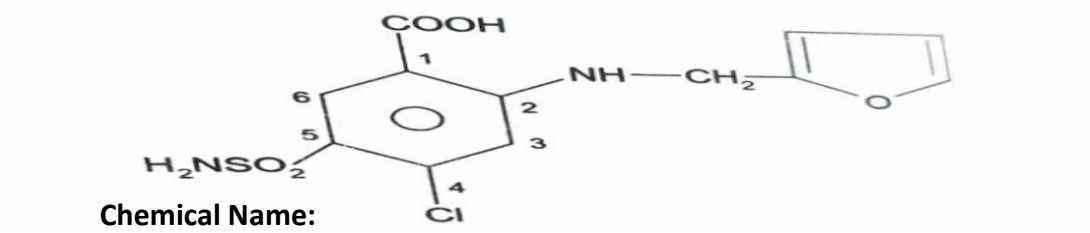
Brand Names: Ureativ, Clobadis, and Lobate-s.

(C) What are high ceiling diuretics? Write the structure of one High ceiling diuretic [2+1]

High-ceiling diuretics may cause a substantial diuresis – up to 20% of the filtered load of NaCl (salt) and water. This is large in comparison to normal renal sodium reabsorption which leaves only about 0.4% of filtered sodium in the urine. Loop diuretics have this ability, and are therefore often synonymous with high-ceiling

diuretics. Loop diuretics, such as furosemide, inhibit the body's ability to reabsorb sodium at the ascending loop in the nephron, which leads to an excretion of water in the urine, whereas water normally follows sodium back into the extracellular fluid. The different Examples are: - Furosemide, Torsemide & Ethacrynic Acid etc.

Structure of Furosemide: -



Chemical Name:

4-chloro-2-furfuryl amino-5-sulphamoyl Benzoic acid

3. (A) Define tranquilizers? Classify them with suitable examples. Write down uses of tranquilizers

[2+4+2]

Tranquilizers refer to an drug which is designed for the treatment of Anxiety, Fear, Tension, Agitation & Disturbances of mind, specially to reduce Stages of Anxiety & Tension without inducing sleep. These are the drugs which produce selective CNS depression.

Classification of Tranquilizers

a) **Major Tranquilizers/ Anti-Psychotic Agents**
   - Tricyclic Compounds
     - Phenothiazine Derivatives:- Chlorpromazine, Prochlorperazine & Triflouroperazine
     - Thioxanthine Derivatives:- Chlorprothixine
   - Butyrophenone Derivatives:- Haloperidol
   - Lithium Salts:-Lithium Carbonate
   - Thioxanthenes:-Thiothixene
   - Indole Derivatives:- Oxypertine
   - Miscellaneous:- Reserpene

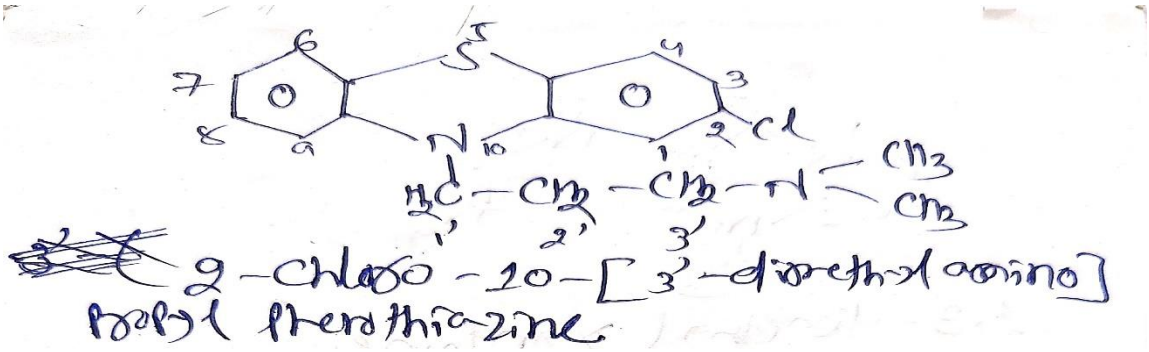
b) **Minor Tranquilizers/ Anxiolytics**
   - Benzodiazepines:- Diazepam, Lorazepam & Chlordiazepoxide
   - Propanediol Derivatives:- Meprobamate

Uses of Tranquilizers

- ✓ Used in treatment of Schizophrenia, Mnia, Senile Dementia
- ✓ Counteract Hallucination, Delusion, Calm the Excitement
- ✓ Facilitate Social Adjustment of patient
- ✓ Controll the effects of Stress, Feeling of Discomfort, Tension & Dysphoria etc.

(B) Write a brief account on different phenothiazine class of tranquilizers [7]

- **Chlorpromazine**



Uses: - Used in treatment of ----------

- Schizophrenia, Mania & Hypomania
- Control Nausea & Vomiting
- Control the Intractable Hiccup etc.

Brand Names: - CAIN, EMETIL etc.

- **Prochlorperazine**

Properties: - It occur as Clear, Pale Yellow, Viscous Liquid, slightly soluble in water

Storage: - Kept in well closed Containers, protected from light

Uses: - Used in treatment of ----------

- Schizophrenia, Mania & Hypomania
- Control Nausea & Vomiting

Brand Names: - ACUVERT, SETIL etc.

- **Trifluoperazine**

Properties: - It occur as Pale-Yellow crystalline powder, odourless, Bitter taste & high soluble in water

Storage: - Kept in well closed Containers, protected from light

Uses: - Used in treatment of ----------

- Schizophrenia, Mania, Hypomania, Anxiety & Tension
- Control Nausea & Vomiting

Brand Names: - ANXTRI, CYNOSLEEP etc.

4. (A) Define sympathomimetic and adrenolytic drugs. Write their uses. Classify adrenergic drugs chemically with examples [4+2+4]

Sympathomimetic Drugs

The Drugs that mimic the action of sympathetic Nervous System / the drugs that produce similar pharmacological effects like Adrenaline or Nor-Adrenaline/ Drugs which bring about stimulation of Adrenergic nerves are called sympathomimetic drugs.

Adrenolytic Drugs

The drugs which block the response of Adrenaline or Nor-Adrenaline / the drugs which antagonize the receptor actions of Adrenaline are called as Adrenergic Blockers/ Adrenolytic Drugs etc.

