MODEL ANSWER

SUBJECT: SOCIAL PHARMACY (ER:2020)

1.a) What is SARS & its mode of transmission, Symptoms & treatment, Role of pharmacist in prevention of the disease.

Ans. Severe acute respiratory syndrome (SARS) is a communicable viral disease, caused by a new strain of coronavirus.

Mode of transmission:

- Direct or indirect contact of mucous membrane of eyes, nose or mouth with respiratory droplets or fomite.
- The natural reservoir appears to be the horseshoe bat (which eats and drops fruits ingested by civets (wild cats), the presumed reservoir and amplifying host).
- The SARS virus can survive for hours on common surfaces outside of the human body, up to 4 days in human waste.
- The virus can survive at least for 24 hours on a plastic surface at room temperature, and can live for extended periods in the cold.
- The virus is shed in stools but the feacal – oral route transmission is unknown.

Symptoms:

The most common symptoms in patients progressing to SARS include fever, malaise, chills, headache, myalgia, dizziness, cough, sore throat and running nose. In some cases, there is rapid deterioration with low oxygen saturation and acute respiratory distress requiring ventilatory support.

Treatment: Further research is needed about it. Severe cases require intensive support. It may include

- Ribavirin (400- 600 mg/d and 4 g/d)
- Lopinavir/ritonavir (400 mg/ 100 mg)
- Interferon type 1 and immunoglobulin I.V and corticosteroids are used.

Role of Pharmacist: People should be

- Advised to stay at home (isolation) when they are suffering from the disease.
- Advised frequent hand washing.
- Educated to use the face mask.
- Advised to suspected person should remain isolated for a period of time equal to incubation period of the disease to prevent infection to others (quarantine).
- Educate the people regarding vaccination.

1.b) **Write about the primary causes of the air pollution. Describe the solid waste disposal process in brief.**

Ans. Air is the component of environment for all lives. It provides oxygen for respiration, carries sound and smell and helps in maintaining the body temperature. The air may contain disease causing organisms, dust, smoke and chemicals which when inhaled may cause sickness and deaths. Decomposition of organic matter, vehicles, industries and many other activities in the environment affect the air.

- The composition of air (Nitrogen, Oxygen, Carbon dioxide and dissolved gases etc.) is constant if there is not much pollution because of natural cleansing methods, but if there is gross pollution air is hazardous to health.

With the increase in human and animal population, industrialization, use of pesticides and other chemicals, the air is becoming more and more polluted.

- The air can be polluted in many ways, Industries are a source of air pollution especially chemical, metallurgy industries, fertilizer factories etc. A tremendous increase in the number of motor vehicles is very important source of air pollution specially in urban areas. Air pollution affects the most is respiratory system. The commonest disease due to prolonged exposure to pollutants is chronic bronchitis. Plants and animals are also very sensitive to air pollution.

Solid waste disposal:

It depends upon the circumstances prevailing in the area as the availability of land, persons and the money allocated for this activity. The following methods of refuse disposal are:

- The refuse is dumped in low areas and pits and the surface is made level and is suitable only for dry refuse. A trench is dug (large depressed land) or selected, the refuse is put in the trench and covered with earth every day and compacted. The refuse is fully decomposed at the end of 6 months and can be used as manure.

By alternate method, refuse and excreta is disposed of together and dumped in a pit, covered with earth, there is anaerobic decomposition and disease producing organisms also die because of heat and ultimately, we get compost which is used as manure.

- For Hospital refuse there is special equipment called incinerator (hollow cylinder) The refuse is put on the land and covered with the incinerator before burning to avoid spread during burning. The process is expensive.

Public must be aware of the hazards of indiscriminate refuse disposal and they should be educated. The policy makers like the international Solid wastes and Public Cleansing Association (ISWA) assists the countries in the improvement of these practices.

1.c) **Discuss about RCH programme & its major interventions Phase-I.**

Ans. Reproductive and Child health Programme (RCH) "People have the ability to reproduce and regulate their fertility, women are able to go through pregnancy and child birth safely, couples are able to have sexual relations, free of fear of pregnancy and of contracting disease.

The RCH phase-I programme aims to child survival and safe motherhood. The major interventions under phase -I

(i)Essential obstetric care:

- Early registration of pregnant women.
- Minimum 3 antenatal (12-16 weeks) & postnatal checkups by ANM or medical officer.
- Safe delivery at home or in an institution.

(ii)24 hours Delivery services at PHCs/CHCs.

(iii)Control of Reproductive tract infections (RTI) and STDs.

(iv)Immunization and essential newborn care: The primary goal is to reduce perinatal and neonatal mortality. The main components are resuscitation of newborn with asphyxia, prevention of hypothermia etc.

(v)Diarrhoeal disease control: The vertical programme for control of diarrhoeal disease, use of low osmolarity ORS for the management of diarrhoea, addition of zinc for reduction of severity and duration of diarrhoea.

(vi)Acute respiratory disease control: The management of ARI and prevention of death due to pneumonia is a part of RCH programme.

(vii)Prevention and control of vitamin A deficiency: The large number of children suffer from sub-clinical deficiency of Vitamin A.

- 1st Dose (1 lakh unit) at 9 months with measles vaccine.
- 2nd Dose (2 lakh units) after 9 months and subsequent doses (2 lakh units) at 6 months interval upto 5 years of age.

(ix)Prevention and control of Anaemia:

- 6 months to 5 years – 20 mg elemental iron + 100 mcg folic acid for 100 days (liquid formulation).
- 6 to 10 years –30 mg elemental iron + 250 mcg folic acid for 100 days (liquid formulation).

The concept is aimed at improving the health status of young women and children.

1.d) **Describe briefly on drug abuse & misuse**.

- Ans: Drug Abuse:

• Drug abuse refers to use of drug apart from medical need. Drug abuse happens when a drug is used to produce change in mood and behaviour of the individual.

• Drug of abuse may be grouped in three categories:

1. Permissive Drugs
2. Prescriptive Drugs
3. Proscriptive Drugs

• Permissive Drugs are those drugs which are generally permitted by the society, e.g. caffeine in tea,coffee and cola, nicotine in gutka.

• Prescriptive Drugs are the drugs which are prescribed by the physician to bring about wellness of the patient. They include sedatives, CNS stimulants, etc.

• Proscriptive drugs are the drugs which have been placed under strict drug control to avoid illegal use.They include narcotic drugs, mood stabilizers, etc.

- Drug Misuse:

• Drug misuse refers to use of a drug in excessive quantity or less quantity for the purpose for which it is prescribed. It happens unknowingly.

• Examples include :

1. Taking the incorrect dose.
2. Taking the drug at the wrong time.
3. Forgetting to take a drug.
4. Stopping the use of drug too soon.
5. Taking a drug for reasons other than why they were prescribed.

1.e) **Write the sources, functions & deficiency diseases due to fat soluble vitamin.**

Ans. Vitamin are a class of organic compounds as essential nutrients and in the category of micronutrients. The fat-soluble vitamins are given in the below table:

Name	Sources	Functions	Deficiency disease
Vit. A (Retinol)	1.Animal-Fish (cod or shark) liver oil (rich in vit. A), egg yolk, milk, 2Vegetable sources-spinach, Amaranthus, pumpkins, mango, papaya.	1.Protein synthesis (cell growth & differentiation), 2.Maintain healthy epithelial tissue, 3.Synthesis transferrin,	1.Night blindness. 2.Xerophthalmia. 3.Keratomalacia.
Vit.D (Antirachitic vitamin). 1.Ergocalciferol: D_2 2Cholecalciferol:D_3	Fatty fish, fish liver oils, egg yolk etc. milk is not a good source of vit. D	1.Synthesis of specific Calcium binding protein. 2.Essential for bone formation.	1.Rickets in children (bone deformities) 2.Osteomalacia in adults.
Vit. E (Tocopherol)	1.Vegetable oils (Wheat germ oil, cotton seed oil, peanut oil, corn oil and sunflower oil) 2.Meat, milk, butter, and eggs.	1.Antioxidant (Scavenger) 2.Protects PUFA. 3.Synthesis of heme. 4.Prevents sterility.	1.Sterility. 2.Megaloblastic anaemia. 3.Impairment of biochemical functions.
Vit. K	1.Cabbage, Cauliflower, alfa alfa, spinach. 2.Egg yolk, meat, liver, cheese & dairy products.	1.As coenzyme. 2.Synthesis of clotting factors II, VII, IX &X).	1.Diarrhoeal disease. 2.Disurbances in intestinal flora. 3. Increase in clotting time.

1.f) **Describe briefly about causative agent, epidemiology, clinical presentation & prevention of poliomyelitis.**

Ans. Poliomyelitis is an acute viral infection of the gastrointestinal tract of human beings. The virus can infect the CNS in some patients.

Causative agent: The polio virus having 3 serotypes 1,2 & 3. Type 1 is responsible for most of the outbreaks of the paralytic polio. Man is the reservoir of this virus.

Epidemiology: The virus can survive in water for 4 days and in faeces for 6 months. It is inactivated rapidly by pasteurization.

- The virus is found in the faeces and oropharyngeal secretions of an infected persons in abundance 7 to 10 days before and after onset of infection
- The main route is faecal – oral. The infection can spread through contaminated fingers or indirectly through contaminated water, milk, food, flies etc. Another route of infection is droplet infection during the acute phase of disease when virus present in the throat.

Clinical presentation:

- ❖ Inapparent or subclinical:95 % no symptoms
- ❖ Abortive polio: 4 to 8 % mild infections.
- ❖ Non – paralytic: 1% feel pain in the neck and back and recovers within 2 to 10 days.
- ❖ Paralytic polio: Less than 1% attacks CNS, Asymmetrical flaccid (part of the body hanging loosely) paralysis.

Prevention: Polio virus vaccine, live attenuated oral (TOPV) and Sabin vaccine is considered the vaccine of choice for primary immunization of children. It is indicated for active immunization against infections of poliovirus caused by poliovirus type 1,2 & 3 in infants starting at 6 – 12 weeks.

- ❖ IPV is replacing OPV because after polio eradication systemic immunity is required which IPV provides effectively.
- ❖ Acute Flaccid Paralysis (AFP) survey is a supplement to PPI (PULSE POLIO IMMUNIZATION) in polio Eradication.
- ❖ All cases of AFP are considered as polio cases until they are found negative on stool examination.

1.g) **Write a detail note on role of pharmacist in Disaster management**.

Ans. The Pharmacist is an employee or a worker of a non-government organization. During disaster, a pharmacist in addition to his duties assigned by, also help the other sectors of the management. The aspects consist of:

(i) Shelter & Emergency settlement: This comes immediately after disaster. Pharmacist involvement has become increased in emergency response in managing the strategic National Stockpile (SNS) responding to natural disaster and working to rebuild healthcare infrastructure.

(ii) Water supply & Sanitation: This is looked by Public Health engineering department and the Municipal Council with the help of pharmacists.

(iii) Vector & Pest Control: By the help of respective department a pharmacist can help to prevent the vector borne diseases. Ex. Arthropod borne diseases.

(iv) Control of communicable diseases & its prevention: At the time of epidemic or pandemic situation a pharmacist can extend his technical knowledge to prevent the outbreak. Ex. Covid-19.

(v) Training of Staffs, Volunteers & Community: They are very useful in disaster management and done by different sectors of the management. It should be noted that for the working of every sector, pharmacist is an important person.

Moreover, the pharmacist can also help in the prevention from infectious diseases, Drug Distribution Centre (DDC) are operated by pharmacists in affected areas.

Disaster management requires multisector involvement. The health sector has special and specific responsibility to manage a disaster.

2.a) **Define social pharmacy. Explain briefly about the role of pharmacist in India's ongoing National Health Programme**.

Ans. Social pharmacy is defined as the discipline dealing with the role of medicines from social, scientific and humanistic perspectives or it can be considered to consist of all the social factors that influence medicine use, such as medicine related beliefs, regulations, policy, attitudes, medicine information, ethics and behaviour.

Role of pharmacist:

A pharmacist must be able to develop and provide pharmacy services required for Public Health as per requirement of the population. Pharmacists by virtue of their training are best equipped person in the multifarious health related activities and act as an important health worker.

As Government of India formulated and launched specific programmes called National Health Programmes for controlling or eradicating diseases both communicable and noncommunicable. e.g., National smallpox Eradication Programme (NSEP), Applied Nutrition Programme (ANP), The National Cholera Control Programme (NCCP), National STD Control Programme, National Malaria Eradication Programme, Family Welfare Programme, National Tobacco Programme and many other programmes.

For the success of all these programmes, a community pharmacist is an important person since he is the first person who comes in contact with the public. He can educate the public and distribute the drugs.

2.b**) Define Pharmacoeconomics & explain its importance**.

Ans. Pharmacoeconomics has been defined as the description and analysis of the cost of drug therapy of healthcare systems and society. It identifies, measures, and compares the cost and consequences of pharmaceutical products and services.

Importance:

- Pharmacoeconomic studies are used in four different areas i. e Cost-minimization, cost-effectiveness, cost-utility and cost-benefits of a pharmacy product and service.
- These data are useful to support various Health related decisions at the level of the patient, society and at the level of entire health care system. Like

Health insurance—it reimburses the expenses incurred during the treatment of a disease or injury by an insured person. Over the years various health schemes and health organizations (HMO) have been coming up to offer best and affordable medical care facilities for people who only need basic medical care such as annual checkups and immunization (RCH Programme). Pharmacoeconomics focus on overall patient wellness and preventive health care while keeping costs low for its people.

2.c) **Define the term "Balanced diet" & give an overview on micronutrients**.

Ans. It is defined as one which contains a variety of foods in such quantities and proportions that the need for energy, amino acids, vitamins, minerals, fats, carbohydrates and other nutrients is adequately met for maintaining health, vitality and general wellbeing. A balance diet has become an accepted means to safeguard a population from nutritional deficiencies.

Fat Soluble Vitamins:

Vitamins	Source(main)	Function	Clinical Significance
Vit. A (750 mcg)	Fish liver oil, Green leafy vegetables, egg and milk etc.	Proper functioning of retina and vision.	Night blindness, Xerophthalmia, Stunted growth.
Vit. D (2-5mcg)	Milk, fish liver oil cheese.	Absorption of calcium and phosphorus.	Osteomalacia
Vit. E (8-10 mg)	Egg yolk, milk, Green leafy vegetable.	Healthy Muscular system, antioxidant.	Cystic fibrosis.
Vit. K (70- 140 g)	Cabbage, Cauliflower, fruits.	Formation of prothrombin and factors vii, ix and x in liver	Slow blood clotting and hemorrhages in new born

Water Soluble Vitamins:

Vitamins	Source(main)	Function	Clinical Significance
Thiamine (B_1) 1-1.5 mg	Rice polishings, Yeast, liver legumes.	Utilization of carbohydrates, nutrition of nerve cells.	Beri-Beri
Riboflavin (B_2)1.5-2 mg	Green leafy vegetables	Tissue Oxidation	Dermatitis, cheilosis.
Pyridoxine (B_6) 1-2 mg	Bran of cereals, soyabeans.	Protein metabolism and formation of WBCs, RBCs.	
Cyanocobalamin (B_{12}) 2-3 g	Moulds, fermenting liquors.	Maturation of RBCs	Pernicious Anemia, degeneration of nerve fibre of spinal cord.
Folic acid 200 mg	Dark green vegetable,	Formation of RBCs.	Anemia
Nicotinic acid (Niacin) 10- 20 mg	Yeast, fish, pulses	Metabolic function (tissue oxidation)	Pellagra.
Pantothenic Acid	Fresh vegetables	Formation of RBCs.	Adrenal insufficiency.
Biotin	Pulses and nuts	Fat metabolism	Conjunctivitis.

Vitamins	Source(main)	Function	Clinical Significance
Ascorbic acid (Vit.C) 30-45 mg	Citrus fruits	Maintenance of intercellular matrix. Iron absorption.	Scurvy.

*Students can write other common sources of the above vitamins and clinical significance if any.

Main Trace elements.

- Zinc: present in all tissues and in many enzymes, deficiency-pernicious anemia, liver disease and delayed wound healing.
- Chromium: carbohydrate and insulin function.
- Selenium: protein calorie malnutrition.
- Molybdenum: mouth and oesophageal cancer.

*Other trace elements can be mentioned by the students wherever required.

2.d) **Discuss about the Environmental pollution due to pharmaceuticals**.

Ans. With the advancement of the developments around the corner and modern lifestyles, increasing the number of communicable and degenerative diseases have resulted into an increased cost-effective production and consumption of variety of prescribed drugs and over the counter (OTC) pharmaceuticals.

- Many of them have been reported to be potentially toxic and contaminated, are usually present in the environment. Pharmaceutical residues from different therapeutic classes and their by- products are generally found in the water, air and soil causing a serious threat to health of the population.
- Pharmaceuticals like antibiotics are said to cause the development of resistance and its by- products are consumed by the human beings and animals.
- Other than antibiotics, hazardous substances like heavy metals, Phenols, drugs, organic matter, salts and other non-biodegradable substances also contaminate the Environment and the whole ecosystem of the earth.

Pharmaceutical waste contamination can be minimized by:

- Take back policy by manufacturer.
- Drugs disposed of by land filling.
- Time to time examination of water, air and soil.

2.e) **What is Artificial ripening, its effects, advantages, disadvantages**.

Ans. Artificial Fruit ripening is a combination of physiological, biochemical and molecular processes which lead to changes in colour, sugar content, acidity, texture and aroma. In general, it is a physiological process which makes the fruit edible, palatable and nutritious.

Its effects and advantages:

Fruits either ripens naturally on the plant or sometimes they are plucked semi ripe for artificial ripening. Artificial ripening is generally done to save the time and earn money.

During the process of ripening:

- The starches convert into sugars.
- The pigment gives color and aroma.
- Organic acids are reduced to taste better.

Disadvantages:

For artificial ripening, chemicals are used under controlled conditions of temperature, P^H and air circulation. Generally, chemicals used are:

- Calcium carbide
- Ethylene gas(expensive)
- Acetylene.

Artificial ripened fruits sometimes can cause irritation of intestine. If human beings are exposed to acetylene gas it can cause symptoms like organophosphorus poisoning. Continuous presence of pesticides beyond a level in the food stuff is injurious.

The authority regulates the standards of food items at the manufactures, storage, distribution, sale and import levels to ensure safe food for human consumption.

2.f) **Write a short note on sewage treatments**.

Ans. Sewage contains waste water, excreta, industrial waste and waste water from public places (0.1% solids). The sewage treatment procedure is a continuous process. The processes are aerobic and anaerobic decomposition of the organic matter by bacteria present in it.

Technically the whole treatment is divided into two stages.

- Primary treatment.
- Secondary treatment.

Primary treatment: It includes the removal of big solid objects and sedimentation associated with anaerobic digestion. This is done by two different steps i .e. Screening, Grit settling chamber and Primary sedimentation tank. In this the solid wastes are collected from different places placed for screening then passed through a long chamber, settled material is removed from the chamber and

disposed of. In primary sedimentation suspended particles are settled down at the bottom and biological actions takes place in the presence of bacteria. It is mainly decomposition of organic matter into simple compounds. The sediment is called “sludge” is removed periodically (by trenching).

Secondary treatment: The sewage from the primary treatment chambers contains colloidal substances, it still needs treatment. The first step in the secondary treatment is subjecting it to aeration so that biological activity is hastened. After trickling filter and activated sludge process the sewage is taken into the secondary sedimentation tank, here the sediment is called aerated sludge or activated sludge. It may be disposed of or incubating it at a proper temperature so that it gets decomposed naturally and the residue is dried and used as manure. the liquid after secondary sedimentation is still left. It can be disposed of in the river or sea.

2.g) **What are the different stages of demography cycle**?

Ans. Demography is defined as the scientific study of human population. Demography cycle is the change of World or National population through different stages, there are five (5) different stages:

- First Stage: It is characterized by a “High birth rate and a high death rate” in this, the population remains stationary. This is also called High Stationary Stage.
- Second Stage: Here Death rate begins to decline while the birth rate remains unchanged. This called Early Expanding Stage.
- Third stage: It is characterized by further decline in death rate and birth rate also falls. The population continuous to grow because births exceed deaths. This is also called Late expanding Stage.
- Fourth Stage: In this stage there is low birth and low death rate with the result that population remains stationary (zero population growth). It also called Low stationary stage.
- Fifth Stage: This is the stage in which the population begins to decline because the birth rate is lower than the death rate. It is also called Declining stage.

2.h) **Write the causative agent, epidemiology & clinical presentation of Malaria**.

Ans. Malaria is caused by infection with specific sporozoan parasites of the Plasmodium and transmitted to man by Female Anopheles mosquito. It is clinically characterized by episodes of chills and fever with period of latency, enlargement of spleen and secondary anaemia.

- Incubation period**:** 10 Days (appearance) ranging from 12 to 40 days. There are 2 cycles of development a) Asexual in man b) Sexual in mosquito. man is the intermediate host and mosquito is the definitive host.

Epidemiology**:** Malaria is caused by 4 distinct species of malaria parasite i.e., P. vivex (70%), P. falciparum (25-30%), P. malarae (1%) and P. ovale (mixed). There are 2 cycles of development a) Asexual in man b) Sexual in mosquito. man is the intermediate host and mosquito is the definitive host It is transmitted by two ways i) Vector transmission by Female Anopheles and ii) Direct transmission by infected needles, blood transfusion, etc.

Attack of malaria consist of 3 stages

- Cold Stage: Sudden onset of fever with rigor and chills (15 min. to 1 hour)
- Hot Stage: Headache and burning hot (2 to 6 hours)
- Sweating Stage**:** Profuse sweating (2 to 4 hours)

The febrile paroxysms occur repeatedly after a period of 2 to 3 days depending on the type of malaria parasite.

The WHO expert Committee on malaria described the following 2 categories of measures.

- Site selection and screening of houses. Prevention of contacts (man & Vector).
- Destruction of Adult Mosquitos by spraying insecticides.
- Destruction of mosquito larvae by larvicide (chemical and biological).
- Source reduction by doing sanitation, water management.
- Measures against malaria parasite which include chemoprophylaxis and chemotherapy.

2.i) **Write down the function of Mid-day meal programme**.

Ans. Mid-day meal programme (MDMP) is also known as School Lunch Programme. Operational since 1961.The primary objective is to attract more children for admission to schools and retain them for literacy improvement. The Meal Should:

- Be supplement not a substitute to home diet.
- Supply $1/_{3}^{rd}$ of the total energy requirement, ½ of the protein need.

Important Goal of the Programme:

- Reorientation of eating habits.
- Awareness on nutrition through studies.
- Improve educational performance of the children.

2.j) **What are STDs. Focus on its epidemiological factors**.

Sexually transmitted diseases (STDs) are now becoming a epidemic in some parts of the World. The primary reason for this is largely social, not medical, and unaware of accepting contraceptive methods.

There are 5 (five) official venereal diseases comprise of gonorrhoea and syphilis and their 3 tropical counter parts, chancroid, lymphogranuloma venereum and granuloma inguinale. The transmission of the STDs by sexual contact but not confined to it. There is strong epidemiological evidence with AIDs, two vaginitides (trichomoniasis and candidiasis).

The increased prevalence of STDs is specially of Gonorrhoea and syphilis. Gonorrhoea with its short incubation period and large carrier reservoir, particularly in women has increased. With syphilis, the position is slightly better as its long incubation period facilitates contact tracing and thus epidemiological control.

Effective control of sexually transmissible diseases is aimed at reducing the silent reservoir of infection and in further preventing the disease.

2.k) **What are genetically modified foods? Describe the negative effects of it.**

Ans. Genetic modification of food, involving the copying and transfer of genes from one organism to another is possible because the genetic code is universal i. e. the DNA of all organisms are made up of the same building blocks and is encoded in exactly the same way.

Once the gene is incorporated into the genome of a plant recipient, the resulting plant is considered to be genetically engineered and the new characteristics coded by that gene are inherited by subsequent generations.

- The disadvantages are that they reduce the fertility of the soil, toxic substances are added to it and the soil is rendered unsafe for subsequent crops. The chemicals used are carcinogenic and they can lead to birth defects, malignancies and many diseases which are not exiting.

3 A) **Differentiate the followings.**

i)

IMMUNITY	IMMUNIZATION
It is the resistance provided or exhibited by the host towards disease causing microorganisms and their products.	Providing immunity by using an immunizing agent is called immunization. Ex. Biologicals or Vaccines.

ii)

MACRONUTRIENTS	MICRONUTRIENT
These are the components of food which are required in large quantities. They are also called proximate principles of food. Ex. proteins, fats and carbohydrates.	These are the components which are required in very small quantities but are very essential for normal body functions. Ex. Vitamins and Minerals.

iii)

EPIDEMIC	PANDEMIC
A disease attacking many people in a region at the same time; widely diffused (expected occurrence at the same place in the past years) and rapidly spreading is called epidemic. Ex. smallpox.	When epidemic affects a large geographical area affecting most of the population, The condition is called Pandemic. Ex. Covid-19.

iv)

MARASMUS (Clinically manifested)	KWASHIORKAR (Clinically manifested)
It is a PEM (Protein Energy Malnutrition) disease. Signs and Symptoms are: severe muscle wasting, severe growth retardation, marked wasting skin and bones, diarrhoea and modified hair texture.	It is a PEM (Protein Energy Malnutrition) disease. Signs and Symptoms are: edema (commonly on lower legs but sometimes on face or generalized), mental changes, poor appetite, diffuse depigmentation of skin and hairs, enlargement of liver and sometimes muscle wasting and growth retardation.

v)

MULTIBACILLARY LEPROSY	PAUCIBACILLARY LEPROSY
It is the infectious form of the disease and include lepromatous and borderline cases.	It is the non-infectious form and includes smear negative, intermediate, tuberculoid and borderline cases.

3.B)

i) **Write down the beneficial Effects of Fibre**.

Ans. It is the undigested part of the food generally long chain of carbohydrates, it cannot be digested by human intestine and fermented in the large intestine.

The Beneficial effects are:

- Laxation of Stools
- Lowering of Blood cholesterol and blood sugar.

ii) **Modes of transmission of HIV/AIDS**.

Ans. HIV is Human Immuno-deficiency Virus/AIDS is Acquired Immuno Deficiency Syndrome.

Mode of transmission:

- Sexual transmission: Any vaginal, oral or anal sex can spread AIDS/HIV as the virus is excreted with the vaginal or semen secretions.
- Blood contact: Blood transfusion or through needles of injection.
- Placental transmission: HIV/AIDS is transmitted from infected mother to the foetus through placenta.

iii) **Formulation of Mala-D tabs**.

Ans. It contains Levonorgestrel 0.15 mg and Ethinilaestradiol 0.03 mg in a package of 28 pills (21 hormonal pills + 7 Ferrous fumerate: brown pills).

iv) **Write down the clinical presentation of Tuberculosis**.

Ans. It is nonspecific and slowly evolving infectious process. The patient begins to complain of generalized malaise, anorexia, wight loss and fatigue as well as intermittent fever with alternative chills and night sweats.

v) **What is Health maintenance organization**.

Ans. It is a network or organization that provides health insurance coverage for a monthly or annual fee. An HMO is an insurance structure that provides coverage through a network of doctors of different specialties.

3.C i) **What is crude death rate.**

Ans. It can be defined as the number of deaths in one thousand population in a year in a particular area.

ii) **Epidemiology.**

Ans. It is the study of the distribution and determinants of health-related events and diseases in the population and also the application of this knowledge to control health problems. Or it is the basis of public health and it describes the disease patterns in the community.

iii)**Weaning.**

Ans. Weaning is not sudden withdrawal of child from the breast.it is gradual process starting around the age of 6 months as mother's milk is not sufficient to sustain growth.

iv)**Incubation period**.

Ans. The time period between the entry of a pathogen and appearance of the first clinical sign or symptom of the disease in an individual.

v) **Water pollution**.

Ans. Water pollution is the process of alternation physical, chemical and biological characteristics of water on addition of excess of undesirable substances, which cause harmful effects an aquatic biota, terrestrial animal and plants and human health. Or

it is defined as the addition of any substances to water which changes the physical and chemical characteristics of water to such an extent that it becomes a health hazard and unsuitable for use.

vi)**Nosocomial infection**.

Ans. It is an infection appearing in a patient because he has visited the hospital and it is not related with the disease for which the patient was admitted. In other words, had he not visited the hospital he would not have got the infection. (Hospital acquired infections)

vii)**Nutraceuticals.**

Ans. It is defined as any substance that is a food or part of a food providing medical or health benefit including prevention and treatment of diseases. It is a combination of nutrition and pharmaceutics.

viii)**Antisera**.

Ans. It is the term applied to substances prepared in animals. originally passive immunization is achieved by the administration of antisera prepared from non-human sources such as horses.

ix)**Psychosocial pharmacy**.

Ans. It is that branch of pharmacy that is used for prevention and treatment of psychological and social behavioural disorders and related problems.

x)**Health according to WHO**.

Ans. According to WHO “Health is a state of complete physical, mental and social wellbeing and not merely an absence of disease or infirmity.

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Model Answer

ODISHA STATE BOARD OF PHARMACY

D. Pharm Part - I **E.R. 2020** **2022(I)**

HUMAN ANATOMY & PHYSIOLOGY (Theory)

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

1. Answer any 6 out of 7. (5 x 6)

a) Define & classify tissue. Write a note on Nervous Tissue.

Ans.

A group or layer of cells that work together to perform a specific function.

There are 4 basic types of tissue: connective tissue, epithelial tissue, muscle tissue, and nervous tissue.

Nervous tissue: Nervous tissue, also called neural tissue, is the main tissue component of the nervous system. The nervous system regulates and controls body functions and activity. It is composed of neurons, also known as nerve cells, which receive and transmit impulses, and neuroglia, also known as glial cells or glia, which assist the propagation of the nerve impulse as well as provide nutrients to the neurons. Nervous tissue is made up of different types of neurons, all of which have an axon, Dendron and cyton. An axon is the long stem-like part of the cell that sends action potentials to the next cell. Bundles of axons make up the nerves in the PNS and tracts in the CNS. Dendron receive signal from other neuron. Cyton or cell bodies analyses signal/information.

Types of Neurons

There are many different types of neurons, and they all have special functions in the brain, spinal cord, and muscles that control our body. Traditionally, scientists classify neurons based on function into three broad types:

- Sensory
- Motor
- Interneurons

Scientists also classify neurons into four groups based on structural differences:

- Multipolar
- Unipolar
- Bipolar
- Pseudo-unipolar

Functions of the nervous system are sensory input, integration, control of muscles and glands, homeostasis, and mental activity.

b) Write down the function of Blood. Discuss about the mechanism of Clottingand write down the Clotting factors.

Functions of Blood

1. Provides oxygen to the cells

Blood absorbs oxygen from the lungs and transports it to different cells of the body. The waste carbon dioxide moves from the blood to the lungs and is exhaled.

2. Transports Hormones and Nutrients

The digested nutrients such as glucose, vitamins, minerals, and proteins are absorbed into the blood through the capillaries in the lining the small intestine. The hormones secreted by the endocrine glands are also transported by the blood to different organs and tissues.

3. Homeostasis Blood helps to maintain the internal body temperature by absorbing or releasing heat.

4. Blood Clotting at Site of Injury

The platelets help in the clotting of blood at the site of injury. Platelets along with the fibrin form clot at the wound site

5. Transport of waste to the Kidney and Liver

Blood enters the kidney where it is filtered to remove nitrogenous waste out of the blood plasma. The toxins from the blood are also removed by the liver.

6. Protection of the body against pathogens

The White Blood Cells fight against infections. They multiply rapidly during infections.

To know more about blood, its types, blood vessels, and composition of blood, please register at BYJU'S or download the BYJU'S app for further reference.

Mechanism of blood coagulation:

The three main steps of the blood coagulation cascade are as follows:

1. Formation of prothrombin activator
2. Conversion of prothrombin to thrombin
3. Conversion of fibrinogen into fibrin

1. Formation of prothrombin activator

The formation of a prothrombin activator is the first step in the blood coagulation cascade of secondary haemostasis. It is done by two pathways, viz. extrinsic pathway and intrinsic pathway.

Extrinsic Coagulation Pathway

It is also known as the tissue factor pathway. It is a shorter pathway. The tissue factors or tissue thromboplastins are released from the damaged vascular wall.

Intrinsic Coagulation Pathway

It is the longer pathway of secondary haemostasis. The intrinsic pathway begins with the exposure of blood to the collagen from the underlying damaged endothelium.

Common Pathway

The factor Xa, factor V, phospholipids and calcium ions form the prothrombin activator. This is the start of the common pathway of both extrinsic and intrinsic pathways leading to coagulation.

2. Conversion of prothrombin to thrombin

Prothrombin or factor II is a plasma protein and is the inactive form of the enzyme thrombin. Vitamin K is required for the synthesis of prothrombin in the liver.

3. Conversion of fibrinogen into fibrin

Fibrinogen or factor I is converted to fibrin by thrombin. Thrombin forms fibrin monomers that polymerise to form long fibrin threads. These are stabilised by the factor XIII or fibrin stabilising factor. The fibrin stabilising factor is activated by thrombin to form factor XIIIa. The activated fibrin stabilising factor (XIIIa) forms cross-linking between fibrin threads in the presence of Ca^{2+} and stabilises the fibrin meshwork. The fibrin mesh traps the formed elements to form a solid mass called a clot.

Clotting factor:

There are about thirteen known clotting factors:

- Factor I - fibrinogen
- Factor II - prothrombin
- Factor III - tissue thromboplastin (tissue factor)
- Factor IV - ionized calcium (Ca++)

- Factor V - labile factor or proaccelerin
- Factor VI - unassigned
- Factor VII - stable factor or proconvertin
- Factor VIII - antihemophilic factor
- Factor IX - plasma thromboplastin component, Christmas factor
- Factor X - Stuart-Prower factor
- Factor XI - plasma thromboplastin antecedent
- Factor XII - Hageman factor
- Factor XIII - fibrin-stabilizing factor

c) Describe the parts of Respiratory System& discus the mechanism of respiration.

Ans.:

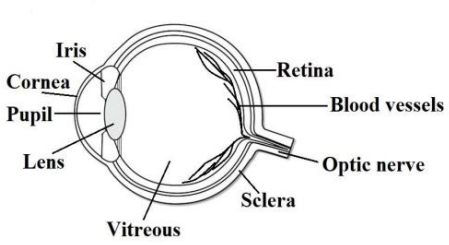
Parts of respiratory system:

- Nose and nasal cavity
- Sinuses
- Mouth
- Throat (pharynx)
- Voice box (larynx)
- Windpipe (trachea)
- Diaphragm
- Lungs
- Bronchial tubes/bronchi
- Bronchioles
- Air sacs (alveoli)
- Capillaries

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.

d) Draw a neat labelled diagram of EYE & write about the physiology of vision.



Physiology of vision

Visual process is the series of actions that take place during visual perception. During the visual process, the image of an object seen by the eyes is focused on the retina, resulting in the production of visual perception of that object.

The physiological events which take place are as follows –

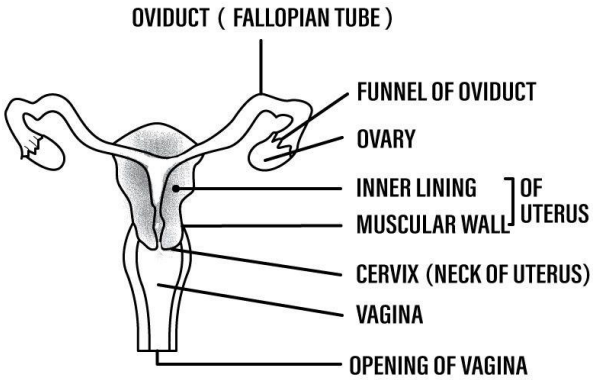
- Light's refraction which enters the eye
- Image focuses on the retina by accommodation of lens
- Image convergence
- Photochemical activity in the retina and the conversion into neural impulse
- To process in the brain and then perception

All the parts of the eye function together thus enabling us to see. At first light enters through the clear front layer of the eye, the cornea. Due to its structure (dome-shaped), it bends light to aid the eye in focusing.

Some part of this light passes the eye through the pupil opening. The coloured part of the eye, the iris, regulates how much light enters the pupil.

Light enters through the lens then when the lens functions with the cornea to focus light aptly on the retina. When light passes the retina, special cells referred to as photoreceptors convert light into electrical signals. These signals pass from the retina to the brain through the optic nerve. The brain then turns signals into images which we see.

e) Draw a neat & labelled diagram of female reproductive system. Write a short note on menstrual cycle.



Menstrual cycle

Each month during the years between puberty and menopause, a woman's body goes through a number of changes to get it ready for a possible pregnancy. This series of hormone-driven events is called the menstrual cycle. During each menstrual cycle, an egg develops and is released from the ovaries. The lining of the uterus builds up.

If a pregnancy doesn't happen, the uterine lining sheds during a menstrual period. Then the cycle starts again.

A woman's menstrual cycle is divided into four phases:

- menstrual phase
- follicular phase
- ovulation phase
- luteal phase

1. Menstrual phase

The menstrual phase is the first stage of the menstrual cycle. It's also when you get your period. This phase starts when an egg from the previous cycle isn't fertilized. Because pregnancy hasn't taken place, levels of the hormones estrogen and progesterone drop. The thickened lining of your uterus, which would support a pregnancy, is no longer needed, so it sheds through your vagina. During your period, you release a combination of blood, mucus, and tissue from your uterus.

Follicular phase

The follicular phase starts on the first day of your period (so there is some overlap with the menstrual phase) and ends when you ovulate. It starts when the hypothalamus sends a signal to your pituitary gland to release follicle-stimulating hormone (FSH). This hormone stimulates your ovaries to produce around 5 to 20 small sacs called follicles. Each follicle contains an immature egg. Only the healthiest egg will eventually mature. (On rare occasions, a woman may have two eggs mature.) The rest of the follicles will be reabsorbed into your body. The maturing follicle sets off a surge in estrogen that thickens the lining of your uterus. This creates a nutrient-rich environment for an embryo to grow. The average follicular phaseTrusted Source lasts for about 16 days. It can range from 11 to 27 days, depending on your cycle.

Ovulation phase

Rising estrogen levels during the follicular phase trigger your pituitary gland to release luteinizing hormone (LH). This is what starts the process of ovulation. Ovulation is when your ovary releases a mature egg. The egg travels down the fallopian tube toward the uterus to be fertilized by sperm. The ovulation phase is the only time during your menstrual cycle when you can get pregnant. Ovulation happens at around day 14 if you have a 28-day cycle — right in the middle of your menstrual cycle. It lasts about 24 hours. After a day, the egg will die or dissolve if it isn't fertilized.

f. **Give the location of adrenal gland. Write the function of the hormones secreted by cortex part of adrenal gland.**

Answer:

Adrenal Gland Location

The Adrenal Glands are found on top of each kidney. Even the name "Adrenal" directly refers to their location: (Latin: *ad*– "near" and *renes* – "kidneys.") These glands are also known as suprarenal glands. (Latin: *supra* – "above" and *renes* – "kidneys.") On the anterior side of the right adrenal gland sits the Inferior vena cava and the right lobe of the liver. The posterior side is flanked by the right crus of the diaphragm. The stomach, pancreas and spleen sit on the anterior side of the left adrenal gland. The posterior side is flanked by the left crus of the diaphragm.

Function of the hormones secreted by cortexpart of adrenal gland.

Different layers of the adrenal cortex produce different hormones and perform different functions. The hormones produced by the adrenal cortex are:

1. **Mineralocorticoids:** It is a family of hormones produced in the zona glomerulosa. The chief hormone produced is aldosterone. It is mainly responsible for the regulation of blood pressure. It is also responsible for the regulation of distal convoluted tubules and

collecting duct, which leads to higher absorption of sodium ions and higher excretion of potassium and hydrogen ions.

2. **Glucocorticoids:** It is produced in the zona fasciculata. The primary glucocorticoid produced by the adrenal cortex is cortisol. It regulates metabolism by stimulating the breakdown of fat (lipolysis), the release of amino acids from the body, and also helps in gluconeogenesis: production of new glucose.
3. **Androgens:** Androgens are produced in the innermost layer of zona reticularis. The chief hormones it produces are:

- **Testosterone:** It is the primary sex hormone in males that are responsible for developing secondary sex characteristics.
- **Dihydrotestosterone:** It is a more potent form of testosterone that binds readily to the androgen receptors.
- **Androstenedione:** It is a weaker steroid androgen that acts as a precursor for the synthesis of estrone and testosterone.
- **Dehydroepiandrosterone (DHEA):** It is an endogenous steroid circulating most abundantly in the human circulatory system. It is a precursor in the production of sex hormones in both males and females.

g. Define joint. Give the classification of joint with suitable example.

Joints is a articular surface can be defined as a point where two or more bones are connected in a human skeletal system.

Depending on the degree of mobility permitted by the joint, we can classify them as:

- *Fixed Joint*–The bones are fused and therefore permit minimal or no movement. These joints are fibrous joints which means that the binding tissue between two bones is 'fibrous' in nature. Example of a fixed joint is the sutures between skull bones.
- *Slightly Movable Joint*– This joint permits slight mobility that is more than what is seen in a fixed joint. The binding tissue in this type of joint is cartilaginous in nature. Example of a slightly moveable joint is those found between intervertebral discs.
- *Freely Moveable Joint or Synovial Joints*– These joints permit maximum movement between the bones involved. They are also called as 'diarthroses' and are further classified into 5 types depending on the kind of movements possible.
    - *Ball and socket joint*– This kind of joint involves two bones. One of the bone has a large rounded end which fits into a cup-like socket of the other bone. This kind of joint is generally found in large bones such as the shoulder joint and hip joint. A ball and socket joint provides the greatest degree of movement among different kinds of joints including rotation, flexion, extension, abduction, and adduction.
    - *Hinge joint*-This joint is said to be a very simple joint that allows movement only in one axis. It allows only two kinds of movements- flexion and extension. Example of this joint is the joints found between in the elbow and knee.
    - *Pivot joint– This type of joint allows rotation along one axis only. A common example of this type of joint is the atlantooccipital joint in the neck.*
    - *Gliding joint*– This joint is very similar to the ball and socket joint but without rotation. It allows movements only in two axes. Example of this is the wrist joint.
    - *Saddle joint*– It is similar to an ellipsoid joint which involves two bones- one of the bones has a convex surface while the other has a concave surface. The convex surface of one bone articulates with the concave of the other to allow limited rotational movement. A very classic example of this kind of a joint is the carpo-metacarpal joint in the thumb.

2. Answer any 10 out of 11. (10 x 3)

a) Write a note on flow of blood through heart.

Ans.

- The blood first enters the right atrium.
- The blood then flows through the tricuspid valve into the right ventricle.
- When the heart beats, the ventricle pushes blood through the pulmonic valve into the pulmonary artery.
- The pulmonary artery carries blood to the lungs where it "picks up" oxygen.
- It then leaves the lungs to return to the heart through the pulmonary vein.
- The blood enters the left atrium.
- It drops through the mitral valve into the left ventricle.
- The left ventricle then pumps blood through the aortic valve and into the aorta. The aorta is the artery that feeds the rest of the body through a system of blood vessels.
- Blood returns to the heart from the body via two large blood vessels called the superior vena cava and the inferior vena cava. This blood carries little oxygen, as it is returning from the body where oxygen was used.
- The vena cavas pump blood into the right atrium and the cycle begins all over again.

b) Write about the function of cerebellum & cerebrum.

Answer:

Function of cerebrum

Your cerebrum handles much of your brain's "conscious" actions. That means it's responsible for elements that require thinking, including:

- Your five senses: Your cerebrum manages and processes everything your senses take in. That includes sight, sound, smell, taste and touch.
- Language: Various parts of your cerebrum control your ability to read, write and speak.
- Working memory: This is a type of short-term memory. An example of working memory is when you remind yourself to pick up something from the grocery store.
- Behavior and personality: Part of your cerebrum is your frontal lobe, which manages your personality and behavior. It's the part of your brain that acts as a filter to stop you from doing or saying things you might later regret.
- Movement: Certain areas of your cerebrum send signals that tell your muscles what to do when you need to use them.
- Learning, logic and reasoning: Different areas of your cerebrum work together when you need to learn a new skill, make a plan of action or puzzle out a problem.

Function of cerebellum

The cerebellum controls voluntary movements such as:

- walking
- posture
- balance
- coordination
- eye movements
- speech

c) Write a note on structure & function of kidney.

Answer:

External and Internal Features of Kidney

- It has a convex and concave border.
- Towards the inner concave side, a notch called the hilum is present through which the renal artery enters the kidney and the renal vein and ureter leave.
- The outer layer of the kidney is a tough capsule.

- On the inside, the kidney is divided into an outer renal cortex and an inner renal medulla.
- The hilum extends inside the kidney into a funnel-like space called the renal pelvis.
- The renal pelvis has projections called calyces(sing: calyx).
- The medulla is divided into medullary pyramids, which project into the calyces.
- Between the medullary pyramids, the cortex extends as renal columns called Columns of Bertini.
- The kidney is made up of millions of smaller units called nephrons which are also the functional units.

Function of kidney

- remove waste products from the body
- remove drugs from the body
- balance the body's fluids
- release hormones that regulate blood pressure
- produce an active form of vitamin D that promotes strong, healthy bones
- control the production of red blood cells

d) Write down the Physiology of Urine formation.

Answer:

The mechanism of urine formation involves the following steps:

Glomerular Filteration

Glomerular filtration occurs in the glomerulus where blood is filtered. This process occurs across the three layers- the epithelium of Bowman's capsule, the endothelium of glomerular blood vessels, and a membrane between these two layers.

Blood is filtered in such a way that all the constituents of the plasma reach the Bowman's capsule, except proteins. Therefore, this process is known as ultrafiltration.

Reabsorption

Around 99 per cent of the filtrate obtained is reabsorbed by the renal tubules. This is known as reabsorption. This is achieved by active and passive transport.