Uses of Sympathomimetic Drugs

- ✓ Used in emergency treatment of Anaphylactic shock
- ✓ Give relieve in Bronchial Spasm in Acute Asthma
- ✓ Used in treatment of Allergic Reaction etc.

Uses of Adrenolytic Drugs

- ✓ Stimulate Gastric Secretion
- ✓ Treatment of Arteriosclerosis, spasm, Peripheral Vascular Diseases
- ✓ Treatment of Thrombophlebitis etc.

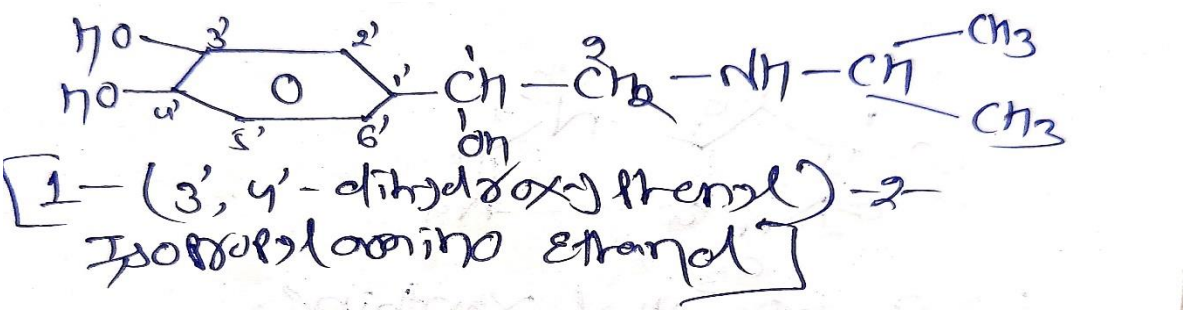
Chemical Classification of Adrenergic Drugs

- ➢ Catecholamines: - Adrenaline, Nor-Adrenaline, Isoprenaline
- ➢ **Non-**Catecholamines
  - ▪ Contain Phenyl-Ethylamine Skeleton
    - With Phenolic Group: - Salbutamol
    - Without Phenolic Hydroxy Group:- Ephedrine
  - ▪ Aliphatic Amine: - Cyclopentamine
  - ▪ Imidazoline Derivatives: - Naphazoline

(B) Write the structure, chemical name, uses, pharmaceutical formulations and popular brand name of

Isoprenaline **[5]**

Structure with Chemical Name of Isoprenaline



Uses: -

- ✓ Used for treatment of Symptomatic relief of Bronchial Asthma
- ✓ Treatment of Bradycardia in patients with Heart Block

Pharmaceutical Formulations: -

- ✓ Isoprenaline HCl Injections B.P
- ✓ Isoprenaline Aerosol Inhalation B.P
- ✓ Isoprenaline Tablets I.P

Brand Names: - ISOLIN, ISOPRIN & AUTOHALER etc.

5. Define analeptics. Classify them. Write the structure, nomenclature, popular brand name, uses of

(i) Theophylline (ii) Caffeine (iii) Coramine [2+4+3+3+3]

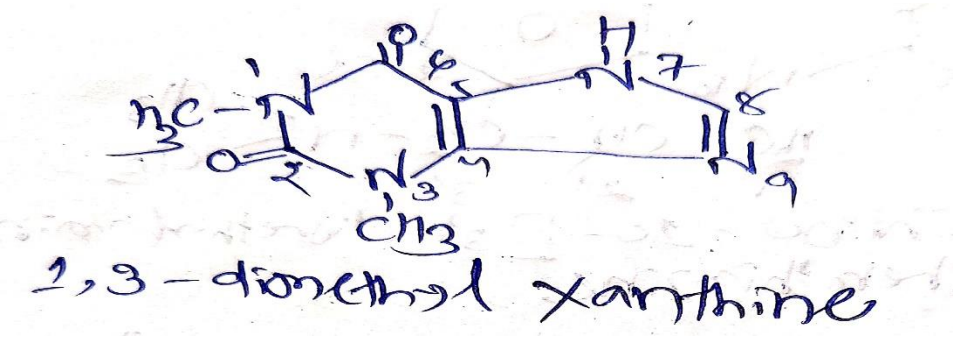
Analeptics: -

Drugs which increase the activity of various functions of Central Nervous systems are called as Central Nervous System Stimulants/ Analeptics. They lessen Narcosis, restore depressed functions of CNS & bring about Respiratory Stimulations.

Classification of Analeptics: -

- ➢ Natural Compounds: - Caffeine, Theophylline & Coramine
- ➢ Synthetic Compounds: - Nikethamide, Dexamphetamine & Leptazol

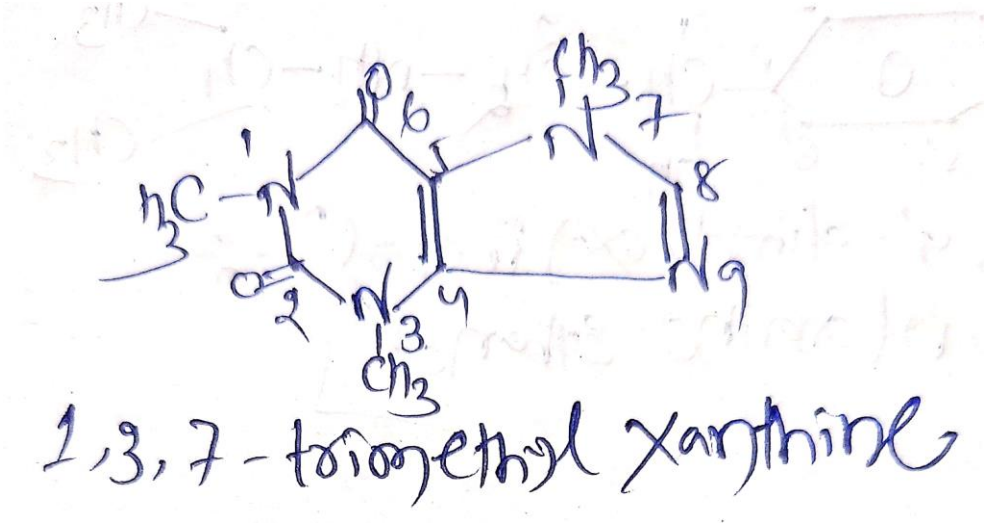
Structure & Nomenclature of Theophylline



Brand Names: - PHYLOBED & ALERGIN.