Secretion

The next step in urine formation is tubular secretion. Here, tubular cells secrete substances like hydrogen ions, potassium ions, etc into the filtrate. Through this process, the ionic, acid-base and the balance of other body fluids are maintained. The secreted ions combine with the filtrate and form urine. The urine passes out of the nephron tubule into a collecting duct.

Urine

The urine produced is 95% water and 5% nitrogenous wastes. Wastes such as urea, ammonia, and creatinine are excreted in the urine. Apart from these, the potassium, sodium and calcium ions are also excreted.

e) Write a note on circulation of Lymph.

Answer:

Circulation of Lymph – Flow Chart

Blood capillaries

↓

Interstitial fluid

↓

Lymphatic capillary

↓

Afferent lymph vessel

↓

Lymph node

↓

Efferent lymph vessel

↓

Lymphatic trunk

↓

Collecting duct

↓

Subclavian vein

f) Write a note on mechanism of Hearing.

Answer:

Hearing mechanism:

- 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 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.

g) Explain the role of Renin Angiotensin System in regulation of blood pressure.

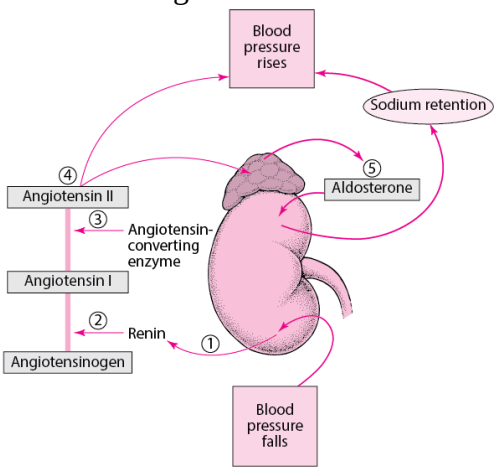
Answer:

Regulating Blood Pressure:

The Renin-Angiotensin-Aldosterone System

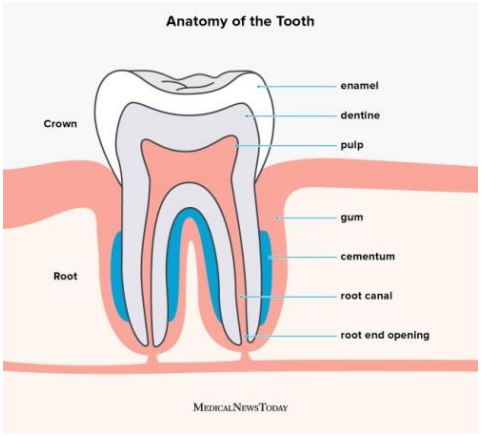
- The renin-angiotensin-aldosterone system is a series of reactions designed to help regulate blood pressure.
- When blood pressure falls (for systolic, to 100 mm Hg or lower), the kidneys release the enzyme renin into the bloodstream.
- Renin splits angiotensinogen, a large protein that circulates in the bloodstream, into pieces. One piece is angiotensin I.
- Angiotensin I, which is relatively inactive, is split into pieces by angiotensin-converting enzyme (ACE). One piece is angiotensin II, a hormone, which is very active.

- Angiotensin II causes the muscular walls of small arteries (arterioles) to constrict, increasing blood pressure. Angiotensin II also triggers the release of the hormone aldosterone from the adrenal glands and vasopressin (antidiuretic hormone) from the pituitary gland.
- Aldosterone and vasopressin cause the kidneys to retain sodium (salt). Aldosterone also causes the kidneys to excrete potassium. The increased sodium causes water to be retained, thus increasing blood volume and blood pressure.



h) Give a brief description on human tooth with suitable diagram.

Answer:



Each tooth consists of a crown and root.

The crown is the visible white part, and the root is the invisible part of the tooth hidden by the gums. The root anchors the tooth into the jawbone. Teeth also consist of layers called enamel, dentin, cementum, and dental pulp.

Enamel

Enamel covers the crown or the outside of the tooth and protects it from physical and chemical injuries.During the maturation stage, enamel crystals grow, which makes the enamel hard and durable.

Dentin

Dentin forms the mainTrusted Source part of dental tissues. Dentin is a similar structure to bone. The cells that form dentin are odontoblast cells, similar to osteoblast cells in bone. Unlike bones, dentin does not have blood vessels.

Cementum

Cementum is a tissue that covers the root's surfaces.

Cementum's primary function is to support and fix the teeth in the jawbones.

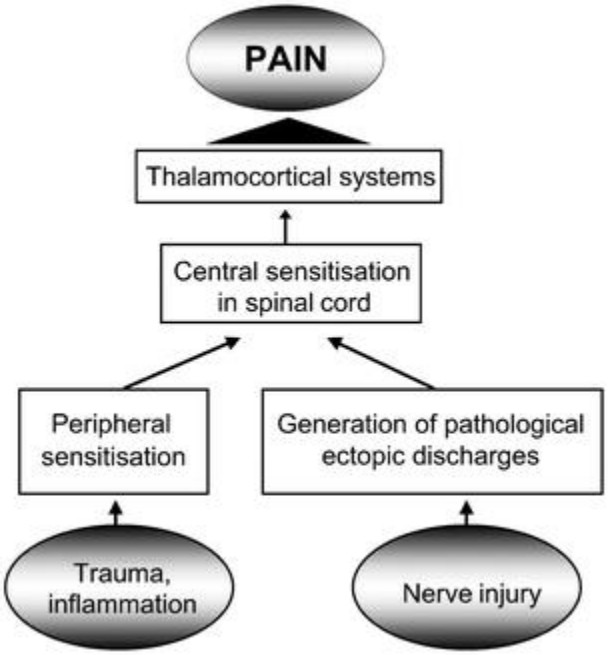
Dental pulp

The center of the tooth contains dental pulp, which consists of loose tissues, including nerves,

blood vessels, and connective tissues. If any bacteria get past the enamel and dentin, the pulp becomes inflamed. Inflammation of the pulp can cause pulpitis, which can be very painful. The dental pulp attacks the bacteria with antibacterial, immune, and inflammatory responses. This may cause the body to reject and fight off the bacterial infection. However, if this does not happen, the dental pulp may remain inflamed. This causes part of the pulp to die and can cause a root canal infection.

i) Write a note on physiology of pain.

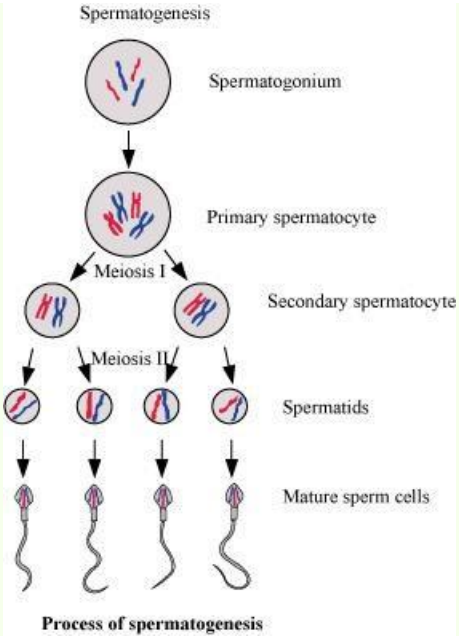
Answer:



j) Explain the process of Spermatogenesis.

Answer:

Spermatogenesis is the process of the production of sperms from the immature germ cells in males. It takes place in seminiferous tubules present inside the testes. During spermatogenesis, a diploid spermatogonium (male germ cell) increases its size to form a diploid primary spermatocyte. This diploid primary spermatocyte undergoes first meiotic division (meiosis I), which is a reductional division to form two equal haploid secondary spermatocytes. Each secondary spermatocyte then undergoes second meiotic division (meiosis II) to form two equal haploid spermatids. Hence, a diploid spermatogonium produces four haploid spermatids. These spermatids are transformed into spermatozoa (sperm) by the process called spermiogenesis.



Process of spermatogenesis

k) Pancreas is known as both endocrine and exocrine gland. Justify your answer.

Answer:

Pancreas:

The pancreas located in the abdomen region is an elongated and tapered organ. It secretes both digestive enzymes collectively called pancreatic juice and hormones, including insulin, for the maintenance of the body.

Exocrine Gland:

- Exocrine glands are those kinds of glands that release their secretion with the help of ducts at specific sites.

Endocrine Gland:

- Endocrine glands or also known as ductless glands are a type of glands that secrete hormones directly into the bloodstream.

Pancreas as an endocrine and exocrine gland:

- A part of the pancreas secretes its enzymes known as pancreatic juice into the pancreatic ducts, which then releases them into the duodenum for its action. It shows the behavior of the exocrine gland.
- In contrast, another part of the pancreas is also known to secrete various hormones like insulin and glucagon, which regulate the sugar concentration of the body directly into the blood. It shows the behavior of the endocrine gland.

Hence, it can be said that the pancreas acts as both exocrine and endocrine glands.

3. A) **Answer the followings.** (20 x 1)

a) What is Osteomyelitis?

Ans. Osteomyelitis is **an infection in a bone**. Infections can reach a bone by traveling through the bloodstream or spreading from nearby tissue. Infections can also begin in the bone itself if an injury exposes the bone to germs

b) Mention the parts of nephron.

Ans. A nephron is a coiled tubule that has renal corpuscle and renal tubules as its components. Generally, a nephron consists of six parts, i.e., Glomerulus, Bowman's capsule, Proximal convoluted tube, Loop of Henle, Distal convoluted tube, and the collecting duct.

c) Enlist two functions of spleen.

Ans.

- 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.

d) Write about the function of valve.

Ans. Heart valves are parts of your heart that act like doors. They open and close to let blood flow from one area of your heart to another. They help ensure that blood moves at the right time and in the correct direction. As the valves open and close, they create two sounds, which are your heartbeat.

e) Name the structures involved in urinary system.

Ans. The organs of the urinary system include the kidneys, renal pelvis, ureters, bladder and urethra.

f) Enlist the function of CSF.

Ans. Cerebrospinal fluid (CSF, shown in blue) is made by tissue that lines the ventricles (hollow spaces) in the brain. It flows in and around the brain and spinal cord to help cushion them from injury and provide nutrients.

g) Write the function of oxytocin.

Ans. The two main physical functions of oxytocin are to stimulate uterine contractions in labor and childbirth and to stimulate contractions of breast tissue to aid in lactation after childbirth.

h) Difference between Tendon & Ligament.

Ans. Tendons connect skeletal muscles to the bones, whereas a ligament connects bones to bones. Tendons are inflexible and inelastic; on the other hand, ligaments are flexible and elastic. Tendons are white, but ligaments are yellow-coloured.

i) Write the universal donor& universal recipient Blood group.

Ans. Group O can donate red blood cells to anybody. It's the universal donor. Group AB can donate to other AB's but can receive from all others.

j) Mention any two functions of liver.

Ans.

- Production of bile, which helps carry away waste and break down fats in the small intestine during digestion.
- Production of certain proteins for blood plasma.
- Production of cholesterol and special proteins to help carry fats through the body.

B) Define the followings

i. **Endocytosis**: include both the ingestion of large particles (such as bacteria) and the uptake of fluids or macromolecules in small vesicles. The former of these activities is known as phagocytosis (cell eating) and the latter as pinocytosis (cell drinking).

ii. **Thrombocytopenia:** Thrombocytopenia is a condition in which you have a low blood platelet count. Platelets (thrombocytes) are colorless blood cells that help blood clot. Platelets stop bleeding by clumping and forming plugs in blood vessel injuries.

iii. **Atherosclerosis** is the buildup of fats, cholesterol and other substances in and on the artery walls. This buildup is called plaque. The plaque can cause arteries to narrow, blocking blood flow.

iv. **Erythropoiesis:** Erythropoiesis is red blood cell (erythrocyte) production. Your bone marrow makes most of your red blood cells. Once they're fully mature, they're released into your bloodstream, where they transport oxygen throughout your body.

v. **Cardiac output:** 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.

vi. **Rheumatoid arthritis:** Rheumatoid arthritis is a chronic inflammatory disorder that can affect more than just your joints. In some people, the condition can damage a wide variety of body systems, including the skin, eyes, lungs, heart and blood vessels.

An autoimmune disorder, rheumatoid arthritis occurs when your immune system mistakenly attacks your own body's tissues.

vii. **Thrombopoiesis**: Thrombopoiesis is the formation of thrombocytes (blood platelets) in the bone marrow. Thrombopoietin is the main regulator of thrombopoiesis. Thrombopoietin affects most aspects of the production of platelets.

viii. **Haematuria:** It can be scary to see blood in urine, also called hematuria. In many cases, the cause is harmless. But blood in urine also can be a sign of a serious illness. If you can see the blood, it's called gross hematuria. Blood that can't be seen with the naked eye is called microscopic hematuria.

ix. **Deglutition:** Deglutition is the transport of a bolus of food or liquid from the mouth to the stomach.

x. **Endocrine gland:** An organ that makes hormones those are released directly into the blood and travel to tissues and organs all over the body. Endocrine glands help control many body functions, including growth and development, metabolism, and fertility. Some examples of endocrine glands are the pituitary, thyroid, and adrenal glands.

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MODEL ANSWER

PART-A

Q1. (i) In microscopic evaluation of drug is also known as histological evaluation.

Stomatal number – It is defined as average number of stomata per square mm of epidermis of leaf.

Stomatal index – It is the percentage which the number of stomata forms to the total number of epidermal cell. Each stomata being counted as one cell. Stomatal index is cakculated by the given formula

S.I = S/E+S * 100

Vein – islet number – It is defined as average number of vein-islet per square mm of the leaf suface midway between the midrib & margin.by counting vein-islet in per square areas.

Palisade ratio – defined as average number of palisade cell beneath each epidermal cell. It is determine with the powdered drugs.

Lycopodium spore method – used for powdered drug when other method of drug evaluation fails to measure the accurate quality.

Lycopodium spore method ius used for those drug powder sample which contain well defined particle that can be counted.

(ii) surgical dressing is a sterile product that are use for protections, coverings, absorbents, or supports to the wound. Surgical dressing should be easy to handle, sterilizable and free from any loose threads & **fibres**.

Cotton :-

Common Name – purified cotton, kapas

Biological source – cotton consists of epidermal trichome of seeds of gossypium herbacium linn. & other species of gossypium.

Family – Malvaceae

Preparation process of cotton – The ripe capsules are collected , dried & taken to ginning process to separate the hairs from seeds.

Long & small hairs are separated from various devices.

Short length hairs are known as linters, used in the manufacturing of absorbent cotton, wool & rayon.

Long hairs are used in fabrics.

Surgical cotton – surgical absorbent cotton wool is prepared from linters & cotton waste.

Step 1- Impurities are removed from cotton hairs & boiled with caustic soda for 15 hours at 1 to 3 atmospheric pressure.

Step 2 – Cotton is washed with water & bleached by soaking in 5 % chlorinated lime solution for 10-18 hrs.

Step 3 – Bleached cotton is washed with water & soaked Hcl for hrs.

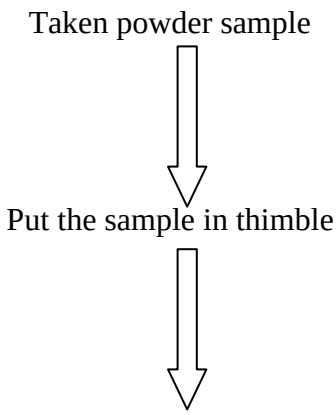
Step 4 – Acdified cotton is washed , dried ,loosened & carded into flat sheet.the cardling machine gives continuous thin layers of cotton.
Step 5 – These thin layer is placed one above the other, packed & sterilised by gaseous method or radiation.
Chemical constituents – Absorbent cotton contains pure from cellulose. Cellulose molecule is made of glucose.
Uses – It used as surgical dressing
It gives mechanical support to absorb blood, mucus, pus & protect the wound from bacterial infection.
Used as filtering media, absorbent gauze & collodion.

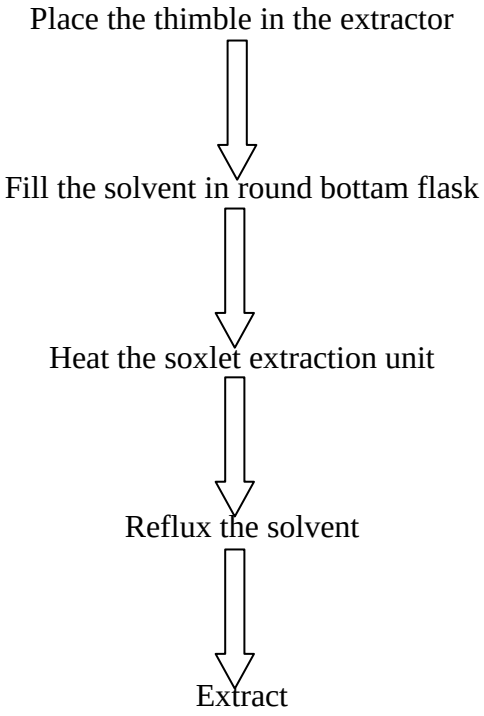
(iii) synonyms – ergota, ergot of rye.
Biological source – ergot is the dried scierotium of a fungus, *cleviceps purpurea*.
Family – *Clavicipitaceae*
The life cycle of ergot consist three stages i.e

1. Sphacelia or honeydew stage
2. Sclerotium stage
3. Ascospore stage

Chemical constituents – ergometrine, ergotamine, ergosine, ergometrinine, ergotaminine, ergosinine, ergocrystine, ergocryptine, ergocryptinine.
Chemical test – Van-urk's test
Ergot powder + p – dimethylamino benzaldehyde = blue color.
Uses – oxytocic action, assist delivery & to reduce post partum haemorrhage. Ergotamine is used in migraine.

(iv) Introduction – Extraction is a process through which active constituents of plnt& animal there are extracted by the standard procedure.
Extraction of active constituents in the plant cells & tissue by the sterilisation process & other method of unit operation.
Ex- Hot percolation method





(v) Phytochemical test for alkaloids -

Sample preparation – 40-60 gm of extract was mixed with 0.5 ml of diluted HCL & filtered. Filtrate so obtained was tested using the following reagents.

Mayers test- 0.5 ml of above filtrate with 2-3 drops of mayers reagent to give white or cream precipitation.

Dragondoff's test – 0.5 ml of above filtrate with 2-3 drops of dragondroffs reagent to give orange brown precipitation.

Hagers test - 0.5 ml of above filtrate with 2-3 drops of hagers reagent to give yellow precipitation.

Wagners test - 0.5 ml of above filtrate with 2-3 drops of wagners reagent to give reddish brown precipitation.

Phytochemical test for glycosides –

Borntraager test- performed for anthraquinone glycosides, it produces pink or red color.

Kellar- killani test – performed for anthraquinone glycosides, it produces reddish brown color appears at junction of the two liquid layers & upper layer appears bluish green.

Legal test – performed for cardiac glycosides, it produces pink or red color.

Baljet test - performed for cardiac glycoside, it gives yellow to orange color.

(vi) It is defined as substituting original crude drug partially or wholly with other similar looking substances. The substance, which is mixed is free from or in ferior in chemical & therapeutic property.

Substitution with substandard commercial variety:
Capscicum minimum is adulterated with capscicum annum.
Indian senna is substituted with Arabian senna or dog senna.
Substitution with inferior drugs:
Mother clove & clove stalk adulterated with clove.
Belladonna leaf adulterated with ailanthus leaf.
Substitution with artificially manufactured commodities
Parafin wax is substituted with bees wax.
Chicory powder is usedas an adulterant in coffee.
Substitution with exhausted drug:
Artificial coloring of exhausted saffron.
Exhausted gentian is made bitter with aloe.
Hrmful adulterant:
Limestone in asafoetida
Lead shot in opium.
Substitution by synthetic material:
Citral to citrus oil.
Addition of benzyl benzoate to balsam of peru.

(vii) Herbal formulation can be defined as the product which is derived from the plant or mainly medicinal plant.
Classification- liquid form i.e tincture, syrup.
Solid form – tablet, pills, capsules.
Semi-solid form- cream, ointments, gel.
Ayurvedic formulation –
Asava & aristha : asavas & aristha are medicinal preparations made by soaking the drugs either in powder form or in the form of kasaya(de coction), in a solution of sugar or jiggery.
Vati or gutika : Medicines prepared in the form of tablets or pills are known as vati or gutika. It is a semi-0 sol,id dosage form.
Churna: it is a fine powder of herb or group of herbs & sometimes processed mineral, salt or sugar also added to it.
Avaleha : it is a semi solid preparation of drug prepared with the addition of jiggery, sugar or sugar candy & boiled with prescribed drug juice or decoction.
Bhasma: Metals & animal products, whiuch are by special process, calcified in closed crucible in pits & with cow-dung cakes are called bhasma.
Taila : preparation in which oil is boiled with prescribe ed decoction & kalkas (a fine paste of drug) of drugs according to formulation.

PART-B

Q2 (i) .The umbelliferous plants are annual,biennial or perennial herb.Pinnate type leaves are found in this family,which are alternate in arrangement.The fruits belonging to this family are known as umbelliferous fruits

.The fruits are schizocarp or splitting fruits known as cremocarp.

.The volatile oils are the main constituents of umbelliferous fruits.

.These oils are present in the vittae.

.Umbelliferous fruits are very useful in medicine and as flavouring agents,condiments and spices.

(ii) Antioxidants are our first line of defence against free radical damage and are critical for maintaining optimum health and wellbeing.

.They are used to prevent the reactive oxygen species and free scavenging radicals.

.They are present in fruits,vegitables and fish E.g-Vitamin E,C and A.

.Dietary antioxidants are vitamin C, Vitamin E .Beta carotene ,carotenoids and oxycarotenoids.

(iii) B.S- It consists of leaves and seed oil of *Azadirachat indica* having family-Meliaceae

C.C-It contain azadirachtin,meliacin,nembosterol,nimbin,margosin,ascorbicacid,carotenoids,amonoacid

Uses-Antiseptic,stimulants,antirheumatic and in skin diseases.

Commercially used as insecticidal agent.

Usesful for the treatment of AIDS.

(iv) Omega-3 fatty acids are the important components of all cell membranes.Their presence in the cell membrane increases the physiochemical stability and functional integrity of the cell

It is essential for normal growth and development of all stages of life.

It make the cells less susceptible to oxidative damage as well as they decrease the formation of lipid peroxides.

(v) .cultivation and domestication of medicinal plants.

.Analysis of phytoconstituents

.preparation of general tonics and stimulants.

. In steroid industry

.Herbal preparation.

.Preparation of antibiotics.

.Flavouring agents and perfumes.

.Tissue culture.

(vi) GOKHRU

B.S—It cosists of dried fully ripe fruits of *Tribuls terrestris.Tribulus lanuginousus* having family-*Zygophyllaceae*

C.C-Diosgenin,ruscogenin,gitogenin,Harman,Harmine,Kampferol,Tribuloside.

PURNARNAVA

B.S-It consists of herb of *Boerhaavia diffusa* having family –*Nyctaginaceae*

C.C- Punarnavine,Urosolic acid Myristic acid,Punarnavoside

(vii) Leyha is a semisolid malt/jam like preparation of drugs,prepared by adding jiggery or sugar and boiled with the prescribed liquid till the correct constituency is obtained . Then spices and ghee are added and stirred well.After colling honey is added.This means preserving the water extract of medicines in sugar media.

(viii) Stomatal number—It is defined as the average number of stomata per square millimeter of epidermis of the leaf.

Stomatal Index --- It is defined as the percentage proportion of the ultimate divisons of the epidermis of a leaf which are converted into stomata.Each stoma is counted as one cell.

$$S.I = \frac{S}{E+S} \times 100.$$

(ix) PALE CATECHU/ GAMBIER

It constists of dried aqueous extract prepared from leaves and twigs of Uncaria gambier having family—Rubiaceae

It contains Ctechins,Catechutannic acid ,fixedoil ,starch,sugar etc.

BLACK CATECHU

(x) ORGANISED DRUGS.

These are organs of plants or animals containing cellular structure.

Microscopically studies are important parameter for identification of organized drugs.

UNORGANISED DRUGS.

These are obtained from part of plants and animals by physical processes like incision , extraction ,expression .

Physical standards and chemical tests are important factor for identification of these drugs.

These are solid,semisolid or liquids in nature.

(xi) B.S—It is obtained by distillation of dried heartwood from the plant *Sntalum album* having family-*santalaceae*

C.C—It contain two isomers alpha and beta santalol,Santalene,Santalone,Santene and Santalic acid.

PART-C

Q.3. a Tannins are derivatives of polyhydroxy benzoic acid combining two proteins i.e condensed tannins and hydrolysable tannins.they are astringent in taste.

2.oleogum resin is combination of volatile oil,gums,resins

Example:myrrh,asafoetida

3.palisade ratio is the average number of palisade cells beneath one epidermal cells using four continuous epidermal cells for the count.

4.cosmeceuticals are products that have cosmetic and therapeutic value. They are bioactive ingredients having medicinal benefits example vitamin c,multivitamins

5.crude drugs are the substances that are getting from natural sources which have power to treatmentof diseases.

Example Vinca from plant used to treat cancer.

B) a. SQUILL Consists of dried slice of bulb *Urginea indica –Liliaceae*

Flowering plant of *Urginea maritime-Asperagaceae*

b.Guggul consists of oleogum resin obtained from exudates from stem and branches of *Commiphora wightii* family *Bursaraceae.*

Commiphora mukul Bursaraceae

c.Isapgol consists of dried seeds of *Plantago ovata –plantagenaceae*

d.Senna-consists of dried leaflets of senna folium,tinnevelly senna –*Cassia acutifolia,Cassia angustifolia* belonging *Leguminaceae.*

e.Rauwolfia consists of dried rhizome and roots of *Rauwolfia serpentine –Apocynaceae*

f.Myrrh consists of gum resin from *Commiphora molomol-Bursaracea*

g.Ashwagandha derived from root of *Withania somnifera –Solanacea*

h.Castor oil obtained from cold compression of seeds of *Ricinus communis –Euphorbiaceae*

i.Aloe vera or aloe emodin obtained from *Aloe vera,Aloe ferox,Aloe perryi,Aloe barbadensis –Liliacea*

j.Artemesia is flowering heads of *A.brevefolia,A.cina,A.maritima-Asteracea*

C. a. FENNEL CC:Anethole,fenchone

b.Gutika are medicaments in form of pills like vati

c.Vitali morin test is chemical test for tropane alkaloid

Atropine+nitic acid gives yellow color

d.Unani system of medicine helps to treat body,mind and soul consists of four humours blood,phlegm,yellow bile and black bile

e.Chemotaxanomy is classification of plants based on similarities and differences in biochemical composition.

MODEL ANSWER FOR THE SUBJECT PHARMACEUTICAL CHEMISTRY (AS PER E.R.2020)

D.PHARM PART-I 2022(I)

1. a) A substance which change color at the end point which is added to reacting medium is called as **Internal Indicator**. All Acid-Base indicators are weak organic Acids/ Bases.

Types of Indicator Theory: - Generally it is of 2 types.

- Ionic Theory / Ostwald's Theory
- Resonance / Chromophore Theory

Ionic Theory / Ostwald's Theory

According to this law, all Indicators are weak organic acids / bases. When any Acidic indicator added to acidic solution, there is depression of Ionization of Indicator occur due to common -ion effect. Hence, we found an Un-Ionized Colour/ Colorless. Like wise if any Acidic indicator added to Alkali medium, then it will promote the removal of H^+ and there is gradually increase in conc. Of ionized form (In^-) and finally we found Ionized form Colour.

Let's take examples of two important indicators **phenolphthalein** which is a weak acid and **methyl orange** which is a weak base.

1. Phenolphthalein

It is represented as HPh. This indicator being a weak acid ionises in solution to a small extent as follows:

$HPh \rightleftharpoons H^+ + Ph^-$

Colourless Pink

Applying law of mass action, we get

$K = [H^+][Ph^-]/[HPh]$

The undissociated molecules of **phenolphthalein** are colourless while the Ph^- ions are pink in colour. In presence of an acid , ionisation of HPh is practically negligible as the equilibrium shifts to left hand side due to high concentration of H^+ ions. Thus, the solution would remain colourless. On addition of alkali, hydrogen ions are removed by OH^- ions in the form of water molecules and the equilibrium shifts to right hand side. Thus, the concentration of Ph^- ions increases in solution and they impart pink colour to the solution.

2. Methyl Orange

It is a very weak base and can be represented as MeOH. It is ionized in solution to give Me^+ and OH^- ions.

$MeOH \rightleftharpoons Me^+ + OH^-$

Yellow Red

Applying law of mass action,

$K = [Me^+][OH^-]/[MeOH]$

In presence of an acid, OH^- ions are removed in the form of water molecules and the above equilibrium shifts to right hand side. Thus, sufficient Me^+ ions are produced which impart red colour to the solution. On addition of alkali, the concentration of OH^- ions increases in the solution and the equilibrium shifts to left hand side, i.e., the ionisation of MeOH is practically negligible. Thus, the solution acquires the colour of unionised **methyl orange** molecules, i.e., yellow.

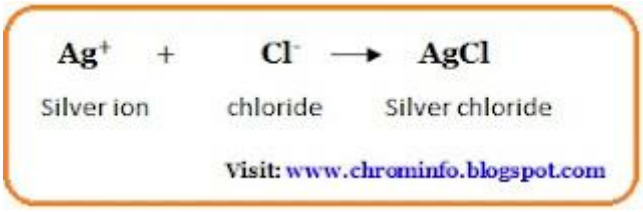
Resonance / Chromophore Theory

According to quinonoid theory, an **acid-base indicators** exist in two tautomeric forms having different structures which are in equilibrium. One form is termed benzenoid form and the other quinonoid form.

The two forms have different colours. The colour change is due to the inter conversation of one tautomeric form into other. One form mainly exists in acidic medium and the other in alkaline medium. Thus, during **titration** the medium changes from acidic to alkaline or vice-versa. The change in pH converts one tautomeric form into other and thus, the colour change occurs.

- ✓ **Phenolphthalein** has benzenoid form in acidic medium and thus, it is colourless while it has quinonoid form in alkaline medium which has pink colour.
- ✓ **Methyl orange** has quinonoid form in acidic solution and benzenoid form in alkaline solution. The colour of benzenoid form is yellow while that of quinonoid form is red.

b) **Principle of Mohr's Method**: - In this titration, Sodium Chloride react with **Silver Nitrate in Neutral solution using Potassium chromate as an Indicator, giving red colour Silver Chromate**, after all chloride ions have reacted at an end point. The principle of precipitation titration is- Amount of added precipitating agent = the amount of a compound that is precipitated.



AgNO3 solution is used to titrate the chloride. As an indicator, a soluble chromate salt (K2CrO4) is used. This results in a yellow solution, when the chloride precipitation is complete.

$$NaCl + AgNo_3 \leftrightarrows AgCl + NaNo_3$$

After all, chlorides have precipitated as silver chloride, the first excess of Ag+ reacts with the indicator to form red silver chromate as a second precipitate.

$$2\ Ag^+(aq) + CrO_4^{2-}(aq) \rightarrow Ag_2CrO_4(s)$$

Mohr's method is a direct method of titration in which a red precipitate of silver chromate is formed at the endpoint. This method is needed to be performed in the neutral to alkaline condition (pH in between 7 to 9).

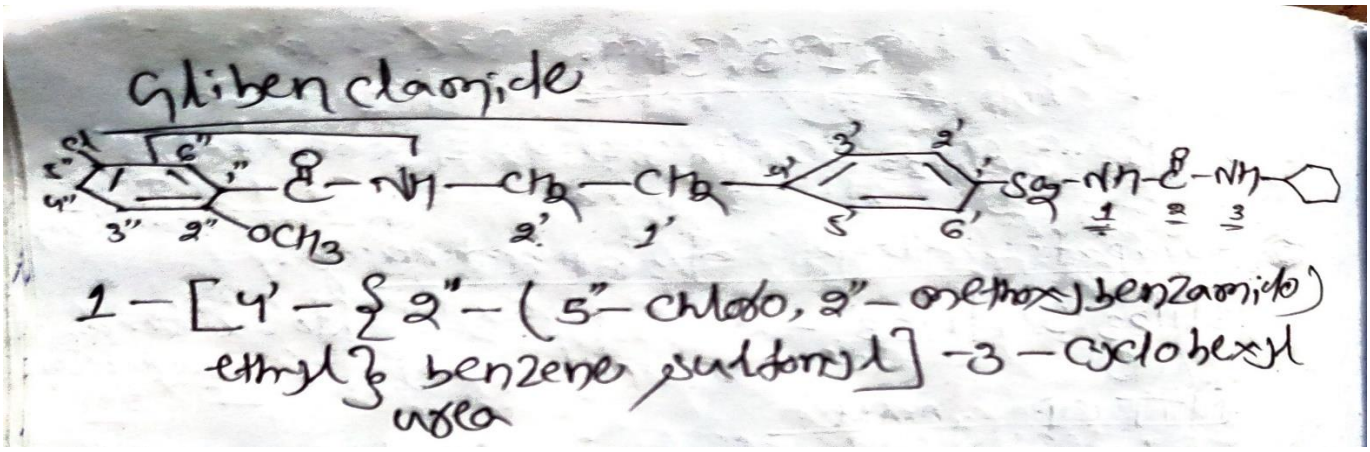
Procedure: -

- Initially, **0.1 N $AgNO_3$ solution was prepared** by taking 16.989 gm of $AgNO_3$ was transferred to 1 litre volumetric flask and finally volume was made up to 1 litre by using distilled water. It is then filled in the Burette.
- Then for **Standardization** process, 0.1 gm of NaCl was taken in conical flask, dissolved in 5 ml of water and 5 ml of Acetic acid. Then to this 50 ml of 95% Methanol and 3 drops of Potassium Chromate indicator was added.
- Then the final solution was titrated against 0.1N AgNO3 solution until the **white ppt. of AgCl changed from white to pink Colour**.

Application: -

Mohr's method is used to detect the concentration of chloride ions, Bromide Ions & Cyanide Ions in a weak basic solution. Also helps to identify the amount of chloride in water samples from a variety of sources, including river water, stream water, and a variety of pharmaceuticals and chemicals.

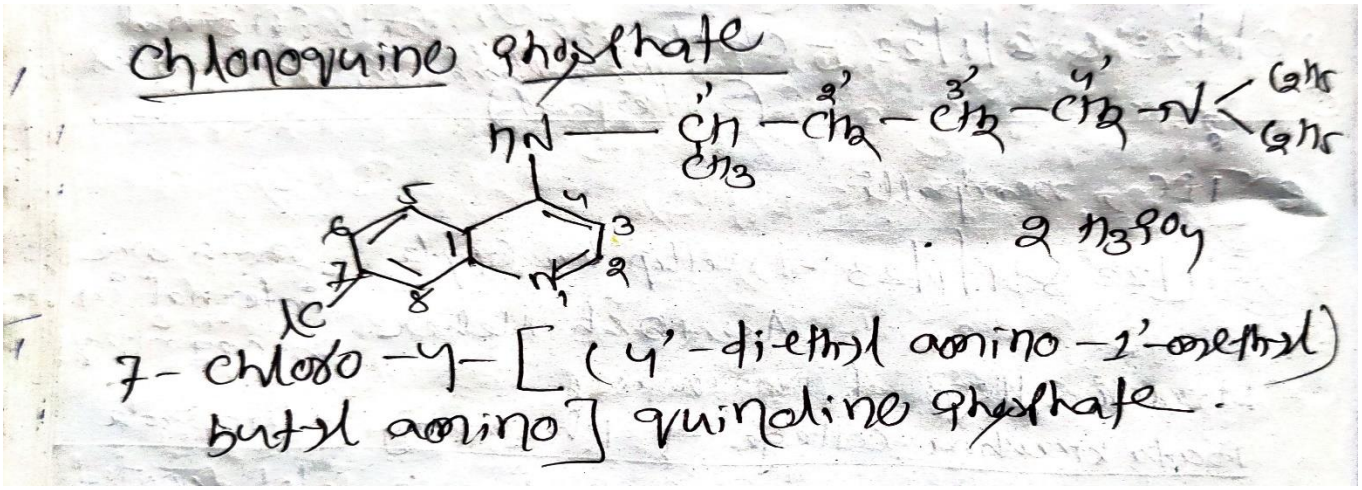
c) **GLIBENCLAMIDE: -**



USES: - Used in Treatment of NIDDM/ Type-2 Diabetes Mellitus

BRAND NAMES: - DAONIL, DIABETA etc.

CHLOROQUINE PHOPHATE



USES:- Used in Treatment of Malaria, Hepatic Amoebiasis, Giardiasis & Rheumatoid Arthritis.

BRAND NAMES: - NIVAQUIN & M-QUIN etc.

d) Quality Control is a department where the drug quality is tested, checked and confirms a drug fulfills the regulatory requirements with respect to safety, quality & efficacy. Quality Control Is Most Important part of Quality Team. Quality Control Department is deal with Sampling, Specification & Analytical Procedure preparation & appropriate execution.

IMPORTANCE OF QC

- The Quality Control Department as a whole will also have other duties, such as to establish, validate and implement all quality control procedures, oversee the control of the reference and/or retention samples of materials and products when applicable, ensure the correct labelling of containers of materials and products, ensure the monitoring of the stability of the products, participate in the investigation of complaints related to the quality of the product, etc. All these operations should be carried out in accordance with written procedures and, where necessary, recorded.

- Finished product assessment should embrace all relevant factors, including production conditions, results of in-process testing, a review of manufacturing (including packaging) documentation, compliance with Finished Product Specification and examination of the final finished pack.
- The different Activities of QC are mentioned below----------
  - ✓ Laboratory Inspection
  - ✓ FAILURE (OUT-OF-SPECIFICATION) LABORATORY RESULTS
  - ✓ PRODUCT FAILURES
  - ✓ RETESTING
  - ✓ RESAMPLING
  - ✓ AVERAGING RESULTS OF ANALYSIS
  - ✓ BLEND SAMPLING AND TESTING
  - ✓ MICROBIOLOGICAL
  - ✓ LABORATORY RECORDS AND DOCUMENTATION
  - ✓ LABORATORY STANDARD SOLUTIONS
  - ✓ METHODS VALIDATION
  - ✓ EQUIPMENT & RAW MATERIAL TESTING
  - ✓ IN PROCESS CONTROLS AND SPECIFICATIONS and Study of STABILITY

e) **CHEMISTRY OF ALUMINIUM HYDROXIDE GEL: -** Aluminum compounds are the one of the widely used Antacid. 3 forms of Aluminum are official in various Pharmacopoeias

- Aluminum Hydroxide Gel
- Dried- Aluminum hydroxide Gel
- Dried- Aluminum hydroxide Tablets

Chemical Formula: - $[Al(OH)_3]$

Molecular Weight:- 77.99

It is an aqueous suspension containing 3.5 to 4.4% w/w of Aluminum oxide. It may mix with pipermint oil/ other flavoring agent. It also contains sweetening agent such as Sorbitol, Glycerin, Sucrose & Saccharin with suitable Anti-Microbial agents. This gel is translucent having **pH of 5.5 to 8.0.**

Storage:- Stored in Air-tight container at a temperature not exceeding 30Oc. It should not allow to freeze. It is usually dispensed in blue/ Amber colored bottles.

Dosage Forms:- Oral Suspensions, Tablets etc.

Uses:-

- Used as Slow acting Antacid
- Used as Skin Protectants & Astringent
- Gives Symptomatic Relief in Gastric and Duodenal Ulcers & Reflux Esophagitis
- Management of Urinary Phosphatic Calculi & in Hyperchlorhydria

f) The drugs which are used in the treatment of Cancer are called as Anti-Neoplastic Agents.

- **Classification** :- 2 types
  - ✓ Drugs Directly act on cells (Cytotoxic Drugs)
  - ✓ Hormonal Drugs

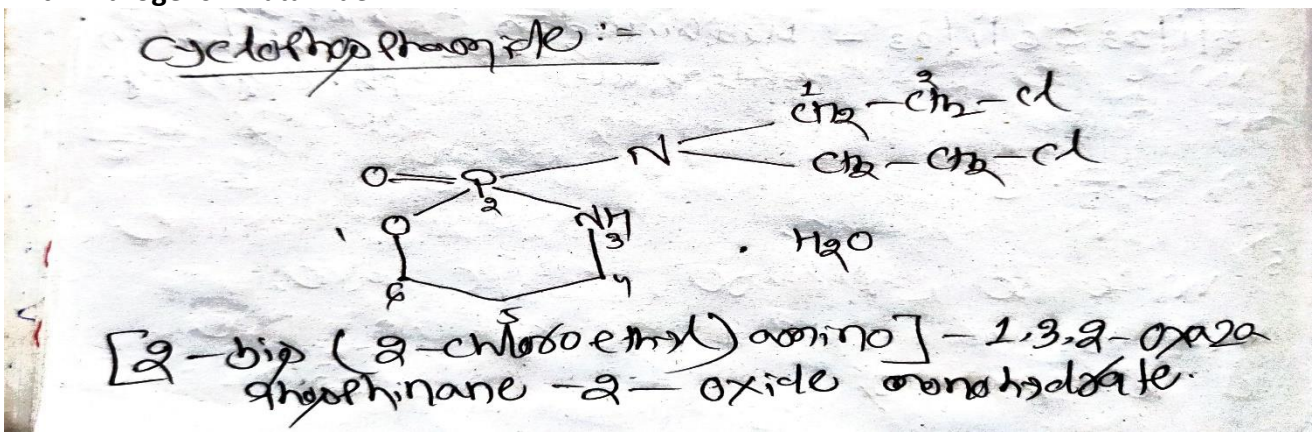
❖ **CYTOTOXIC DRUGS**

1) ***Alkylating Agents***
   - **(a) Nitrogen Mustards-----** Cyclophosphamide, Chlorambucil
   - **(b) Ethylenimine----------**Thio-Tepa
   - **(c) Alkyl Sulfonate----------** Busulfan
   - **(d) Nitrosoureas----------**Carmustine, Lomustine
   - **(e) Triazine----------**Dacarbazine
2) **Platinum Co-ordination Complexes----------** Cisplatin
3) **Anti-Metabolites**
   - ✓ **Folate Antagonist---** Methotrexate
   - ✓ **Purine Antagonist---** 6-Mercaptopurine
   - ✓ **Pyrmidine Antagonist---** 5- Fluorocil

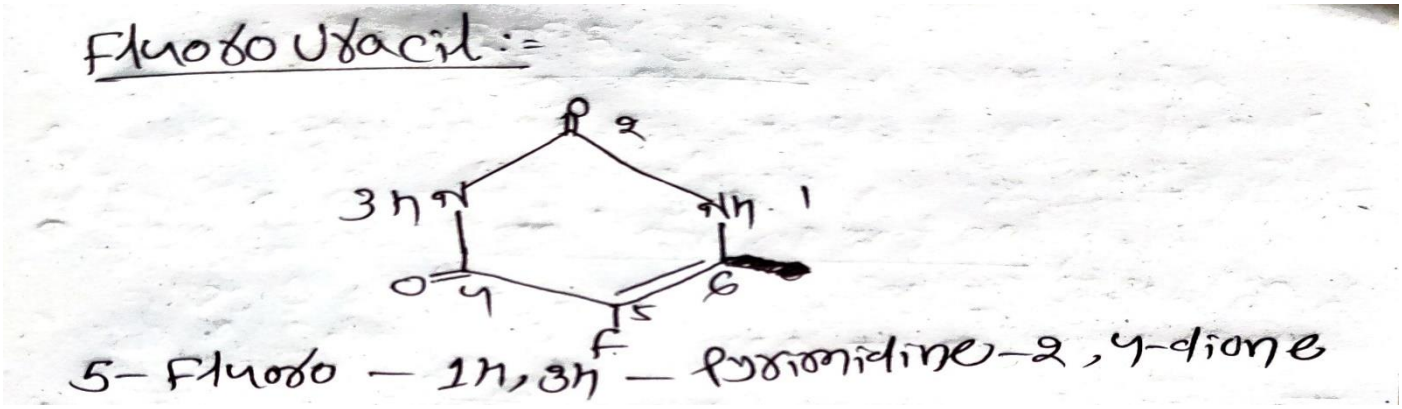
4) **Vinca Alkaloids--------** Vincristine, Vinblastine
5) **Topo-Isomerase-2 Inhibitors/ Epipodophyllotoxins: ----** Etoposide
6) **Topo-Isomerase-1 Inhibitors/ Camptothecin Analogues: ---** Topotecan
7) **Antibiotics: ----** Actinomycin-D, Doxorubicin, Daunorubicin, Bleomycin
8) **Miscellaneous: -** Hydroxy Urea, As_2O_3

❖ **HORMONAL DRUGS**

a) **Glucocorticoids:-** Prednisolone
b) **Estrogens:-** Ethinyl Estradiol
c) **Progestins:-** Hydroxy Progesterone Acetate
d) **Anti-Androgens:-** Flutamide



Brand Names: - LEDOXAN, CYCLOXAN etc.



Brand Names: - FIVOCIL, FLOCIL etc.