Uses: - Widely used in treatment of Bronchial Asthma, diseases of Cardio-Vascular System.

Structure & Nomenclature of Caffeine

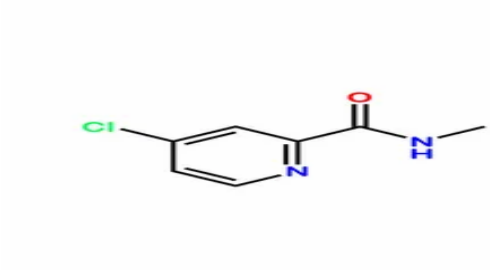


Brand Names: - VIVARIN & LUCIDEX

Uses: - Widely useful for----------

- ✓ Producing a state of wakefulness
- ✓ Enhancing Mental Activity
- ✓ Useful for stimulation of Respiratory Centre
- ✓ Used in treatment of Neuralgia, Rheumatism & Migraine etc.

Structure & Nomenclature of Coramine



4-Chloro-N-methyl-2-Pyridine Carboxamide

Brand Names: - CORAMIN & MIKETHYL

Uses: - Widely useful for----------

- ✓ Producing a state of wakefulness
- ✓ Enhancing Mental Activity
- ✓ Increase breathing rate as well as the sensitivity to CO2 of the respiratory center

- ✓ Increases myocardial contractility and blood pressure

6. (A) Define analgesic, antipyretic & anti-inflammatory agent [3 x 2]

Analgesic:-

The drug which decreases the sensitivity of pain by depressing CNS without loss of Consciousness are called as Analgesics/ True Analgesics. These drugs increase the capacity to tolerate pain.

Anti-Pyretic:-

The drugs which lower the raised body temperature and bring it to normal are called as Anti-Pyrectics. These drugs have no effect on normal body temperature in therapeutic doses.

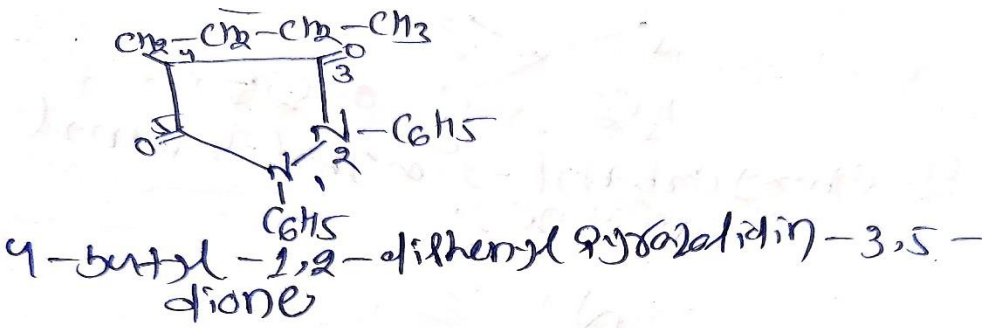
Anti-Inflammatory Agents: -

The drugs which are used to reduce Inflammation and pain arising from it are called as Anti-Inflammatory Agents/ The drugs which are used in treatment of Arthritis, Rheumatoid Arthritis & Spondylitis are also called as Anti-Inflammatory Agents.

(B) Write the structure, chemical name & uses of following drugs [3 x 3]

i) Phenylbutazone ii) Paracetamol iii) Pethidine

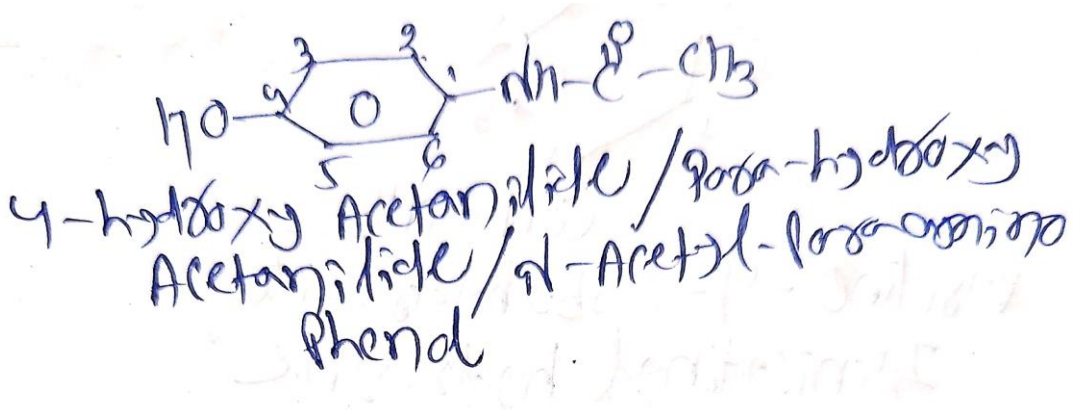
Structure & Chemical Name of Phenylbutazone



Uses:- Used in treatment of ----------

- ✓ Rheumatoid Arthritis
- ✓ Osteoarthritis
- ✓ Acute Gout
- ✓ Dysmenorrhoea
- ✓ Acute musculo-skeletal disorders like Lumbago, Neck pain & Myalgia etc.