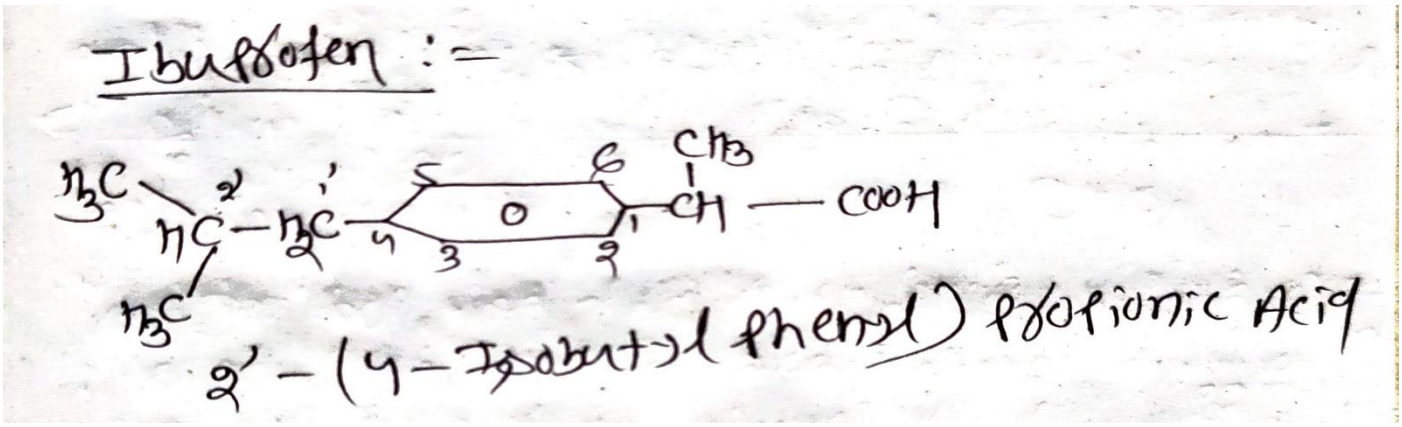
g) NSAIDs are the medications used to relieve pain, reduce inflammation and also lower the elevated body temperature.

<u>Classifications</u>

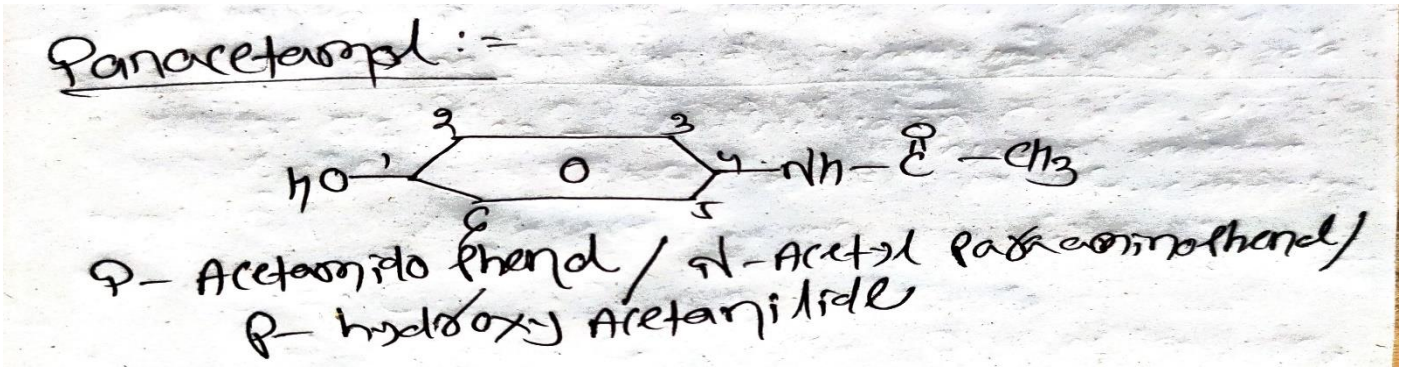
- ***Non-Selective COX Inhibitors***
    - ✓ Salicylates: - Aspirin
    - ✓ Anthranilic Acid Derivatives: - Mefenamic Acid
    - ✓ Aryl Acetic acid Derivatives:- Aceclofenac, Dicyclofenac
    - ✓ Propionic Acid Derivatives:- Ibuprofen
    - ✓ Oxicam Derivatives:- Piroxicam

- ✓ Pyrrole Derivatives:- Ketorlac
- ✓ Indole Derivatives:- Indomethacin
- ✓ Pyrazolone Derivatives:- Phenyl Butazone

- Selective COX-2 Inhibitors:- Celecoxib
- Preferential COX-2 Inhibitors:- Nimesulide
- Analgesics & Anti-Pyretics
  - ✓ Para amino Phenol Derivatives:- Paracetamol
  - ✓ Pyrazolone Derivatives:- Metamizol
  - ✓ Benzo-Oxazocine Derivatives:- Nefopam



Brand Names: - BRUFEN, ACIFEN etc.



Brand Names: - CALPOL, CROCIN etc.

2. a) Mouth Washes is a liquid which is held in the mouth / swilled around the mouth by contraction of perioral muscle used to washed the mouth cavity.

Ingredients of Mouth wash

- Solvents- Water/ Ethanol
- Flavors- To produce nice fresh feelings

- Phenolics- Kill the Germs
- Humectants- Increase osmotic pressure, require solubilization of Flavour
- Solubilizers/ Emulsifiers- Maintain a clear end product
- Buffer- To maintain pH e.g:- Benzoic acid
- Anti-Microbials-Cetyl Pyridinium chloride to produce nice feelings

Mention some important points regarding Labelling, Container & Indications etc.

Examples:- HYDROGEN PEROXIDE MOUTH WASH B.P

COMPOUND SODIUM CHLORIDE MOUTH WASH B.P

b)Fluorides in excess, if deposited on teeth, it produce Carcinogenic effects. When more quantity of Fluorides is ingested, it is carried to bones/ teeth, produced **MOTTLED ENAMEL**, which is known as "**DENTAL FLUOROSIS''.**

ROLE OF FLUORIDES AS ANTI-CARIES AGENTS

Fluoride is an essential element in the composition of enamel of teeth.

- Fluoride prevents the action of acids/ enzymes in forming cavities
- Increase the acid resistance of enamel
- Shows Anti-Bacterial Activity
- Helps in Re-Mineralization of Enamel
- Act by inhibiting bacterial Growth

c)**Haematinics** are the agents that tend to stimulate blood cell formation/ to increase the hemoglobin in the blood. In Anemia, Haematinics are used as medications.

List of Official Compounds:-

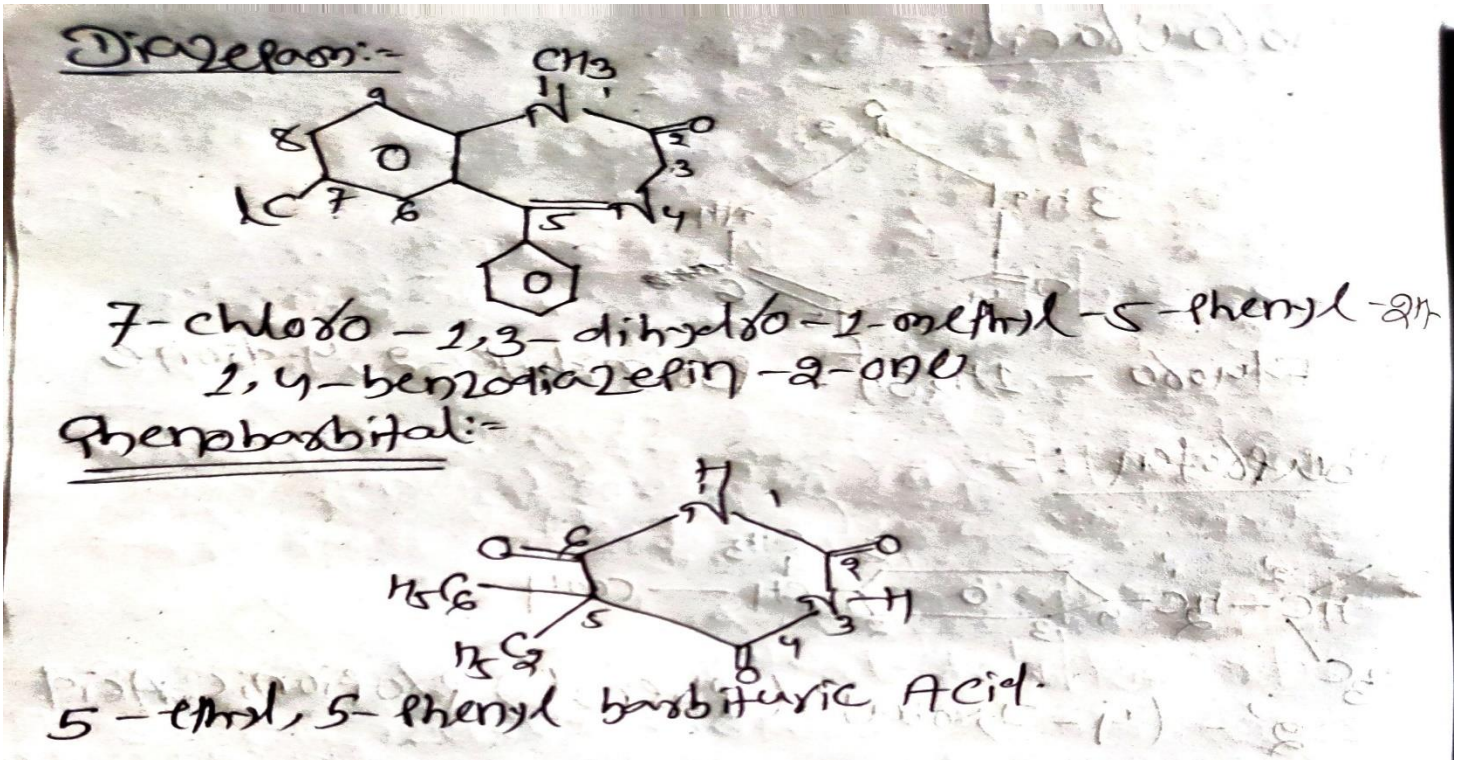
Ferrous Sulphate, Ferrous Fumarate, Carbonyl Iron, Ferric Ammonium Citrate, Ferrous Ascorbate

Ferrous Fumarate as an Ideal Compound

M. Formula: - $C_4H_2FeO_4$. Ferrous fumarate is present in non-anaemic form. So, it is used in iron in-sufficiency in infants and young children, and can be recommended as a useful fortification compound for complementary foods designed to prevent iron deficiency. Also given in Mouth for treatment of Iron Deficiency Anaemia.

d)**Sedatives: -** These are the drugs which reduce excitement and motor activity and produce calming effect without inducing sleep.

Hypnotics: - These are the drugs which induce sleep by depression of CNS function as like to Normal.



e) LIGHT KAOLIN: - Also known as China clay/ white clay. It is a pure, natural, hydrated Aluminum Silicate. Light Kaolin made up of Aluminum silicate+ Traces of Magnesium + Traces of Calcium + Traces of Iron.

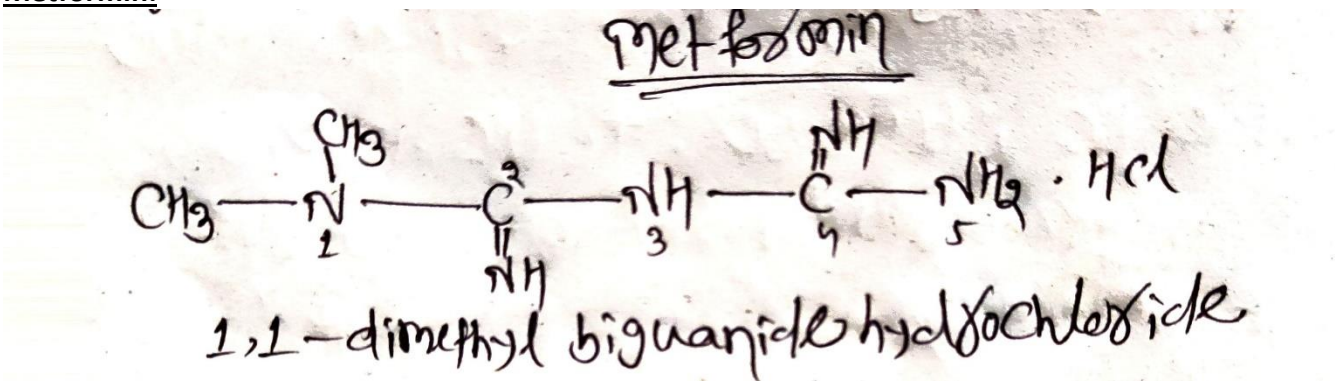
Uses

- ✓ Used as Adsorbents in Intestinal Infection
- ✓ Used in treatment of Dysentery/ Diarrhoea
- ✓ Used in treatment of Cholera, Colitis and Alkaloidal & Food Poisoning
- ✓ Used in Dusting powders & also in Cosmetic Industries.

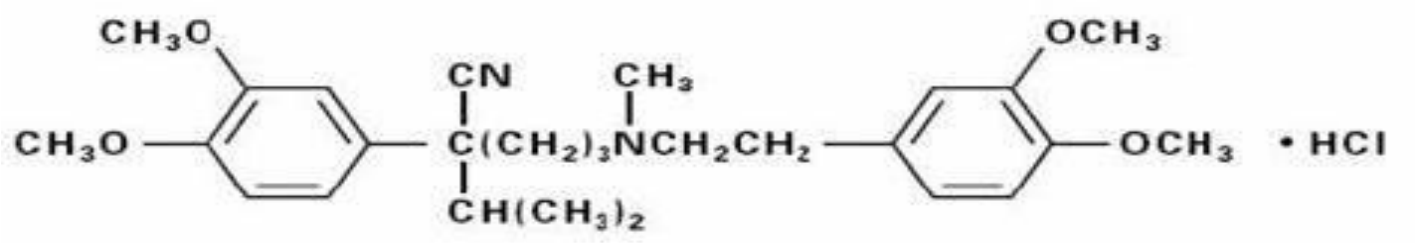
STORAGE & INCOMPATIBILITY

- ➢ Stored in well closed containers & It is in-compatible with all types of acids, Alkalis., insoluble in water. So always stored in closed containers.

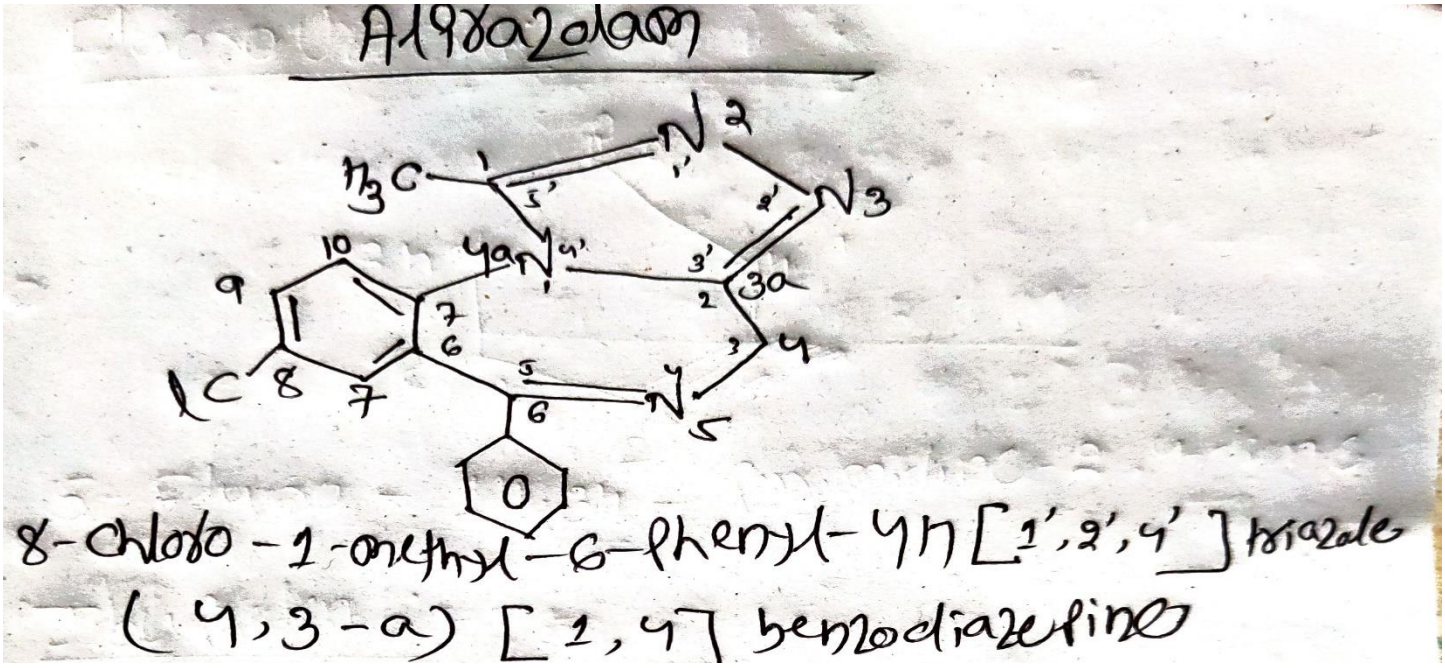
f) Metformin: -



Verapamil: -



Alprazolam: -



g) **Raw materials** required for manufacturing of pharmaceuticals either synthesized/ obtained from natural sources like plants, animals, microbes etc. During this process, along with desired products, some traces of impurities also mixed. So always, pure raw materials have to be used. If **raw materials contain an impurity**, then this impurity gets incorporated into the final product. Impurities like Lead, Arsenic etc are present in the raw materials and hence found in substances as impurities.

E.g:- If copper foils are contaminated with Arsenic, the final product $CuSo_4$ may contain arsenic impurity.

h) **Advantages of $BaSo_4$ Reagent over $BaCl_2$in Limit test for Sulphate: -** In Limit test for Sulphate, $BaSO_4$ reagent was used which contain $BaCl_2$ reagent, Sulphate free Alcohol & Potassium Sulphate (K_2SO_4) solution. So here Barium Chloride react with sulphate impurity, Alcohol prevents supersaturation where as Potassium sulphate increase rate of Reaction & Sensitivity.

i)**Principle of Limit Test for Chlorides: -** Chloride impurity reacts with Silver Nitrate to form a white precipitate of silver chloride in the presence of Dilute HNO_3. It is observed as opalescence.

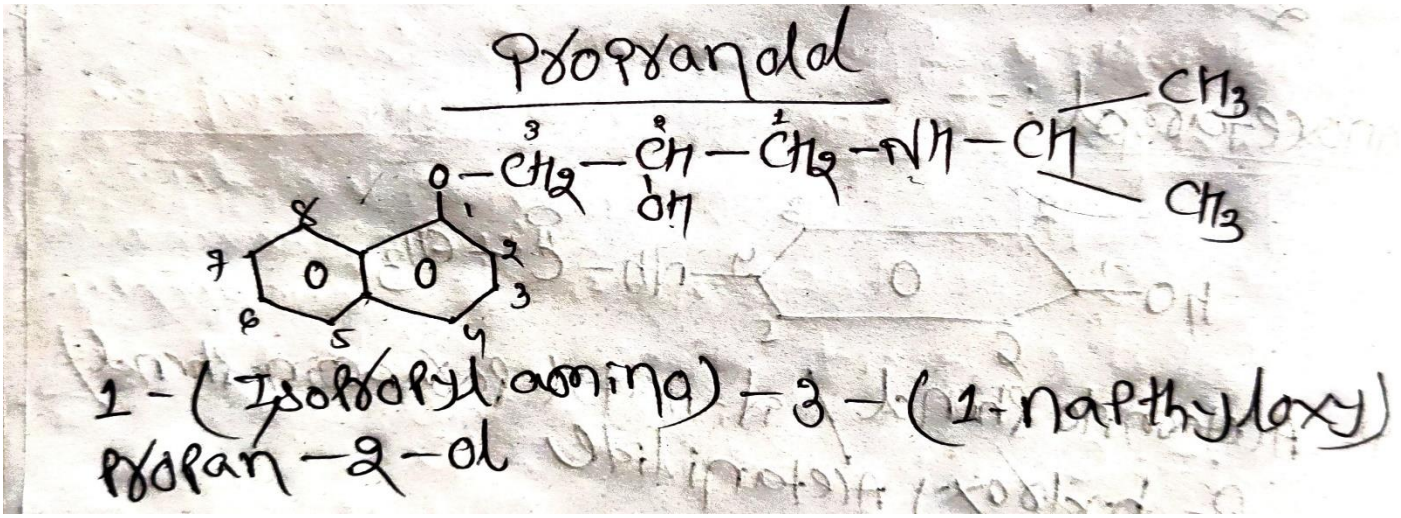
Reaction: - Chlorides + AgNO3 (silver nitrate) ————————> AgCl (silver chlorides) + nitrate

Dissolve a specified quantity of a given sample in distilled water. Then add 10ml of dilute nitric acid (HNO3) and mix. Add 50ml of distilled water and 1ml of 5% silver nitrate solution (AGNO3). Stir the solution with a glass rod and allow it to stand for 5 minutes. Keep the solution protected from light. Then compare the opalescence produced with that of standard solution transversely.

j) **DOT Therapy in Tuberculosis:** -T. B is an infectious disease characterized by growth of nodules/ tubercules in the tissue of Lungs. DOTS is stand for Directly Observed Treatment Short Course/ Directly Observed Therapy. It is so popular, because for treatment of TB, combination therapy is used because M. Tuberculosis done some remarkable changes like------

- Rapidly growing with high bacillary load
- Slow growing Stage
- Spurters Stage
- Dormant Stage. So, our aim is to---------
    - Kill the microorganisms by dividing Bacilli
    - Kill persistent bacilli & Prevent emergence of resistance. SO DOT therapy is popular in T.B.

k) The drugs which reduce elevated blood pressure to normal level are called as "**Anti-Hypertensive Agents''**.



3. A) Define the Followings:

i)Normality: - Number of gram equivalent weight of solute per litre of solution. It is designated as N. SO 1N = 1 gram equivalent weight of solute per litre of solution.

ii) Conjugate Acid & Conjugate Base with suitable Examples: - An acid donates a proton and base accepts it. So, by donating one proton by acid, a substance formed known as **Conjugate Base**. Like this, base by accepting a proton, converted into **Conjugate Acid**.

$H_2SO_4 + H_2O \Rightarrow HSO^-_4 + H_3O^+$

In this example, sulfuric acid (H_2SO_4) is an acid because it "donates" H^+ to the water. It becomes the hydrogen sulphite ion (HSO^-_4) which is the conjugate base of sulfuric acid.

iii)Hemosiderosis: - It is a disease in which iron overloading occur, then Haemosiderin portion in body get increased. So that skin pigmentation occurs whereas grey appearance of Total skin occur. The different symptoms are---------

Hepatomegaly, Weakness, Lethargy, Chronic Abdomen pain, Diabetes & Impotence etc.

iv)Oxidant &Reductant with Examples: - **Oxidant/ Oxidizing Agent** are the substances containing an atom/ion capable of taking an electron, resulting in the decrease in +ve valency/ Increase in their -ve Valency. Eg: - $KMnO_4$, $K_2Cr_2O_7$, I_2, KIO_3 etc.

Reductant/ Reducing Agent are the substances containing an atom/ion capable of losing an electron, resulting in the increase in +ve valency/ decrease in their -ve Valency. Eg: - H_2S, $FeCl_2$, CaH_2, NaH etc.

v) Cathartics: - These are also known as Purgatives. These are the medicinal agents that speed up and increase bowel evacuation from intestinal tract specially through colon & rectum result in defecation.

vi) **Astringent: -** The substances which produce protein precipitations and having low cell permeability. The effects are seen by producing contraction & wrinkling of tissues. Eg: - Alum, Calamine, $ZnSo_4$, Aluminium Citrate.

vii) Complexometric Titration: - It is a form of volumetric analysis in which the titration based on colour complex formation between the analyte and titrant which produced and indicates the end point of Titration. / It is a technique involbs the titrations of metal ions with a complexing/ chelating agents are called as Complexometric titrations.

viii) Impurity: - Impurity is an undesirable matter which may / may not be toxic but present in the pharmaceutical substances. There are many types of impurities commonly occur in pharmaceuticals like---

- Toxic Impurity
- Harmless Impurity
- Impurity affecting storage property
- Impurity causing technical Difficulties etc.

ix) Self Indicator with Example: - These indicators are so strongly coloured that after the equivalence point, if a single drop of it added, an intense colour in the reaction occurs. So, they are known as Self Indicators.

E.g.:- Potassium Permanganate = Pink colour

Ceric Sulphate= Yellow colour & Iodine Solution= Brown colour

x) **Anti-depressant: -** These are the drugs which overcome mental depression by balancing the biological amine in the brain. These drugs improve the mood of depressed individuals.

E.g :- Imipramine, Amitriptyline, Phenelzine, Fluoxetine, Bupropion.

3. B) (i) <u>Dapsone:-</u>

dapsone

Uses:-

- Used in the treatment of Leprosy, Dermatitis.
- It combined with Pyrimethamine to treat Pneumonia

(ii) <u>Magaldrate: -</u>

C. Formula is $Al_5Mg_{10}(OH)_{31}(SO4)_2.XH2O$.

It is the combination of Magnesium hydroxide & Aluminium hydroxide.

Uses:-

- Used as an Antacid.
- Used in the treatment of Oesophageal, Duodenal& Gastric ulcers and also used in treatment of Heart burn, Indigestion/ Stomach Upset.

(iii) <u>Potassium Permanganate: -</u>

C. Formula is $KMnO_4$. It is used as a Strong oxidising agent in presence of Acidic medium.

Uses:-

- Assay of $FeSO_4$, H_2O_2 & Sodium Nitrite.
- Assay of Calcium oxalate/ Calcium Lactate/ Calcium Carbonate/ Calcium Chloride
- Used as an Anti-microbial agents & used as an Antidotes for Barbiturate poisoning
- Used as Mouth wash & Gargles & Deodorants etc.

(iv) **Bleaching Powder: -**

C. Formula is $Ca(OCl_2)$ / $CaOCl(Cl)$

Uses:-

- Used as Disinfectant Agent.
- Used to disinfect Feaces, Urine & Sputum and also used for disinfecting swimming tanks.
- Used for Sterilization of Water.

(v) **Green Vitriol: -**

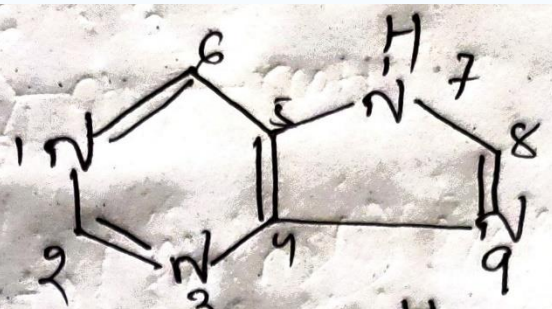
C. Formula is $FeSO_4.7H_2O$

Uses:-

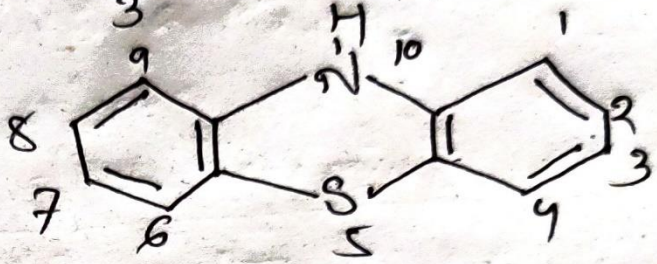
- Given in Mouth for the treatment of Iron deficiency Anaemia.

3. C)

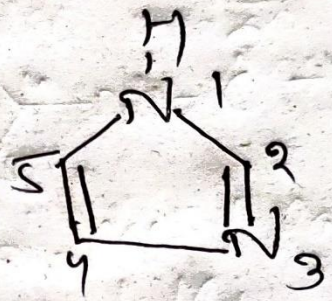
(i) Purine :-



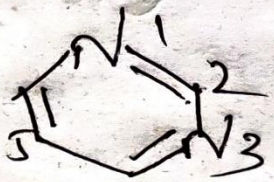
(ii) Phenothiazine :-



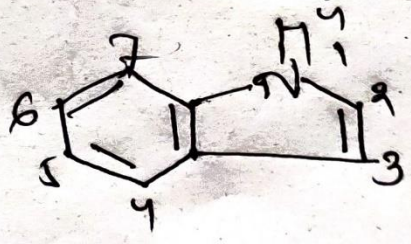
(iii) Imidazole :-



(iv) Pyrazimidine :-



(v) Indole :-



ODISHA STATE BOARD OF PHARMACY

Model answer for Pharmaceutics (Theory) 2020

1. Long type questions (answer any six) [6x5=30]

i. Define Immunity. Write down the details about small pox vaccine. (1+4=5)

Answer: 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.

Smallpox is a virus. Symptoms of smallpox infection begin with a two- to five-day period of high fever, malaise and backache followed by the development of a rash. The smallpox vaccine is made using a poxvirus that infects cows (cowpox). Cowpox causes disease in cows, but it rarely causes disease in humans. Because cowpox and human smallpox are similar, infection with cowpox can protect people against smallpox. The person who first used cowpox to protect against smallpox was Edward Jenner in 1796. Jenner was a family physician who lived in southern England. He noticed that every few years, when smallpox would sweep across the English countryside, women who milked cows (milkmaids) were spared the infection. He reasoned that these women were getting infected when they came in contact with blisters on the udders of cows during milking, and that this infection was protecting them from infection with smallpox. So, he took fluid from the blisters of cows and injected it into several people (including his 15-month-old son) to see if that fluid protected against smallpox. It worked.

A drop of the vaccine virus (called vaccinia) is placed on the upper arm. The drop is then inoculated into the skin using a two-pronged, stainless steel needle. The needle is used to puncture the skin three or 15 times (people getting their first vaccine get three punctures, whereas those getting a booster dose of vaccine receive 15 punctures). The vaccination often causes a residual, lifelong scar.

The smallpox vaccine initially causes a red, raised bump at the site of inoculation that progresses to a blister and eventually a scab. The scab then separates from the skin about two weeks after inoculation.

ii. Define tablet. Write down the details about excipients used in tablet preparation with suitable examples. (1+4=5)

Answer: Tablets are solid, flat or biconvex dishes, unit dosage form, prepared by compressing a drugs or a mixture of drugs, with or without diluents.

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.

iii. Discuss different methods for identification of types of emulsion. (5)

We can find out the type of emulsion with the help of the following tests:

Dilution Test: This test can be conducted by adding water or oil to the emulsion. If water is added, and it gets mixed with the emulsion, then the emulsion is of the oil-in-water (o/w) type. If water does not mix with the emulsion, then it is known as the water-in-oil (w/o) type. Apart from water, if oil is added to the emulsion, and it gets mixed, then it is called the water-in-oil type.

Dye Solubility Test: This test can be conducted by adding a water-soluble dye to the emulsion. If the emulsion becomes red, it means that it is the oil-in-water type and vice-versa.

Conductivity Test: In this test, some amount of electrolyte is added to the emulsion to measure its conductance. If it shows an increase in conductance, the emulsion is of the oil-in-water type. On the other hand, if there is no change in conductance, the emulsion is water-in-oil type.

iv. Define Q.A & Q.C. Write briefly about cGMP. (2+3)

Quality Assurance is known as QA and focuses on preventing defect. Quality Assurance ensures that the approaches, techniques, methods and processes are designed for the projects are implemented correctly.Quality assurance activities monitor and verify that the processes used to manage and create the deliverables have been followed and are operative.

Quality Control is known as QC and focuses on identifying a defect. QC ensures that the approaches, techniques, methods and processes are designed in the project are following correctly. QC activities monitor and verify that the project deliverables meet the defined quality standards.

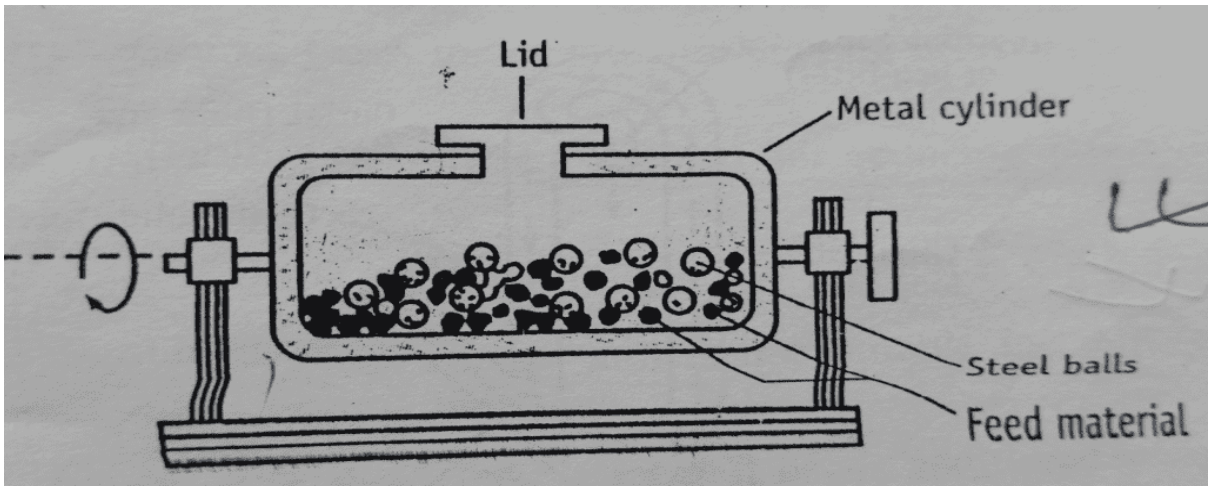
GMP is also sometimes referred to as "**cGMP**". The "c" stands for "current," reminding manufacturers that they must employ technologies and systems which are up-to-date in order to comply with the regulation. Systems and equipment used to prevent contamination, mixups, and errors, which may have been first-rate 20 years ago may be less than adequate by current standards.

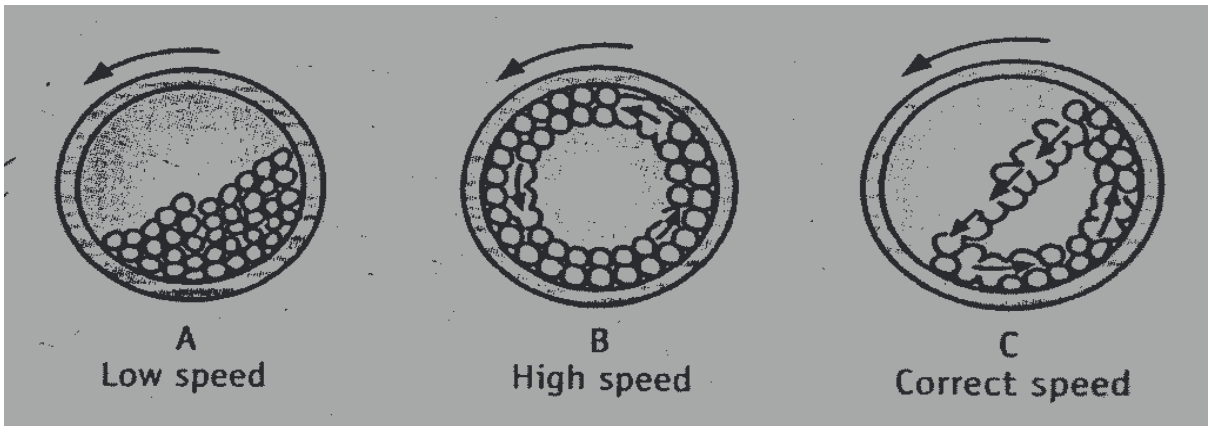
Current good manufacturing practices are defined by the FDA as systems to assure proper design, monitoring, and control over manufacturing processes and facilities in pharma and other FDA-regulated industries. These systems are designed to help organizations assure drug products are the correct identity, strength, purity, and quality.

v. Write down the principles, construction, working and application of Ball Mill with labelled diagram. (1+1+1+1+1=5)

In the ball mill, Impact and Attrition both are responsible for the size reduction Rapidly moving balls are used for the comminution of brittle material.

The ball mill consists of a hollow metal cylinder mounted on a shaft and rotating about its horizontal axis. The cylinder can be made of metal, porcelain, or rubber. Inside the cylinder balls or pebbles are placed. The balls occupy between 30 and 50% of the volume of the cylinder. The diameter of the balls depends on the size of the feed and the diameter of the cylinder. The diameter of the balls varies from 2cm to 15cm. The balls can be made of metal, porcelain, or stainless steel. The ball acts. as a grinding medium.





At low speed, the mass of balls will slide or roll up one over another and will only produce an insignificant amount of size reduction. At high speeds, the balls are thrown to the cylinder wall due to centrifugal force and no grinding will occur. At 2/3rd speed centrifugation just occurs which is called the critical speed of the ball mill. At this speed, the balls are carried almost to the top of the mill and then fall in a cascade across the diameter of the mill. In this way, the maximum size reduction is obtained by the impact of the particles between the balls and by attrition between the balls. It is usually 0.5 cycles per second (cps).

1. Very fine powder can be obtained.
2. Suitable for both wet and dry grinding processes.
3. Toxic substances can be ground, as closed cylinders are used.
4. Sterility can be maintained due to a closed cylinder system.
5. In a ball mill, installation, operation, and labor costs are low.
6. Suitable for batch or continuous process.
7. Grinding medium is cheap
8. The cost of installation and production is low.

vi. Write down different quality control tests for tablets. (5)

Weight variation test: The U.S.P. weight variation test is run by weighing 20 tablets individually, calculating the average weight, and comparing the individual tablet weights to the average. The tablets meet the USP test if "not more than 2 tablets are outside the percentage limit and if no tablet differs by more than 2 times the percentage limit."

Content Uniformity test : Weight variation test is applicable when the amount of medicament in the tablet is high. In potent drug the medicament is less in amount in comparison to the other excipients. The weight variation may meet the pharmacopoeial limitation but this will not ensure the correct variation of potency. hence, in this case the weight variation test is followed by content uniformity test. In this test 30 tablets are randomly selected for sample, and at least 10 of them are assayed individually according to the official assay method. Only 9 of the 10 tablets must have potency within ± 15 % of the labelled drug content.Only 1 tablet may be within ± 25%.

Disintegration Test : The time a tablet takes to disintegrate is the disintegration time. To test the disintegration time one tablet is placed in each tube, and the basket rack assembly is positioned in a 1-litre beaker of water, simulated gastric fluid or simulated intestinal fluid, at $37^0C \pm 2^0C$, such that the tablet remains 2.5 cm from the bottom of the beaker. A standard motor moves the basket up and down through a distance of 5 to 6 cm at a frequency of 28 to 32 cpm (cycles per minute).

Dissolution Test : Disintegration test simply identifies the time required for the tablet to break up under the condition of the test but it does not ensure the drug release in the bulk of the fluid. Rate of dissolution is directly related to the efficacy of the drug. Rate of dissolution is a good index for comparing the bioavailability of two tablet products of the same drug. Apparatus-I (Basket): In general, a single tablet is placed in a small wire mesh basket and immersed in the dissolution medium (as specified in the monograph) contained in a 1000 ml flask at . $37^0 \pm 0.5^0C$. Generally it is rotated at 50 rpm unless otherwise specified. Apparatus-2 (Paddle) : The same equipment is used. Instead of basket a paddle is introduced as the stirring element. The tablet is allowed to sink at the bottom of the flask before stirring. Limit: A value of $t_{90\%}$ (i.e 90% drug release) within 30 minutes is often considered satisfactory and is an excellent goal since a common dissolution tolerance in the USP/NF is not less than 75% dissolved in 45 minutes.

Tablet Hardness : The resistance of the tablet to chipping, abrasion or breakage under conditions of storage, transportation and handling before usage depends on its hardness. Method: A tablet is taken between the 2nd and 3rd finger and pressing it with the thumb as fulcrum. If the tablet breaks with a "sharp snap", yet, it does not break when it falls on the floor – is said to possess proper hardness. Instruments used: a) Monsanto Hardness Tester b) Strong Cobb

Hardness Tester -Manual mode. c) Pfizer Hardness Tester. d) Erweka Hardness tester. – Automatic. e) Schleuniger Apparatus. – Operates without manual involvement. Hardness of a tablet: The hardness at which the tablet crushes is the hardness of the tablet. Unit of hardness: Kg/sq.in. or lb/ sq.in .Limit: Generally maximum 5 kg/sq.in. hardness is required.

Friability: Tablet hardness is not an absolute indicator of strength since some formulations, when compressed into very hard tablets may produce chipping, capping and lamination problems. Therefore, another measure of tablet strength i.e. friability is often measured, i.e. the friability. Instrument: Roche Friabilator Objective of friability test: This apparatus is designed to evaluate the ability of the tablet to withstand abrasion, in handling, packaging and shipping operation. Method: 20 tablets, previously weighed are taken in the plastic chamber of the laboratory friability tester. In the plastic chamber the tablets are subjected to abrasion and shock by rotating the plastic chamber at 25 rpm for 4 mins (i.e. total 100 revolutions). The tablets are dedusted and reweighed. Limit: - For conventional compressed tablet the weight loss should be within 0.5 to 1.0 %

vii. Write down different methods used in formulation of parenteral preparations. (5)

1. Cleaning of containers and closures: - All the containers, closures and equipments which are required during the preparation of parental products are thoroughly cleaned with detergent and washing is done with tap water , followed by clean distilled water and finally rinsed with water for injection. Rubber closures are washed with hot solution of 0.5 % sodium pyrophosphate in water followed by rinsing with filtered water for injection .

2. Preparation of Solution:- The raw materials required in the preparation of parenteral products should be pure. Water for injection free from pyrogens and microorganisms are used in preparation of parenteral products. The Industrial pharmacist should decide the order of mixing and exact method of preparation to be followed before preparing the parenteral products . The parenteral preparation must be prepared under strict aseptic conditions . The ingredients are accurately weighed separately and dissolved in the vehicle as per method of preparation to be followed. The parenteral Solutions so formed is passed through bacteria proof filter ,such as ,filter candle, seitz filter, membrane filter, and sintered glass filters to avoid contamination of filtered solution, before it is finally transferred into final container and sealed

3. Sterilization:-The parental preparations should be immediately sterilized after sealing in its final containers. For thermostable medicament ,the parenteral product are sterilised either by autoclaving at the temperature of 115°C to 116°C for 30 minutes or 121 degree centigrade for 20 minutes or in hot air oven at 160 degree centigrade for 2 hours. The thermolabile preparations are sterilized by filtration through a suitable bacteria proof filters. parenteral preparations which are sterilised by filtration method may contain a suitable bacteriostatic agent to prevent the growth of microorganisms .

4. Filling and Sealing:- The filtered product is filled into final container such as, ampoules, vials and transfusion bottles, which are previously cleaned and dried. On small scale feeling is done manually by using hypodermic syringe and needle .on the large scale feeling is done by automatic filling machine. The filling operation is carried out under strict aseptic precautions. During the filling of ampoules, the care should be taken that the solution should be filled below the neck of ampoules and the solution should not touch the neck of ampoules. This will prevent the cracking and stanining of the neck of ampoules at the time of Sealing. Sealing should be done immediately after filling .

5. Evaluation of Parenterals:- The finished parenteral products are subjected to the following test ,in order to maintain quality control. a) Sterility test b) clarity test c) Leakage test d)Pyrogen test.

6. Packaging and labeling:- After evaluation of the parenteral preparation,the ampoules ,vials and transfusion bottles are properly labelled and packed. The label should state as :- a) Name of the preparation b) Quantity of the preparation c) Mfg.Lic .no. d) Batch no. e) Date of manufacture f) Date of expiry g) Storage condition h) Retail price i) Manufacturer's address

2. Short type questions (answer any ten) [10x3=30]

i. Write the ideal properties of filter aids. Give two examples of filter aid.

- Should be chemically inert and free from impurities.
- Should have low specific gravity, hence can remain suspended in liquids.
- Should be porous rather than dense, so that the porous cake can be formed.
- Should be recoverable.
- **Diatomite** (Kieselgur) , obtained from natural siliceous deposits.
- **Perlite** is an aluminum silicate.
- **Cellulose**, **Asbestos**, **charcoal**, **talc**, **bentonite** , **fullers earth** etc.

ii. Write a short note on homogenisation.

Homogenization is the process of converting two immiscible liquids (i.e. liquids that are not soluble, in all proportions, one in another) into an emulsion (Mixture of two or more liquids that are generally immiscible). Sometimes two types of homogenization are distinguished: primary homogenization, when the emulsion is created directly from separate liquids; and secondary homogenization, when the emulsion is created by the reduction in size of droplets in an existing emulsion. Homogenization is achieved by a mechanical device called a *homogenizer*. It is the process in which large droplet particles are divided into smaller one. In pharmaceuticals following Homogenizers are mainly used:

Hand Homogenizer

Silverson mixer Homogenizer

Colloid Mill

iii. Write a short note on Soxhlet extraction.

Soxhlet extraction is used when the desired compound has a *limited* solubility in a solvent, and the impurity is insoluble in that solvent.

A Soxhlet extractor has three main sections: a percolator (boiler and reflux) which circulates the solvent, a thimble (usually made of thick filter paper) which retains the solid to be extracted, and a siphon mechanism, which periodically empties the thimble.

1. The source material containing the compound to be extracted is placed inside the thimble.
2. The thimble is loaded into the main chamber of the Soxhlet extractor.
3. The extraction solvent to be used is placed in a distillation flask.
4. The flask is placed on the heating element.
5. The Soxhlet extractor is placed atop the flask.
6. A reflux condenser is placed atop the extractor.

iv. Write a short note on sterilization.

Sterilization is a process that eliminates (removes) or kills all forms of life, including transmissible agents (such as fungi, bacteria, viruses, spore forms, etc.) present on a surface, contained in a fluid, in medication, or in a compound such as biological culture media. Sterilization can be achieved by applying the proper combinations of heat, chemicals, irradiation, high pressure, and filtration.

A. Physical methods:

1. Heat sterilization: a. Dry heat sterilization b. Moist heat sterilization

2. Sterilization by radiation

a. Use of ultra violet rays b. Ionising radiation

B. Chemical methods:

a. Sterilization by Gases

C. Mechanical methods:

a. Ceramic filters b. Seitz filter c. Sintered glass filters d. Sintered Meta filters e. Membrane filters

v. Differentiate between flocculated and deflocculated suspension.

A flocculated suspension is a suspension in which particles have undergone flocculation.