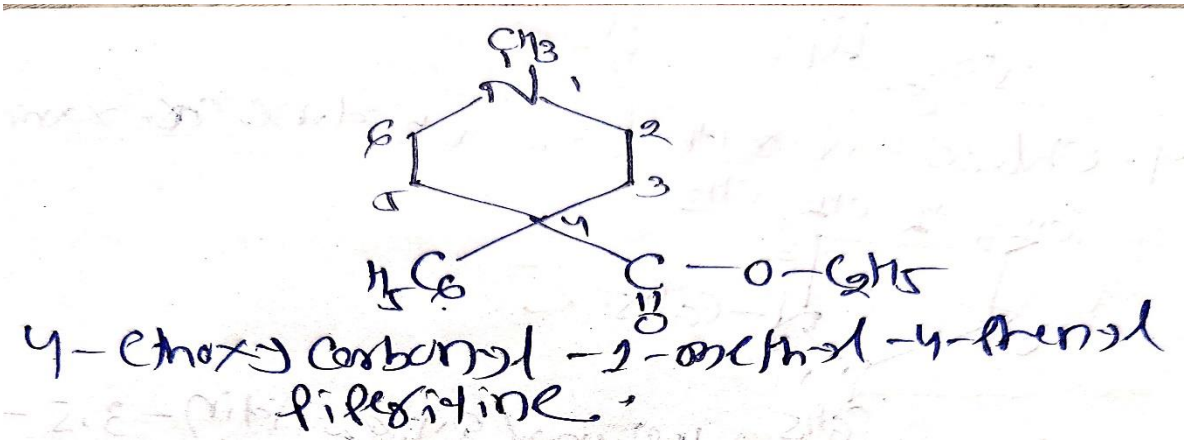
Structure & Chemical Name of Paracetamol



Uses:- Used as------

- ✓ An Anti-Pyretics
- ✓ An Analgesics for relief of pain such as Head ache, Toothache, Neuralgia & Rheumatism etc.

Structure & Chemical Name of Pethidine



Uses:- Used in treatment of------

- ✓ Moderate to severe pain in spastic condition of Intestine, Uterus, Urinary bladder & Brochi
- ✓ Abstinence Syndrome
- ✓ Used as an Analgesics during Labor pain etc.

7. What do you mean by Tuberculosis? Classify Antitubercular drugs. Why combination therapy is preferable for treatment of tuberculosis? [2+3+1]

Tuberculosis (TB)

It is an Infectious disease characterized by growth of nodules/ tubercules in the tissue of Lungs. It is caused by basically Mycobacterium tuberculosis / Mycobacterium bovis. Primary infection site is Lungs. TB infection occur as a result of inhalation of infected droplets.

Classification of Anti-TB Drugs

- **First Line Drugs: -** Ethambutol, Rifampicin, Isoniazid, Pyrazinamide etc.
- **Second Line Dugs: -** Kanamycin, Cycloserine, PAS, Ethionamide, Amikamycin, Thioacetazones
- **Newer Drugs: -** Azithromycin, Ciprofloxacin & Ofloxacin
- **Recent Drugs: -** Bedaquiline, Delamanid & Pretomanid

Combination Therapy for TB

Treatment of TB is a continuous & lengthy process. Since complete elimination of Mycobacterium from the body take long time. Drugs are given for a longer period of time hence resistance by mycobacterium is developed. So the drugs became useless and we have to changed another new drugs. Also, Mycobacterium done remarkable changes in body like----------

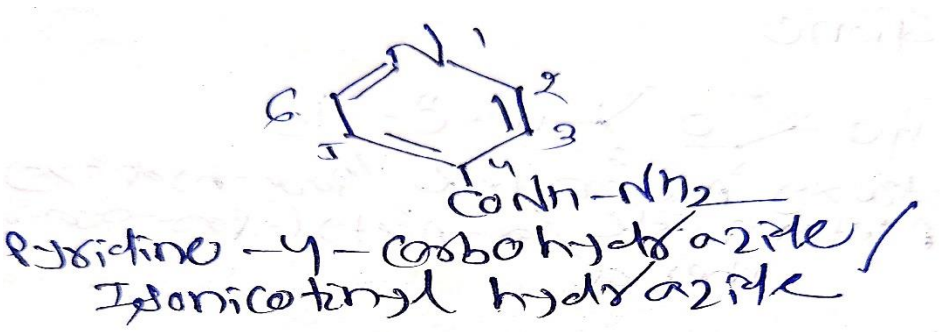
- ✓ Rapidly growing with high boiling load stage
- ✓ Slow growing stage
- ✓ Spurters Stage
- ✓ Dormant Stages

So for this reason for treatment of TB, we generally prefer Combination of Drugs.

Write the structure, Nomenclature, popular brand name & uses of the followings:

i) INH ii) PAS iii) Ethambutol [3×3×3]

Structure & Nomenclature of INH: -

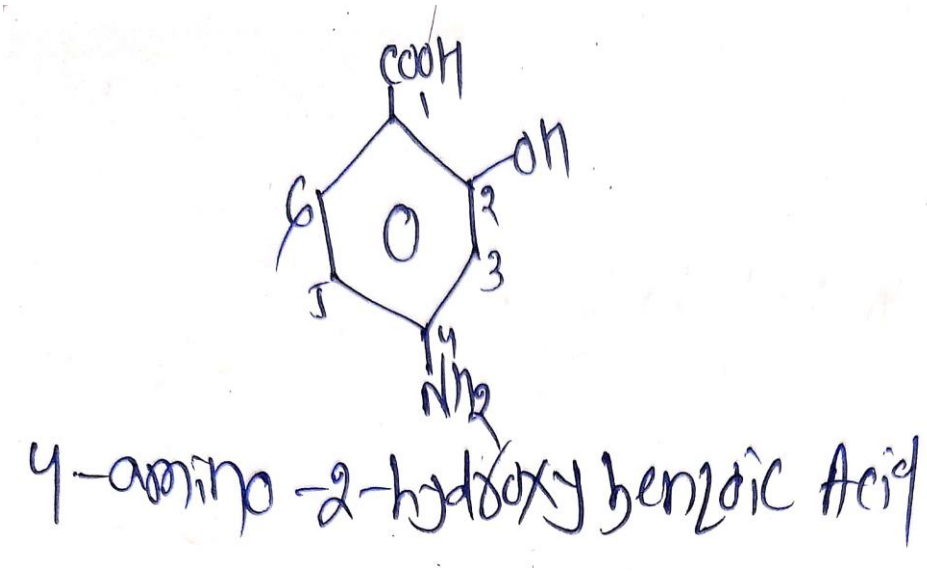


Brand Names: - ISOKIN, INSONEX & HYCOZID etc.

Uses:-

- ✓ Used as Antibacterial Tuberculostatic
- ✓ Used in treatment of Pulmonary TB
- ✓ Used in treatment of Lupus Vulgaris etc.

Structure & Nomenclature of PAS: -

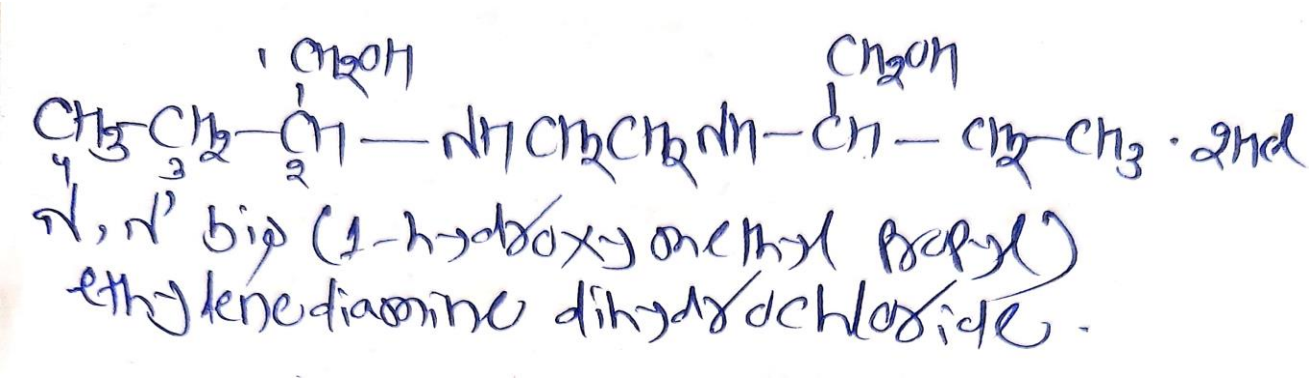


Brand Names: - PARASAL, APAS & PAMISYL etc.

Uses:-

- ✓ Used in treatment of Pulmonary TB with combination of other Anti-TB drugs
- ✓ Used in treatment of Lupus Vulgaris
- ✓ It delays the development of resistance to TB drugs

Structure & Nomenclature of Ethambutol: -



Brand Names: - COMBUTOL, TIBUTOL & MYAMBUTOL etc.

Uses: -

- ✓ It is given by orally /by injection along with Isoniazid & Rifampicin
- ✓ Used in treatment of Pulmonary TB
- ✓ Used in treatment of Pulmonary TB when resistant to Isoniazid& Streptomycin etc.

MODEL ANSWER

D.PHARM-II (ER-1991) 2022 SPECIAL EXAMINATION

PHARMACEUTICS-II (T)

1. (A) Define the following terms

(i**) Liquification** – "Liquification" refers to the process of transforming a substance or material from a solid or gaseous state into a liquid state. This transition occurs when a substance's temperature or pressure changes to reach the point at which it becomes a liquid.

(ii**) Pyrogen** – pyrogen are the metabolic byproduct of microorganism .

(iii) **Co-solvency** - It is defined as water-miscible organic solvents that are used in liquid drug formulations to increase the solubility of poorly water-soluble substances or to enhance the chemical stability of a drug.

(iv) **proof spirit** – Any alcoholic solution which contains 57.1%V/V alcohol is a proof spirit and is said to be 100 proof.

(v) **Effervescences** - Effervescence is the escape of gas from an aqueous solution and the foaming or fizzing that results from that release.

(vi) **Zeta-potential** - Zeta potential is the charge that develops at the interface between a solid surface and its liquid medium.

(vii**) Liniments** – It is a liquid or semiliquid preparations meant for external application to the skin by rubbing or friction but should not be applied to the broken skin.

(viii**) Snuffs** – It is the finely divided solid dosage form of medicament which are inhaled into the nostrils for their antiseptic, decongestion or bronchodilator action.

(ix) **Wafer capsule** – It is the solid unit dosage form of medicament in which the drug is enclosed in a tasteless sheet made by pouring a mixture of rice flour and water between two hot polished revolving cylinders.

(x**) Linctus** – It is the sweet, viscous liquid preparations usually containing medicinal substances which have demulcent, sedative or expectorant action.they are used for the treatment of cough.

(xi**) synergism** – when two or more drugs are used in the combined form their action is either increased or decreased depending on the drugs used in the combination. when the potency or duration of action is increased, the phenomenon is called synerigsm.

(xii) **Tachyphylaxis** – When a drug administered repeatedly at very short interval the cell receptors get blocked up and pharmacological response to that particular drug is decreased.

(xiii) **Emulsifying agent** – Emulsifying agents are also known as emulgents of emulsifier. They reduce the interfacial tension between the two phases i.e aqueous phase & oil phase thus make them miscible with each other and form a stable emulsion.

(xiv) **Inscription** – it is the main part of the prescription in which the base, adjuvant and vehicle and dose of medicament is written.

(xv**) Purgative - A purgative, also known as a laxative, is a substance or medication that is used to promote bowel movements and relieve constipation. Purgatives are typically taken orally and work by stimulating the intestines or softening the stool, making it easier to pass.**
-

B) Translate the following into English

i) mitte tales – send such

ii) auris laevus – left ear

iii) dolore urgent – when the pain is severe

iv) jentaculum – at breakfast

v) post cibos – after meal

2. What is Suppository ? classify different bases of suppository ? Describe briefly each bases ?

Answer – suppositories are the solid dosage form of medicament meant for insertion into the body cavities other than mouth. They may be inserted into rectum, vagina or the urethra. These products are so formulated that after insertion, they will either melt or dissolve in the cavity fluids to release the medicament.

There are three types of suppositories bases

i) oily bases

ii) water soluble and water miscible bases

iii) emulsifying bases

OILY BASES –

i) Theobroma oil – it is also known as cocoa butter. It is obtained from the crushed and roasted seeds of theobroma cocoa. It is a yellowish white solid which becomes white on storage. It has butter like consistency and chocolate like odour. It has a melting point of 30-35 degree centigrade. It is a mixtures of glyceryl esters of stearic, palmitic oleic & other fatty acids.

Theobroma oil is most widely used suppository base since it melts at body temperature and release the medicaments in the body cavity fluids for rapid absorption. It is a good base for rectal suppository.

ii) Emulsified Theobroma oil – it may be used as a base when large quantities of aqueous solutions are to be incorporated. Several agents have been used to form emulsified theobroma oil suppositories. The use of 5% glyceryl monostearate, 10% lanette wax, 2-3% cetyl alcohol, 4% bees wax and spermaceti upto 12% is recommended for emulsified theobroma oil suppositories.

iii) Hydrogenated oils- As a substitute of theobroma oil a number of hydrogenated oils i.e hydrogenated edible oil,coconut oil,palm kernel oil,hydrogenated pea oil,stearin and a mixture of oleic and stearic acids are recommended

it has some advantages that

- Overheating does not affect the solidifying point.
- They are resistant to oxidation.
- Their emulsifying and water absorbing capacities are good
- Lubrication of the mould is not required.
- They produce colorless, odourless and elegant suppositories.