1. Particles exist as loose aggregates.
2. Rate of sedimentation is high.
3. Sediment formed rapidly.
4. Consist of loosely packed particles possessing a Scaffolding structure a hard dense cake does not form and the sedimentation can easily be redispersed.
5. Elegant preparation is obtained due to the uniform distribution of loosely bonded flocs.

A deflocculated suspension is a suspension where no flocculation has taken place.

1. Particles exist as separate entities.
2. Rate of sedimentation is low.
3. Sediment formed slowly.
4. Sediment becomes very closely packed as the repulsive forces between the particles are overcome a hard cake is formed which is difficult to redisperse.
5. Unsightly preparation results due to the formation of sedimentation.

vi. Write notes on factor affecting size reduction.

1. Hardness
2. Toughness
3. Abrasiveness
4. Stickiness
5. Slipperiness
6. Softening temperature
7. Moisture content

vii. Define diffusible solid & indiffusible solid.

Suspension containing diffusible substances and they consists easily dispersible solids. They are light and easily wettable substances.

Suspensions containing indiffusible solids. These are insoluble powders and will not be remain distributed in a vehicle long enough to ensure uniformity of dose.

viii. Write down the difference between liniments and lotions.

Liniments are liquid or semi-liquid preparations, usually applied to the skin with friction and rubbing of the skin. Liniments are more viscous. Liniments are counter-irritant and rubefacient. Liniments should not be applied to the broken skin because they may cause excessive irritation.

Lotions are liquid preparations meant for external application without friction. Lotions are slightly less viscous than liniments. Lotions have antiseptic, anti-inflammatory, cooling, and soothing properties. Lotions are applied directly to the skin.

ix. Write short note on fusion method of preparation of suppositories.

It involves first melting the suppository base, and then dispersing or dissolving the drug in the melted base. The mixture is removed from the heat and poured into a suppository mold. When the mixture has congealed, the suppositories are removed from the mold. The fusion method can be used with all types of suppositories and must be used with most of them.

Suppositories are generally made from solid ingredients and drugs which are measured by weight. When they are mixed, melted, and poured into suppository mold cavities, they occupy a volume – the volume of the mold cavity. Since the components are measured by weight but compounded by volume, density calculations and mold calibrations are required to provide accurate doses.

x. Differentiate between calibration and validation.

Calibration is a process that ensures that accuracy is maintained in the measurements produced by your equipment. Calibration performance of any equipment is compared against a reference standard. Calibration assures accuracy of measurements. It should be performed as per calibration SOP

Validation is a documented process that provides assurance that a product, service or system consistently provides results within the acceptable criteria. Validation provides proof of consistence across all the processes; bathes of products or methods being used. It should be performed as per the validation protocol.

xi. Write a short note on effervescent granules.

Effervescent granules are the specially prepared solid dosage form of medicament, meant for internal use. They contain a medicament mixed with citric acid, tartaric acid and sodium bicarbonate. Sometime saccharin or sucrose may be added as a sweetening agent. Before administration, the desired quantity is dissolved in water, the acid and bicarbonate react together producing effervescence. The carbonated water produced from the release of carbon dioxide serves to mask the bitter and saline taste of drugs. Moreover , carbon dioxide stimulates the flow

of gastric juice and helps in the absorption of medicament. Method of Preparation:- There are two methods of preparation of effervescent granules:

Heat method and Wet method.

3. Objective type Questions, Answer all from both sections, Each carries One mark (20x1)

(A) DEFINE THE FOLLOWING

i) Impact: In this, the substance is subjected to hammers or bars at high speed. Impact occurs when a forceful particle is strike against a stationary object for size reduction.

ii) Co-solvent: Co-solvents are substances added to a primary solvent in small amounts to increase the solubility of a poorly-soluble compound. Co-solvents are added to increase the solvent power of the primary substance in the mixture.

iii) Colloidal suspension: A mixture having particles of one component, with diameters between 10^{-7} and 10^{-9} meters, suspended in a continuous phase of another component. The mixture has properties between those of a solution and a fine suspension. A suspension is similar to a colloid except that the dispersed particles tend to be larger and will eventually settle or form sediment.

iv) Enteric coated tablet:
An oral dosage form in which a tablet is coated with a material to prevent or minimize dissolutio n in the stomach but allow dissolution in the small intestine. This type of formulation either prote cts the stomach from a potentially irritating drug or protects the drug from partial degradation in t he acidic environment of the stomach.

v) Microencapsulation: Microencapsulation is a process in which tiny particles or droplets are surrounded by a coating to give small capsules, with useful properties. Generally polymeric materials, to give small capsules that may range from sub-microns to several millimeters in size.

vi) Clarification: Clarification is the process of clarifying liquids containing small amounts of solid particles by removing the solid portion from the liquids. It is a term used to describe processes that involve the removal or separation of a solid from a fluid, or a fluid from another fluid.

vii) Lyophilisation: Lyophilization or freeze drying is a process in which water is removed from a product after it is frozen and placed under a vacuum, allowing the ice to change directly from solid to vapor without passing through a liquid phase. The process consists of three separate, unique, and interdependent processes; freezing, primary drying (sublimation), and secondary drying (desorption).

viii) Sieve number: The sieve number denotes the number of holes present in the sieve within one inch length of the sieve mesh in each direction. A sieve consists of a housing containing a removable wire mesh of a defined aperture size.

ix) 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.

x) Opsonin: Any substance (e.g. antibody) that binds to the surface of a particle (e.g. antigen) to enhance the uptake of the particle by a phagocyte (e.g. macrophage). The process wherein a substance is chemically modified to become delicious to a phagocyte is referred to as opsonization.

xi) Pharmacopoeia: A pharmacopeia is a book containing a list of medicinal drugs with their uses, preparation, dosages, formulas, published by an authority such as a government or pharmaceutical society.

xii) 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.

xiii) Tablets: Tablets are solid, flat or biconvex dishes, unit dosage form, prepared by compressing a drugs or a mixture of drugs, with or without diluents.

xiv) Poultice: Poultice is paste-like preparations used externally to reduce inflammation because they retain heat well. After heating, the preparation is spread thickly on a dressing and applied, as hot as the patient can bear it, to the affected area.

xv) 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.

(B) ANSWER THE FOLLOWING.

i. Give two major differences between emulsion and suspension.

- The pharmaceutical emulsion is a thermodynamically unstable system that consists of two immiscible liquid phases, one of which is dispersed as globules within the other and is stabilized by a third substance known as an emulsifying agent.
- Pharmaceutical emulsions are classified into two types 1. Oil in a water type (o/w), 2. Water in oil type (w/o).

- The pharmaceutical suspension is a biphasic liquid or semi-solid dosage form, in which insoluble solid drug particles are homogeneously dispersed in a liquid or semi-solid medium.
- The pharmaceutical suspensions are classified into four major parts according to their pharmaceutical use i.e. oral suspensions, parenteral suspensions, ophthalmic suspensions and, suspensions for external use.

ii. Differentiate between 'purified water' and 'water for injection'.

Purified water is water that has been mechanically filtered or processed to remove impurities and make it suitable for use. Distilled water was, formerly, the most common form of purified water, but, in recent years, water is more frequently purified by other processes including deionization, reverse osmosis, ultrafiltration etc.

Water for injection is sterile water of extra high quality without significant contamination.

Water for injection is generally made by distillation or reverse osmosis.

iii. Write advantages of evaporating pan.

- Evaporating pan is constructed both for small scale and large scale batch operations.
- It is simple in construction and easy to operate, clean and maintain.
- Its cost of installation and maintenance is low.

iv. Give two examples of wetting agent.

Sodium lauryl sulfate, Quaternary ammonium compounds

v. What is prodrug.

It is a biologically inactive compound which can be metabolized in the body to produce a drug.
Or

It is a pharmacologically inactive substance that is converted in the body (as by enzymatic action) into a pharmacologically active drug.

Q1. A.

i) Health

- Health can be defined as a state of complete physical, mental, and social well-being with the absence of disease or infirmity .when people are healthy they are more efficient at work

ii) Acute myocardial infarction.

- Also known as myocardial infarction or Heart attack.
- Definition: -Myocardial infarction is a medical condition that is brought on by atherosclerosis and thrombus or embolus occlusions that restrict blood flow through the coronary artery.
- Fat, Bad-cholesterol deposition can cause the formation of plaques in heart arteries which gives rise to blood clots, which results in blockage of arteries, which later on causes a heart attack.

iii) Three D'S disease

- Niacin, referred to as vitamin B-3, is a deficiency that leads to pellagra. Dermatitis, dementia, and diarrhea are the major signs of pellagra. Also known as "the three Ds". This is due to the fact that niacin deficit is more apparent in bodily systems with rapid cell turnover, like skin or gastrointestinal tract.

iv) Disinfection

- The procedure of utilizing a disinfectant to eliminate, Inactivate, or significantly lower the presence of harmful agents such as bacteria, viruses, and fungi is called disinfection.

v) Nosocomial Infection

- It directly means Hospital-acquired infection
- Nosocomial infections are acquired by patients while they are in the hospital and are caused by pathogens that emerge in hospitals or other clinical care centers. Nosocomial infections can infect anyone who interacts with the hospital, including staff members such as nurses, doctors, aides, visitors, salespeople, delivery drivers, and custodians.
- The nosocomial pathogens that cause diseases are of twotypes endogenous (the patient's own microbes) or exogenous sources (microbes other than the patient's).

vi) Universal antidote

- Universal Antidotes are used to neutralize acids, absorb alkaloidal poisons, precipitate or chelate metals, as well as to treat specific glucosides and alkaloids when it is unknown what type of poison has been consumed.
- A table spoonful of the universal antidote, which contains one part magnesium oxide (neutralises acid), two parts activated charcoal (adsorbs alkaloids), and

one part tannic acid (precipitates alkaloids), should be administered twice daily in 200 ml of water.

vii) Prokaryotic

- Microorganisms with a single cell are known as prokaryotic cells. A single membrane composed of amino acids and carbohydrates makes up a prokaryotic cell. There are four primary parts to prokaryotic cells. DNA, ribosomes, plasma membrane, and cytoplasm There is no nuclear membrane, mitochondria, golgi bodies, chloroplast, or lysosomes. One chromosome contains the genetic material. They lack the essential components of eukaryotic chromosomes, the histone proteins. Respiratory enzymes are carried via the plasma membrane, which serves as the mitochondrial membrane. They divide asexually through binary fission.

viii) Safe period

- A period of time throughout the menstrual cycle when fertilisation is considered to be least possible, often a few days before and after the start of menstruation called as safe period.

ix) Epidemiological Triad

- A model that enables the evaluation of the interactions and causality of the agents responsible for the spreading of an infectious disease. The triad is a methodology that characterizes infectious diseases, because it identifies the interaction between the environmental agent, virus and host.

x) Demography

- The statistical study of population especially human beings is called as demography.

Q1. B.

a) WHO- World Health Organization
b) PEM- Protein Energy Malnutrition
c) IUCD- Intrauterine Contraceptive Device
d) NMEP- National Malaria Eradication Program
e) DEC- Diethyl Carbamazine
f) CHD- Coronary heart disease
g) ORS- Oral Rehydration Salt
h) OTC- Over The Counter
i) IDDM- Insulin dependent diabetes mellitus
j) FSH- Follicle Stimulating Hormone

2. Write the objectives and principles of First Aid. Discuss in details the first aid for Snakebite, Burns & Poisoning

ANSWER

First aid

Providing immediate treatment to the victim of an injury or sudden sickness until more advanced care is available, using the human and material resources that are on hand at the site of the event. Principle of first aid is to provide immediate action.

Main objective of first aid is to promote healing by protecting casualty from herm and preserve life.

PRINCIPLES OF FIRST AID

Certain important principles involved in the first aid are:

- Act calmly and logically.
- Take control over problems as well as problem
- Be to gentle and firm and speak the casualty kindly but purposely.
- Build up trust by talking to casualty throughout the examination and treatment.
- Explain to casualty what you are going to do.
- Answer honestly and avoid giving misleading information.
- Never leave the casualty alone.
- Continuously reassure the casualty.
- Never separate a child from its parent or guardian.
- Use quickest means of transport.
- Inform the police about serious accidents.
- Inform the relatives of casualty.

Some Things to avoid in Fist aid those are

- Touching wound with your fingers
- Put an unclean dressing or cloth over wound.
- Allow bleeding to go unchecked.
- Allow a crowd to gather around the casualty.
- Move a patient without unnecessarily.
- Move fracture patient without splints.
- Neglect shock.
- Use of too hat or heated objects.

- Fail to give artificial respiration.
- Permit air to reach a burned skin surface.
- Wash wounds
- Leave a tourniquet on for over 20 minutes without loosening it.
- A tourniquet is a strip of cloth that is tied tightly rounded an injured arm or leg in order to stop its bleeding.

FIRST AID BOX

To operate a first aid procedure a first aid box is required containing medical supplies for emergency use is kept in housekeeping department. Ideally it should be of 17 ½"" x 10"x 6 ½" and dirt proof. A first aid box must at least contain' the items A first aid book, Antiseptic cream, Savlon or any other antiseptic solution, Paracetamol, Aspirin, Soframycin and skin ointment, Clinical thermometer, Sterilized white absorbent gauze, Sterilized dressing no.18 & 24, Sterilized cotton wool, Crepe bandage, Adhesive plaster, Roller bandage of various sizes, Unbleached triangular bandages, Eye pad, Tweezers, Dressing scissors, Safety pins and Splint etc.

Snake bite

When a snake bites to anyone first don't panic or run. Don't let heart rate increase by any action or movement

Confirmation of a snake bite can be obtained if there are teeth marks & the affected area.

Make the person lie down comfortably and allow him/her physical and mental rest try to reassure them.

If the snake is not poisonous, the person should be made to understand that he/she will be fine soon.

If the snake is poisonous; and has bitten the victim on the hands or legs, tie a rope, handkerchief, or tourniquet near the bitten area so as to avoid the venous blood flow carrying the venom towards the heart.

A tourniquet should not be tied so tight that blood flow into that organ

Make an inch- long cut over the bitten area and start sucking and spit out the venom and blood.

The make sure you your self have no wound in the mouth when doing this.

In case medical aid is not available immediately. Continue the suction for half an hour.

Do not give the victim anything to eat or drink.

Burns

Burns may be caused by dry heat or by hot fat or oil. For minor burns on the skin, immediately hold the injury under cold running water for five minutes.

A small burn needs no further treatment. It should simply be left exposed to air.

Do not prick or remove blisters.

Poisoning

If someone has had a drug overdose or swallowed some harmful substance (such as a toxic substance), a doctor should be called even if there are no ill effects are seen.

If the victim is not breathing, give mouth-to-mouth artificial respiration.

If the poison is still in the mouth, use the mouth-to-nose method of giving artificial respiration.

If the victim is unconscious but breathing, place him/her on his/her side with the uppermost arm and leg drawn up and the head tilted back to keep the airway open.

Look around for any bottles, tablet casings, berries, and smells of substances such as paraffin, or cleaning fluid for clues as to what may have been ingested.

3. Write short notes on any three of the following.

i) Water pollution

One of the renewable resources, water is necessary for maintaining all life forms, producing food, fostering economic growth, and ensuring general well-being. It is truly a one-of-a-kind gift from nature to humanity because it cannot be replaced for the majority of its purposes, is costly to transport, and is difficult to decontaminate. Water is one of the natural resources that is easiest to manage since it can be recycled, diverted, carried, and stored. All of these characteristics provide water its tremendous human benefit. Agriculture, hydropower generation, cattle production, industrial operations, forestry, fisheries, navigation, leisure activities, etc. all increasingly depend on the surface water and groundwater resources of the country.

In the last few decades, there has been a tremendous increase in the demand for Fresh water due to rapid growth of population and the accelerated pace of industrialization Government agencies and experts have focused their study on water contamination. Because of major water contamination and a global shortage of water resources, maintaining river water quality is urgently needed.

Sources of water pollution

Urbanization, Sewage and other Oxygen Demanding Wastes, Industrial Wastes, Agro-chemical Wastes, Thermal pollution, Oil discharge into the surface of sea, Acid rain pollution, radioactive waste,

Effect of water pollution on human health

Pollution can cause very severe and critical cases in day today life like Chemicals in water that affect human health, Water borne disease, Nutrient deficiency in aquatic ecosystem many more problematic situation may arises to minimize the pollution of water govt. of India taking several

steps The Ganga Action Plan and the National River, waste water from domestic sources is hardly treated, The water quality management in India is accomplished under the provision of Water (Prevention and Control of Pollution) Act, 1974, There should be ban on washing of clothes and laundry alongside the river bank, Industries should install Effluent Treatment Plant (ETP) to control the pollution at source etc.

ii) Cardiopulmonary Resuscitations (CPR)

This procedure is carried out on a person whose respiration has ceased. A constant supply of oxygen Is vital for the brain and if breathing stops, blood oxygen level will be affected as all tissues get oxygen through blood circulation. The heart maintains this circulation, acting as a pump. If the heart too stops functioning death will result unless urgent actions are taken.

The flow of oxygenated blood to the brain is in such case rapidly restored by means ‘of artificial ventilation and chest compression. This is called CPR. In case only breathing has stopped, technique for chest compression to stimulate cardiac function can be left out and only artificial respiration is to be concentrated on.

The ABCs of artificial respiration are

- **A** for Airway: Clear airway.
- B for Breathing: Restore breathing.
- **C** for Circulation: Restore circulation.

Clearing the airway An unconscious casualty's airway may be blocked, making breathing difficult and noisy. The main reason for this is that muscular control in the throat is lost, which allows the tongue to sag back and block the throat.

- Remove the obstructing object or substance from the mouth with fingers.
- Using first finger as a hook to dislodge it.
- Extend the neck to open the airway. Place one hand under the name of the neck, and the other hand on the forehead, and tilt the head back. Lift the chin up gently without closing the mouth.
- Check if breathing has been restored. If not, start mouth-to-mouth resuscitation.

Restoring breathing

- This is done by administering mouth-to-mouth respiration. Put your face close to the casualty's mouth and look, listen, and feel for breathing for five

seconds, before taking any further action.

- If the heart is beating, it will generate a pulse in the neck (the carotid pulse) where the main arteries pass up to the head.
- With the head tilted back, feel the Adam's apple with two fingers.
- Slide fingers back along the victim's throat till they sit in the gap between the Adam's apple and the strapmuscle feel for the carotid pulse.

A minute of CPR delivers 60 chest compressions (l5 at a time multiplied by 4 times and 8 lung inflations (2 at a time multiplied by 4 times). To sum up, the main steps of cardio-pulmonary resuscitation are

1. Clear airway.
2. Breathe into victim's mouth four times quickly.
3. Compress chest 15 times.
4. Give, 2 quick lung inflations.
5. Alternate 15 chest compressions with 2 quick lung inflations.
6. In a minute, the victim should revive.

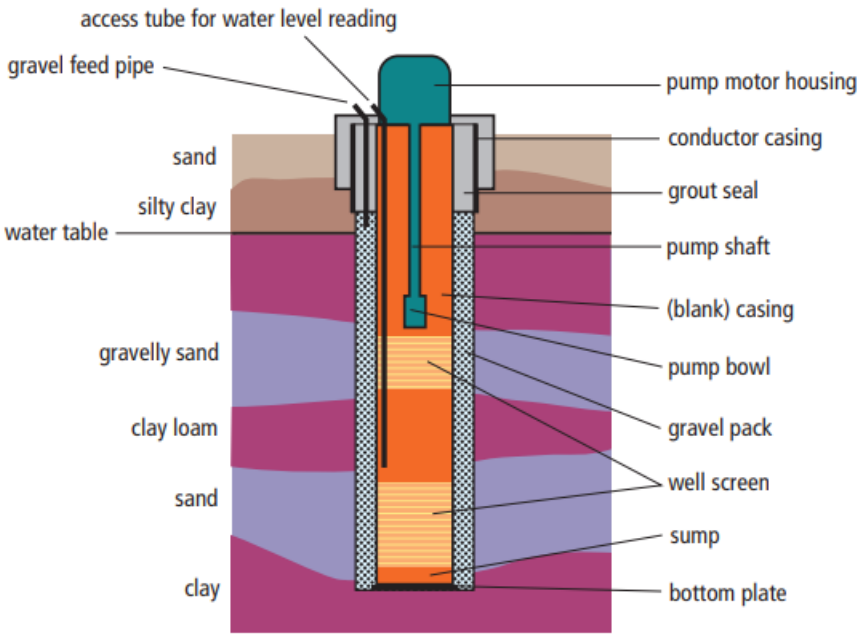
iii) Sanitary Well

A sanitary well is one that is strategically placed, well-built, and well-protected from potential contamination sources to ensure the delivery of clean water. Location At least 15 meters should separate a sanitary well from potential sources of pollution. The primary factor that determines a well's location is its desired use. The most crucial factors for producing drinking and irrigation wells are groundwater quality and long-term groundwater availability.

WATER WELL DESIGN AND INSTALLATION

Once the well location has been determined, a preliminary well design is completed. In order to get more specific data on the depth of water-producing zones, confining beds, well production capacities, water levels, and groundwater quality, a test hole will frequently be drilled before a big production well. The site-specific findings acquired in the test hole or during the well drilling may influence the final design.

The overall goal of the design is to produce a well that is structurally sound, durable, and effective, has enough room to house pumps or other extraction devices, enables ground water to flow into the well effortlessly and without clogging up the water supply at the desired volume and quality, and guards against bacterial growth and material decay.



A well consists of a bottom sump, well screen, and well casing (pipe) surrounded by a gravel pack and appropriate surface and borehole seals via holes or perforations in the well screen, water enters the well. Wells can be continually screened along the bore or at predetermined intervals of depth. In order to verify that the screened zones match the aquifer zones from which water will be taken, the latter is required when a well taps several aquifer zones.
A different part of motor like pump motor housing carries the motor inside which lift up water conductor casing and grout seal get compact and allow the process to be done pump shaft allow shafting .access tube for water level reading.

iv) Methods of Sewage treatment

Sewage is the wastewater produced by a community, including home wastewater from sinks, toilets, and other outlets, industrial wastewater that has been cleaned and released into the drainage system, and occasionally rainwater and urban runoff. Sewage's primary constituent is domestic wastewater. Sewage is the wastewater produced by a community, including home wastewater from sinks, toilets, and other outlets, industrial wastewater that has been cleaned and released into the drainage system, and occasionally rainwater and urban runoff. Sewage's primary constituent is domestic wastewater.
We need to take various steps to treat sewage water.
A purification process generally consists of five successive steps
(1) Preliminary treatment or pre-treatment (physical and mechanical)
(2) Primary treatment (physicochemical and chemical)
(3) Secondary treatment or purification (chemical & biological)
(4) Tertiary or final treatment (physical and chemical)
(5) Treatment of the sludge formed (supervised tipping, recycling or incineration).