It has some disadvantages also

- On rapid cooling in the refrigerator they become brittle.
- When melted they are more fluid than theobroma oil and result in greater sedimentation of the added substances.

WATER SOLUBLE AND WATER MISCIBLE BASES

i) Glycero-Gelatin – this is a mixture of glycrin and water which is made stiff by the addition of gelatin. The stiffness of the mass depends upon the proportion of gelatin used which is adjusted according to the purpose for which the preparation is intended.it is hydrophilic in nature, slowly dissolves in the aqueous secretions and provide a slow continuous release of medicament. This base is specially used for vaginal suppositories.

ii) Soap Glycerin suppositories – in glycerogelatin base the gelatin is replaced with either curd soap or sodium stearate which makes the glycerin sufficiently hard for suppositories and a large

quantity of glycerin upto 95% of the mass can be incorporated further the soap helps in the evacuation action of glycerin whereas gelatin does not.

iii) Polyethylene glycol – this polymers are widely used in the extemporaneous preparations & commercial manufacture of suppositories. They are commonly known as carbowaxes and polyglycols. They have different molecular weight.those have 200-1000mw are liquids and those have higher than1000mw are wax like solids. They are chemically stable and physiologically inert substances and do not allow bacterial or mold growth to take place.

EMULSIFYING BASES-

These are synthetic bases

i) Massa Esterinum – this is also known as adeps solidus. It is a mixture of mono, di & triglycerides of saturated fatty acids. It is a white, brittle , almost odourless and tasteless solid. It melts at 33.5 to 35.5°C. several grades of mass esterinum are available but grade B is recommended for general dispensing.

ii) witepsol – they consists of triglycerides of saturated vegetable oil with varying proportions of partial ester. A small amount of beeswax is added for use in hot climates. It should not be ice cooled because they may brittle.

iii) Massuppol – it consists of glyceryl esters mainly of lauric acid. To which a small amount of glyceryl monostearate has been added to improve its water absorbing capacity.

3. What are mixtures? Classify different types of mixtures.Describe the methods of dispensing of mixture containing.

a) indiffusible solids b) precipitate forming liquids.

Answer- A mixture is a liquid preparation intended for oral administration in which drug or drugs are dissolved, suspended or dispersed in a suitable vehicle & generally several doses are contained in a bottle.it may be homogeneous or heterogeneous.

CLASSIFICATION

Mixtures may be classified as

i) simple mixture

ii) mixture containing diffusible solids.

iii) mixture containing indiffusible solids

iv) mixture containing precipitate forming liquids.

v) mixture containing slightly soluble liquids

vi) miscellaneous mixtures.

A)**mixture containing indiffusible solids** – indiffusible solids are those substances which do not dissolve in water and do not remain evenly distributed in the vehicle for sufficiently long time to ensure uniformity of the measured dose. This difficulty is overcome by increasing the viscosity of the vehicle for which purpose suspending agents are used. The two suspending agents are (a)compound tragacanth powder which is used in the ratio 2gm per 100ml of the suspension (b)tragcantha muscilage, it is used in the ratio of $1/4^{th}$ of the volume of the suspension to be prepared and when only vehicle is chloroform water or water because mucilage is prepared by using chloroform water & if added to preparation containing medicinally active vehicle may replace some of the medicinally active vehicle thereby decreasing their activity. In such cases compound tragacanth powder must be used as suspending agent. Indiffusible solids i.e aspirin , aromatic chalk powder phenobarbitone etc.

B) **Mixture containing precipitate forming liquids-** in this type of preparation the highly diluted solutions of the reacting substances are mixed together so as to form very finely divided precipitates so formed are generally diffusible in nature therefore there is no need of adding any suspending agent.

Precipitate forming liquids include compound benzoin tincture, benzoin tincture , lobelia ethereal tincture, tolu tinctur. These liquids are not only insoluble in water but they form indiffusible precipitates particularly when salts are present. They contain resinous matter and when mixed with water lead to precipitation of the resin and may stick to the sides of the bottle which is difficult to rediffuse by shaking. so prevent this type of difficulty a suspending agent like compound tragacanth powder or tragacanth mucilage should be added.

4. Write short notes on any two of the following

i) Evaluation of the parenteral preparation – in the preparation of parenteral products strict quality control tests must be carried out throughout the entire process of preparation of a parenteral preparation to give assurance to that final product meets the required standards.

The following tests are

(i) sterility test – all parenteral preparations are required to be sterile, they should be tested for sterility and must comply with the official test for sterility described in U.S.P. According to this two basic methods for sterility testing are (a) Diect inoculation of test sample on culture media (b) filteration techniques

In this direct inoculation technique an aliquot quantity of the material under test is transferred to culture tubes containing a measured volume of a suitable culture medium like fluid Thioglycolate medium or Thioglycolate broth medium. This whole operation must be carried out under aseptic conditions. These tubes are plugged with sterilized cotton wool and incubated for seven days at a temperature of 30-35°C. the material under test is considered sterile if there is no growth of microorganisms in the tubes but if there is any turbidity or growth of micro-organisms in the tube the test must be repeated 2^{nd} time with fresh sample & so on for 3^{rd} time if this time growth appears then the material fails to pass the sterility test.

(ii) pyrogen test – pyrogens are metabolic byproducts of micro-organisms and are produced by all micro-organisms. In this test rabbits are used as test animals because they show similar physiological response to pyrogenic substances like that of man but the rabbits are very sensitive to external stimuli, therefore they must be handled carefully. Only the healthy and mature rabbits should be used.

The test is made by introducing a suitable quantity of the sample to be tested into the ear vein of the rabbit. Rectal temperature is noted at 1,2 and 3 hours after giving injection. If there is any rise in temperature of 0.6°C or more above the normal temperature which has been taken before giving the injection, then the test is positive and the preparation contains pyrogen. If the rabbits do not show any rise in temperature then the product is consider free from pyrogen. Generally 5-8 rabbits are used for this test and average is calculated.

(iii) clarity test – the presence of particulate matter in parenteral preparations particularly those which are given intravenously are serious concern. The particle larger than the size of red blood cells are dangerous, they may block the blood vessel with serious results. During preparation of injection particulate matter may enter from environment.

For checking the clarity of single dose or multi dose packagings the unlabeled containers are held by the neck against strongly illuminated screen of which white surface is used for dark coloured particles & black surface for the detection of light coloured particles. The contents of the containers ae slowly inverted and otated and the solution examined for the presence of turbidity, dust or other foreign materials. If any particulate is visible , the package is rejected.

(iv) leaker test – all the ampoules which have been sealed by fusion must be subjected to leaker test to check that there should not be any passage for leaking of the contents from the container. This test is performed by dipping the ampoules in a deeply coloured dye solution for which 1% solution of methylene blue is used. The whole process is carried out in a vacuum chamber under negative pressure. When the vacuum is released the coloured solution will enter the ampoules with defective sealing. After careful washing of ampoules from outside, the dye can be seen in the leaker ampoules.

(ii) formulations of eye drops- Eye drops are sterile aqueous or oily solutions or suspensions for instillation into the eye. They are usually applied into the space between the eyeball and eyelids or on to the corneal surface.

Most of the eye drops contains aqueous vehicles rather than oily vehicles. Aqueous eye drops may support bacterial and fungal growth therefore these must be preserved by adding a suitable preservative for which purpose phenylmurcuric nitrate or acetate 0.002%, benzalkoniumchloride 0.01% and chlorhexidine acetate 0.01% may be used. Phenyl mercuric nitrate should not be used in eye drops which are intended for prolonged treatment and benzylkonium chloride is not suitable as a preservative for eye drops containing local anesthetics.

The eye drops must be protected fro contamination during use and must be used within two weeks after first opening of the container. Due to this reason eye drops prescribed in small amounts. i.e 5-10ml. it should be dispensed in glass or suitable plastic containers with screw cap fitted with rubber teat and glass dropper for easy application of the drops or containers may be fitted with nozzle. Eye drops should not be used after one week after opening of the container.

(iii) Various additives used in the preparation of shampoo –

1. Opacifiers – It is used to make the shampoo opaque. Such substances include esters such as glycol and glyceryl stearate and higher alcohols such as cetyl and stearyl alcohol, stearate soaps & waxy alkideamides such as stearic amides.

2. Solubilizing agents- it is used to solubilize poorly soluble substances so as to get a clear shampoo.it includes ethyl alcohol, glycerol, propylene glycol and diethylene glycol monoethyl ether.

3. Thickening agent - it is used to increase the viscosity of the shampoo and provide the consistency to the preparation. Sodium stearate and stearic amide are excellent thickening agents for cream type shampoo. Polyvinyl alcohol , methyl cellulose and sodium alginate are also used for this purpose.

4. Conditioning agent- it is used to improve the manageability and texture of the hai. Various oil, fatty alcohols, glycol esters, humectants and protein derivatives are used for this purpose. Lanolin & its derivatives are also used as hair conditioners.

5. Preservatives – shampoos prepared with surfactants must be suitably preserved because such preparations lead to bacterial and mold growth. Methyl paraben and propyl paraben are commonly used preservatives in shampoos.

5. (a) what do you mean by incompatibility ? Describe different types of incompatibility. Discuss regarding alkaloidal incompatibility their methods of correction .

Answers- A Pharmaceutical incompatibility may be defined as the result of prescribing or mixing the substances which are antagonistic in nature & an undesirable product is formed which may affect the safety, purpose or appearance of the preparation.

There are three types of incompatibility i.e

- Physical incompatibility
- Chemical incompatibility
- Therapeutical incompatibility

Alkaloidal incompatibility their method of correction

1. alkaloidal salts with alkaline substances – most of the alkaloidal salts are soluble in water but alkaloidal bases are partially insouble in water and free soluble in organic solvents.

When an alkaline substances like sodium bicarbonate, potassium bicarbonate is added to an alkaloidal salt solution the free alkaloid may be precipitated, because all alkaloids are slightly soluble in water.

Rx

Strychnine hcl solution	6ml
Aromatic spirit of ammonia	4ml
Water	120ml

Make a mixture

In this prescription strychnine hcl is an alkaloidal salt and aromatic spirit of ammonia is an alkaline substance. When they react together the precipitates of strychnine are formed because the quantity of strychnine hcl prescribed is much more than its solubility, moreover the amount of alcohol present in aromatic spirit of ammonia is also negligible, hence strychnine gets precipitated. It forms diffusible precipitates so follow method A.

2. Alkaloidal salts with soluble iodides – Potassium iodide is generally prescribed as an expectorant in some of the cough mixtures also containing alkaloids but incompatibility of alkaloids present (e.g emetine from ipecacuanha tincture) is usually so low that the precipitation of hydrochloride is unlikely to take place.

Strychnine when combined with soluble iodides forms a very insoluble hydrochloride the precipitates of which are diffusible hence follow method A.

3. Alkaloidal salts with tannins - when an alkaloidal salt is combined with drug containing tannins, the alkaloids forms tannates which are indiffusible in water & precipitates so formed are usually diffusible in nature therefore follow method A for precipitate yielding combinations.

4. Alkaloidal salts with salicylates –

Rx

Quinine hcl	130mg
Sodium salicylate	4gm
Water	90ml

when quinine compounds are prescribed with salicylates in the treatment of malaria. It forms indiffusible precipitates of quinine salicylate therefore follow Method B.

(b) Describe on geometric dilution of powders.

Answer- The invariable rule is to add a small amount of the substance present in greater amount to whole of the substance present in smaller amount (generally potent substance) and mix thoroughly. The remaining of the substance present in larger amount is then incorporated gradually in small quantities at first which are subsequently increased until whole of it has been added, this method is known as geometric dilutions which may explained that as follows

100mg of any potent drug is mixed with 900 mg lactose

The best method is to take out

100mg of lactose from bulk and mix it with 100 mg of drug =200 mg of mixture

200 mg of lactose and mix it with 200 mg of mixture =400 mg of mixture

400 mg of lactose and mix it with 400 mg of mixture = 800 mg of mixture

To this 800 mg mixture add whole of the remaining lactose and mix thoroughly so as to get a uniform powders.

6. Define suspension. Explain different types of additives used in the formulation of suspension. Differentiate between flocculated and non-flocculated suspension?

Answer – suspensions are the biphasic liquid dosage form of medicament in which the finely divided solid particles ranging from 0.5 to 5.0 micron are suspended or dispersed in a liquid or semi solid vehicle. The solid particles constitute the discontineous phase whereas the liquid vehicle constitutes the continuous phase.

There are following additives used in the formulation of suspensions i.e.

1. flocculating agent

2. suspending agent/ thickening agents

3. wetting agents

4.dispersing agents

5.preservative

6.organoleptic additives

1.flocculating agents - when formulating suspensions it must be ensured that the particles are well dispersed in the vehicle. The dispersion can be improved by adding a surfactant which will act by reducing the interfacial tension. Example – if surfactants with negative charges are absorbed on the particles ,prevents or minimizes flocculation in the presence of positive ions because of natural repulsion of like charges, example sodium lauryl sulphate . non – ionic surfactant also usually assume a negative charge in solution thereby act as effective flocculating agents. Examples- tweens, spans, and carbowaxes.

2. suspending agent/ thickening agents – these are the substances which are added to a suspension to increase the viscosity of the continuous phase so as that the particles remain suspended for a sufficiently long time and it becomes easy to measure an accurate dose. While selecting a suspending agent it is not only important that it should increase the viscosity of the system but the pourability , spreadability etc. example- acacia, tragacanth ,sodium alginate.

3. wetting agents – these are the substances which reduce the interfacial tension between the solid particles and liquid medium thus producing a suspension of desired quality. this may be achieved by adding a suitable wetting agent which is adsorbed at solid/liquid interface in such a way that the affinity of the particles for the sorrounding medium is increased and the interparticular forces are decreased. Example- alcohol in tragacanth mucilage, glycerin and glycol in sodium alginate.

4. Dispersing agent- The first step in the formulation of any suspension is to ensure that the particles may come together and form larger particles. To overcome this difficulty the substances which are used are known as dispersing agent. They carry good charge and are easily adsorbed on to the disperse phase particles. These substances increase the zeta potential and do not allow the particles to come together to form large particles.

5. preservative – the presence of suspending agents and medicaments which are liable for bacterial growth makes it necessary to incorporate a preservative in suspension. they should be chemically and physically stable.it should be non toxic and compatible with other added medicaments. Example- benzoic acid, sodium benzoate, methyl paraben and propyl paraben.

6. organoleptic additives – colours , sweetening agents and flavouring agents are used in oral suspensions. Colours and perfumes are added in suspensions meant for external application but compatible with other ingredients.

flocculated	**Non-flocculated**
1. particles form loose aggregates & form a network like structure.	Particles exist as a separate entities.
2. Rate of sedimentation is high.	Rate of sedimentation is slow.
3.sedimentation is rapidly formed.	Sedimentation is slowly formed.
4. sediment is loosely packed and does not form a hard cake.	Sediment is very closely packed and a hard cake is formed.
5. sediment is easy to redisperse.	Sediment is difficult to redispersed.
6. suspension is not pleasing in appearance.	Suspension is pleasing in appearance
7.the floccules stick to the sides of the bottle.	They do not stick to the sides of the bottle.

7. Differentiate between :

a)

ointment	**paste**
1.Ointments are soft semisolid preparations meant for external application to the skin or mucous membrane.	Pastes are semisolid preparations meant for application to the skin.
2. it is used for their emollient and protective action.	They are less greasy than the ointment.
3.they usually contain a medicaments dissolves, suspended or emulsified in the base.	They contain large amounts of finely powdered Solids such as starch, zinc oxide, calcium carbonate.
4. ointments melts at normal body temperature.	Since paste are stiff they do not melt at ordinary temperature.

b)

Simple powder	**Compound powder**
A simple powder consists of a single active pharmaceutical ingredient (API) in a powdered form. It typically contains only one drug substance. Simple powders are used when a single medication needs to be administered in a powdered form, usually for immediate use or as part of a larger formulation, such as a capsule or tablet.	A compound powder, also known as a mixture or combination powder, contains two or more active pharmaceutical ingredients (APIs) mixed together in powdered form. Compound powders are used when multiple medications need to be combined into a single dosage form for convenience or when it is challenging to administer them separately.

c)

Type – I glass	**Type – II glass**
Type I glass is a specific type of glass used in the pharmaceutical and medical industries for the production of vials, ampoules, and containers for storing and packaging medications, vaccines, and other sensitive substances. It is known for its high level of chemical resistance and inertness, making it an ideal choice for pharmaceutical packaging, particularly for drugs that are sensitive to interactions with glass or require long-term storage.	Type II glass is another category of glass used in the pharmaceutical and medical industries for packaging and storing medications, vaccines, and other sensitive substances. Like Type I glass, Type II glass is designed to meet specific quality and performance standards, but it has some differences in terms of its chemical composition and characteristics. Type II glass is considered a more economical option compared to Type I glass, which tends to be costlier due to its higher chemical resistance.

d)

Cold cream	**Vanishing cream**
Cold creams are cosmetic preparations which are applied on the face. The name cold cream is given because of cooling effect of such products on the skin. They are generally prepared by emulisification of oils and water.	Vanishing creams are oil-in-water type emulsions which are prepared by emulsification of stearic acid and water by means of alkalies such as sodium hydroxide, potassium hydroxide, borax triethanolamine. Glycerin also added. Stearic acid is the most important constituent of vanishing cream hence a good quality stearic acid should be selected

e)

SVP (small volume parenteral)	**LVP (large volume parenteral)**
A small parenteral volume would usually indicate a relatively small volume of medication or solution that is injected or infused into the patient's body. These smaller volumes are often used for specific medical purposes, such as: bolus injection, intra muscular, subcutaneous injection etc.	A large parenteral volume would typically indicate a larger volume of medication or solution being injected or infused into the patient's body. Such larger volumes are often used for various purposes, such as: Intravenous (IV) infusions, Blood transfusions, Contrast media for imaging studies, etc.