Pre-treatment involves removing all suspended materials and (floating) solid particles from the wastewater. Before considering secondary treatment, this pre-treatment stage that can be completed by mechanical or physical techniques is essential because of particle pollution. Before

its discharge into the environment or its reuse, the pre-treated effluent must undergo secondary purification treatment using the most appropriate of the biological, physical or chemical techniques available to remove the chemical pollution. In certain cases, a final or tertiary treatment can also be required to remove the remaining pollutants or the molecules produced during the secondary purification.
Coarse particles and settle able solids can be treated as sieves sediments, non settleable, biodegradable substances can be treated as biological treatment, undissolved (suspended particles) by micro-sieves filtration and dissolved inorganic particles by ion exchangers electro dialysis reversed osmosis distillation.

4. Define Food. Classify it according to chemical constituent, origin, function & nutritive value. Describe the function of carbohydrate, Protein & fats.

Any nutrient that sustains life and growth, whether it is consumed by humans, animals, or plants, or absorbed by soil. For living things to survive, food is necessary. It gives us the energy we need for daily tasks as well as for our bodies to grow, expand, and repair any harm. Subsequently, it becomes crucial to understand the significance of eating the proper foods.
Classification according to chemical constituents, origin, function and nutritional value there are various types
A. **By chemical nature**
1. Carbohydrates- These are digested and broken down into glucose and provide energy to the body consists of carbon, hydrogen, and oxygen molecules. Grain products, dairy goods, fruits, legumes, and starchy vegetables like potatoes are the main sources of carbs in diet. Carbohydrates are also present in non-starchy vegetables, such as carrots, albeit in smaller amounts.

2. Lipids- are a class of molecules that likewise include carbon, hydrogen, and oxygen, however they are not water soluble like carbohydrates. Butter, oils, meats, dairy products, nuts and seeds, as well as many processed meals, are the main sources of lipids. Triglycerides, phospholipids, and sterols are the three primary categories of lipids. Lipids' primary function is to supply or store energy.

3. Proteins- Help in metabolism, act as enzymes, and hormones. chains of amino acids, which are simple components formed of carbon, oxygen, hydrogen, and nitrogen, make up the massive molecules that make up proteins. Meats, dairy goods, seafood, and a range of plant-based foods including beans, nuts, and seeds are all good sources of protein.

4. Micronutients-While the body needs micronutrients in lesser levels, they are nevertheless crucial for performing basic activities. All of the necessary vitamins and minerals are considered micronutrients. There are thirteen necessary vitamins and sixteen vital minerals.

5. Vitamins- are organic nutrients that are categorized according to how easily they dissolve in water. Vitamin C and all of the B vitamins are examples of water-soluble vitamins. Specifically, vitamins A, D, E, and K are fat-soluble nutrients. Vitamins are necessary for the body to carry out a variety of processes, including the synthesis of bone tissue, the production of red blood cells, and the maintenance of healthy eyesight, neurological system, and immune systems.

6. Minerals- Minerals are inorganic substances that are classified depending on how much the body requires. Major minerals, such as calcium, magnesium, potassium, sodium, and phosphorus, are required in amounts of hundreds of milligrams or more per day. Trace minerals, such as molybdenum, selenium, zinc, iron, and iodine, are only required in amounts of a few milligrams or less per day. Many minerals are critical for enzyme function, and others are used to maintain fluid balance, build bone tissue, synthesize hormones, transmit nerve impulses, contract and relax muscles, and protect against harmful free radicals in the body.

5. Water -Water is another nutrient that humans need to have in significant amounts. Each molecule of water is made up of two hydrogen atoms and one oxygen, but it does not include any carbon. Water makes up more than 60% of your whole body weight. Without it, the body would be unable to transfer anything into or out of it, undergo chemical reactions, cushion the organs, or regulate body temperature.

B. According to their function in the body

1. Energy giving foods

Protein, lipids, and carbs are all categorized as calorie-containing nutrients because they provide the body with the energy it needs to function. Energy-giving foods include rice, chapatti, bread, potatoes, sugar, oil, butter, and ghee.

2. Body building foods

Proteins, lipids, and carbohydrates are examples of foods that are referred to be "body-building food." They serve as the building blocks for bodily tissues. Some foods for growing muscle include fish, beef, poultry, eggs, lentils, almonds, and milk.

3. Protective foods

Vitamins and minerals are the nutrients that function to regulate body processes. They protect us from various diseases. Fruits and vegetables are some examples. Therefore we must eat these regularly.

C. According to chemical properties

Organic: Nutrients that contain the element of carbon are called as organic nutrients.

Inorganic: Nutrients that do not contain carbon element are called as inorganic nutrients.

E. According to its origin

Food has been divided into two categories: animal food sources and plant food sources, depending on where it comes from.

F. According to its nutritive value

Cereals and millets, Pulses, Nuts and oil seeds, Vegetables, Green leafy vegetables, Non-leafy vegetables, Roots and tubers, Fruits, Milk and milk products, Animal foods—meat, fish, liver, egg etc, Carbohydrate foods, Condiments and spices

Function of Carbohydrate

1. Starches, sugar, and fiber are the three different types of carbs. Energy is derived from Carbohydrates. Protein and fat-containing meals can also provide energy, but the body prefers to get its energy from carbs.
2. Glucose is necessary for the operation of every cell in a person's body. In the body, carbohydrates are converted to glucose. With the aid of the hormone insulin, Glucose travels from the circulation into the body's cells.
3. One strategy to stop this starvation-related loss of muscle mass is by consuming at least some carbs.
4. Carbohydrate can promote digestive health.
5. It forms part of the structural frame work of DNA and RNA molecules.
6. It participates in cell membrane and cellular function.

Function of Protein

1. Protein helps repair and build your body's tissues.
2. Proteins are made up of amino acids that join together to form long chains. You can think of a protein as a string of beads in which each bead is an amino acid.
3. proteins and enzymes that aid the thousands of biochemical reactions that take place within and outside of cells.
4. Some proteins are hormones, which are chemical messengers that aid communication between your cells, tissues and organs.
5. Certain proteins are fibrous, giving tissues and cells their rigidity and stiffness.
6. Protein is essential for controlling the levels of bases and acids in blood and other body fluids.
7. Immunoglobulins, or antibodies, are made of proteins and fight infection.
8. Transport proteins move chemicals throughout the circulation.
9. Protein provides the same amount of energy as carbohydrates at four calories per gramme. At nine calories per gramme, fats have the highest calorie content.

Function of Fats

1. Both the body and the diet utilize fats for their beneficial effects. Fat serves as a vital energy storage depot in the body.
2. Fats help the body to produce and regulate hormones.
3. Dietary fats in our foods facilitate the movement of fat-soluble vitamins through the digestive system and enhance intestinal absorption.
4. It provide twice a number of energy than carbs and proteins.
5. Fat contains essential fatty acid and act as a carriers for some vitamins.

5. What is Communicable disease? How COVID 19 is related to communicable diseases? Write the causative agent, mode of transmission & prevention of Influenzas, Chicken pox Typhoid & Rabies.

A communicable disease is one that may be transmitted from one person, animal, or surface to another. A pathogen frequently starts reproducing as soon as it enters a person's body. The person may then start to exhibit symptoms. The illness will determine the specific symptoms. Some people won't have any symptoms at all. They can still spread the infection. The pathogen's damage to the body's cells is the cause of several symptoms. Others are brought on by the

immune system's reaction to the infection. Certain infectious diseases may be minor, with short-lived symptoms. some of them can be critical and even fatal. Depending on a person's general health and immune system, the intensity of their symptoms may change.

COVID 19 is related to communicable diseases

The virus that gave rise to COVID-19 is the same one that previously caused the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2 virus), making it a communicable illness. There is yet no viable treatment for COVID-19 since the processes behind the disease's pathology are still being thoroughly investigated. As the world waits for a potential treatment, prevention of transmission. Microbiology research has connected the source of the infection, viral load, mode of transmission, and individual susceptibility to the transmission of the virus. The incidence of infection has been reduced as a result of understanding these parameters, maintaining social distance, and emphasizing isolation as public health interventions.
As we clearly know about the communicable disease and there signs with symptoms the COVID-19 shows the clear signs of communicable disease. This can be spread by interacting with peoples, getting contact with infectious people, sneezing publically, by touching things and places with bear hands etc. results the transmission of disease. Some prevention need to adopt by us. In general sense the disease get transmitted through expose to infected people or things. Which gives a clear sign of being a communicable disease.

causative agent, mode of transmission & prevention of Influenzas

The influenza, often known as flu, is a viral infection that affects the throat, nose, and lungs. It is a contagious respiratory infection with mild to severe symptoms. It is caused by influenza virus of Class A, B and C.

Transmission

1. Flu is extremely infectious. In homes, companies, schools, and friend groups, it may spread quickly.
2. Most often, the flu is spread from person to person. Droplets from a sick person's sneeze, cough, or speech can travel through the air. we might get ill as well if these droplets come into touch with your mouth or nose.
3. Moreover, the flu virus can be spread through handshakes, hugs, and contact with infected surfaces or objects. Shouldn't share drinking glasses or utensils with anyone, especially if they appear to be ill.

Prevention

1. Routinely wash hands with warm water and soap.
2. Clean surfaces such as keyboard, telephone and door handles regularly to get rid of the germs.
3. Use tissues to cover the mouth and nose when coughing or sneezing.
4. The flu vaccine is administered by injection in the arm. There’s also a nasal spray flu vaccine option for nonpregnant individuals between the ages of 2 and 49.

Causative agent, mode of transmission & prevention of Chicken pox

Varicella-zoster, another name for chickenpox, causes a red rash that blisters and then crusts over. It spreads rapidly The disease is caused by a germ called varicella-zoster virus.

transmission

coming into touch with a chickenpox afflicted person.
receiving airborne infection from a sick individual who sneezes or coughs.
obtaining bodily fluids from an infected child's mouth, nose, or eyes.

Prevention

Vaccination against chicken pox can prevent infection.

Causative agent, mode of transmission & prevention of Typhoid

Salmonella typhi is a bacteria that causes typhoid. High fevers of up to 104°F, diarrhoea, and vomiting are among the symptoms. If an individual does not receive early treatment with antibiotics, it might be fatal.

Transmission

1. It is passed through contaminated water and food
2. Some people who have typhoid carry the germs in their intestines or gallbladder long after they have recovered
3. consuming contaminated water that has Salmonella typhi in it
4. Close contact with infected person may cause typhoid.

prevention

1. Avoid eating from the street, only drink filtered water
2. maintain personal hygiene if near a typhoid carrier,increase fluid intake
3. Always wash your hands. Obtain vaccine if going to visit typhoid prone location
4. Chloramphenicol, ampicillin, sulfamethoxazole/trimethoprim should be used.

Causative agent, mode of transmission & prevention of Rabies

A virus called rabies inflames the brains of both humans and other animals. Humans can get rabies from infected animals by being bitten or scratched. In this disease flu-like symptoms occur, including a fever of 100.4°F (38°C) or above, headache, anxiety, feeling generally unwell, sore throat and a cough, nausea and vomiting, discomfort at the site of the bite.

Transmission

1. The virus is spread by saliva. , rabies can spread if an infected animal bites a human.

2. It can also happen if an infected animal's saliva enters a wound that is open or passes through a mucous membrane, such the mouth or eyes.

3. The animals that are most prone to spread the disease include raccoons, coyotes, bats, skunks, and foxes.

4. Any animal can carry and spread the virus, although smaller mammals, such rodents, rarely contract the disease or spread it.

Prevention

1. routine rabies vaccinations for household animals and pets.
2. prohibitions or limitations on the import of animals from certain countries
3. widespread rabies vaccinations of humans in some places
4. increased access to medical treatment for those who bitten

Q6.

i) **Disinfection of Sputum**

The body creates mucus, commonly referred to as phlegm or sputum, to protect sensitive airway structures. Phlegm that has changed in colour, thickness, or volume may be an indication of a health issue, such as a lung infection, cancer, or a respiratory infection.

Mucins and other proteins make up mucus. To maintain moisture in the thin, fragile tissues of delicate places, such as the respiratory system, the body creates Sputum.

The body's sensitive surfaces are lined with mucus, which also serves to capture and eliminate microscopic foreign particles that could be dangerous.

The lungs may make too much mucus. The body produces spit or phlegm in an effort to eliminate this surplus.

Through the use of hot steam, the sputum is disinfected. The Sputum Disinfecior is a boiler and sieve combination. The patients' entire sputum output is dumped into the boiler. More dense particles and other solid materials that unintentionally entered the sputum remain in the sieve, where the steam disinfects them. Using a circular tube that has tiny spray openings above and below, the steam enters the boiler.

While utilizing the disinfector, the boiler should only be three-quarters full of sputum before being replaced and the steam turned on. The sputum that had previously accumulated at the bottom of the boiler is stirred up by the steam that is forced downward.

After twenty minutes When the steam supply is cut off and the off-flow is opened, the whole contents of the boiler are dumped down the drain. The water is then mixed with cold water and switched on, thoroughly washing every component as it travels through the same circular tube.

The Sputum Disinfector is used to properly clean, disinfect, and decontaminate the patients' spitting flasks and other equipment.

The device consists of a rectangular box with a tight-fitting top that opens and rests on four legs, between which two shelves are fastened. the bottom's access to hot and cold water and steam

ii) Hardness of water

Water that contains calcium and magnesium salts is referred to as "hard water." Hard water produces a precipitate instead of soap lather.

There are several minerals in hard water. It is created when water seeps through chalk and limestone formations, which are composed of magnesium and calcium carbonates. It cannot be used for laundry since it does not produce a lather when soap is added.

Boilers suffer from hard water because it causes salt to build, which lowers the boiler's efficiency. Drinking hard water is harmless, but drinking it frequently might cause a variety of

issues, including: Strains in skin,Water appliances work harder resulting in higher water bills,Spots appear on clothes and linens
Two types of hardness is there those are temporary and permanent hardness of water

Temporary Hardness of Water

Water becomes temporarily hard due to magnesium and calcium carbonates present. In this instance, boiling the water will get rid of the hardness.
As water is heated to a boil, the soluble $Mg(HCO3)2$ salts are changed to the insoluble $Mg(OH)2$, which precipitates out and needs to be removed. The water we receive after filtering is soft water.

permanent hardness of water
We refer to the presence of soluble magnesium and calcium ions in the form of chlorides and sulphides in water as permanent hardness since boiling cannot dissolve this hardness.

By adding washing soda to the water, we may soften it up. As washing soda combines with the sulphide and chloride compounds of calcium and magnesium, insoluble carbonates are created, resulting in the transformation of hard water into soft water

iii) Immunity
The immune system, which defends our body against infections, is made up of several cell and molecule kinds. Pathogens include anything from bacteria, fungi, viruses, and haptens to parasites. Haptens are molecules that, when they come into contact with a protein, may trigger an immunological response. All of these chemicals and cells, which are dispersed throughout the body's tissues and lymphoid organs, work to prevent or avoid microbial infections, slow the spread of tumours, and begin the process of healing injured tissues.
The immune system is separated into many sorts of responses and defends against microorganisms. There are three categories of immunity:
i) innate immunity
All of us have innate immunity, also known as natural immunity, which is a form of inherent defence.
Innate immunity is the name for the immunity that is already present in an organism at birth. The body's defence mechanism is referred to as innate immunity. As an illustration, the skin serves as the body's barrier by preventing the entry of bacteria that cause illness.
ii) Adaptive defences
At birth, a person develops immunity; this is known as adaptive or acquired immunity. During our lifetimes, we create an adaptive immune system. When we are exposed to infectious illnesses and allergies or when we receive vaccinations against them, we develop adaptive immunity.
iii)passive defence
Antibodies produced outside of the body help to create passive immunity. The duration of this immunity is brief. For instance, a newborn is temporarily immune to illnesses thanks to antibodies found in breast milk.
iv) Active Immunity
A sort of adaptive immunity known as "active immunity" is created when one's own body produces antibodies. When we come into contact with the disease or its antigen, we develop this form of immunity. A initial response occurs when the immune system comes into contact with an

antigen for the first time and mounts an active defence against it. When a body encounters a pathogen for the first time, it retains a small number of the antibodies that combatted the infection in case it assaults again later. This is referred to as organic active immunity.
The process of creating an individual's immunity against an infectious illness by the introduction of an outside substance or vaccine is known as immunisation. Once receiving the vaccination, the body begins to produce antibodies against it and becomes immune to the illness. When the same infectious agent is exposed again, the body uses built-up antibodies to fight the infection.

iv) Ziehl–Neelsen Method

It is a staining method Ziehl invented the Ziehl-Neelsen staining method, a differential staining method that Neelsen subsequently refined, hence the name Ziehl-Neelsen stain. To distinguish between acid-fast and slow-growing bacteria and To stain Mycobacterium species is the main objective.
Neelsen created the Ziehl-Neelsen Staining Method by heating carbol-fuschin from Ziehl's experiment, adding a decolorizing agent made of acid-alcohol, and a counterstain made of methylene blue dye.
The technique is known as Acid-Fast Stain because it uses acid-alcohol, and it is known as the hot method of Acid-Fast Staining because it uses heat. Both names are interchangeable for the Ziehl-Neelsen Staining technique.
This method is applied to microorganisms that are difficult for simple stains like negative staining or gramme staining to stain. Mycobacterium spp. is one of the most complicated microorganisms that needs rigorous treatment with Ziehl-Neelsen chemicals.
Mycolic acid, a lipoidal compound found in mycobacterium, actinomycetes, norcadia, isospora, cryptosporidium, and certain fungi, makes up the thick cell walls of these organisms.
Simple stains like gramme staining cannot penetrate the thick cell wall of these organisms because mycolic acid is difficult to stain.
They need more severe treatments, such as the Ziehl-Neelsen or hot technique of Acid-fast stain, to allow stain penetration for identification and analysis.
Main principle of this method is Basic fuchsin and phenol chemicals are used in the Ziehl-Neelsen stain to colour Mycobacterium species' cell walls.
The employment of heat, carbol-fuschin, and phenol facilitates penetration of the bacterial cell wall for visibility because mycobacterium does not readily attach to simple stains.
Mycobacterium's cell wall is waxy, hydrophobic, and impermeable because to the high lipid content made up of mycolic acid on it.
Usage of the basic compound carbol-fuschin causes significant binding to the bacteria's harmful byproducts, such as mycolic acid and the lipid cell wall. Heat and the addition of acid alcohol combine to generate a powerful complex that is difficult to remove using solvents.
The principal dye, carbol-fuschin, has a red hue that the acid-fast bacteria absorb.
But non-acid-fast bacteria readily discolour when acid-alcohol is added and absorb the counterstain pigment methylene blue, making them seem blue
Mycobacterium leprae and Mycobacterium tuberculosis have both been identified using this method.

7. Define Epidemiology. Write down the scope, uses & analytical methods of Epidemiology

The branch of medical science epidemiology studies every element that affects whether illnesses and disorders exist or not. In order to understand how many individuals have an illness or problem, whether those numbers are changing, and how the disorder impacts our society and economy, epidemiological study is essential. epidemiological estimates try to determine how the number of people affected by a disorder changes over time.

A methodological field called epidemiology offers rules and principles for producing fresh quantitative data regarding health-related occurrences. Its goal is to advance knowledge to benefit both community medicine and clinical care. In order to draw conclusions about a target community, epidemiological research use scientific methodologies to collect empirical data from a studied population.

Scope

1. To determine the etiology or cause of the disease.
2. To determine the frequency and extend of health condition and disease in the community.
3. To provide foundation for developing policies public and regulatory decision.
4. To prevent and control of disease.

Uses

- To start, identify the disease's agent, host, and carrier. Deep research is done by epidemiology on his studies. Demography, sociology, psychology, and all medical studies are included in the study. The disease's information is gathered in a systematic way.
- Studying how often diseases arise in the environment calls for community diagnosis and prognosis.
- pays attention to the groups of people having the same disease, rather than the individual.
- The ideal control measure is the primary measure to prevent disease. Diagnosis and treatment come under secondary control. Rehabilitation and defect correction are tertiary control.

Types of epidemiology

1. Case-control studies: The degree of association between various risk factors and outcomes are used in case-control studies.

2. Cohort studies differentiate patients into two groups. It checks if the patient develops the disease in the exposed or unexposed groups.

3. Experimental studies include randomized clinical trials that are standards for study purposes.
4.

Analytical methods of Epidemiology

The key feature of analytic epidemiology is a comparison group. Analytical determinants of disease: Recognize the elements that affect the likelihood of health-related events. Recognize the "how" and "why" of the situation.

Analytical determinants of disease: Recognize the elements that affect the likelihood of health-related events. Recognize the "how" and "why" of the situation

The difference technique states that all factors, save for one, are the same in two or more locations.

The method of agreement: Many diverse settings share a single element. The technique of concurrent variation states that a disease's frequency fluctuates in accordance with the strength of a factor, and the related associations imply that the factor is the disease's causal agent.

The residues technique involves subtracting the causes from the effects to identify which one or combination of causes has the most influence on a dependent variable.

MODEL ANSWER

ODISHA STATE BOARD OF PHARMACY

D. Pharm Part - I **E. R. 1991** **2022(I)**

HUMAN ANATOMY & PHYSIOLOGY (Theory)

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

(Answer any five questions including question No. 1)

1. A) Define the followings: (20x1)

a) Thrombocytopenia: Thrombocytopenia is a condition in which you have a low blood platelet count. Platelets (thrombocytes) are colorless blood cells that help blood clot. Platelets stop bleeding by clumping and forming plugs in blood vessel injuries.

b) **Anaemia**: Anemia is a condition in which you lack enough healthy red blood cells to carry adequate oxygen to your body's tissues. Having anemia, also referred to as low hemoglobin, can make you feel tired and weak. There are many forms of anemia, each with its own cause.

c) **Deglutition**: The process of swallowing, also known as deglutition, involves the movement of substances from the mouth (oral cavity) to the stomach via the pharynx and esophagus. Swallowing is an essential and complex behavior learned very early in development.

d) **Vital capacity**: Vital capacity (VC) refers to the maximal volume of air that can be expired following maximum inspiration.

e) **Oedema**: Swelling in the ankles, feet and legs is often caused by a build-up of fluid in these areas, called oedema. Oedema is usually caused by: standing or sitting in the same position for too long. eating too much salty food, eing overweight.

f) **Glaucoma:** Glaucoma is a group of eye conditions that damage the optic nerve. The optic nerve sends visual information from your eye to your brain and is vital for good vision. Damage to the optic nerve is often related to high pressure in your eye.

g) Tidal Volume: Tidal volume is the amount of air that moves in or out of the lungs with each respiratory cycle. It measures around 500 mL in an average healthy adult male and approximately 400 mL in a healthy female.

h) Synapse: Synapses refer to the points of contact between neurons where information is passed from one neuron to the next. Synapses most often form between axons and dendrites, and consist of a presynaptic neuron, synaptic cleft, and a postsynaptic neuron.

i) Cardiac output: Cardiac output (CO) is the product of the heart rate (HR), i.e. the number of heart beats per minute (bpm), and the stroke volume (SV), which is the volume of blood pumped from the left ventricle per beat; thus giving the formula: **CO = HR X SV**

j) ESR: The erythrocyte sedimentation rate (ESR or sed rate) is the rate at which red blood cells in anticoagulated whole blood descend in a standardized tube over a period of one hour. It is a common hematology test, and is a non-specific measure of inflammation.

B) Answer the followings

i) **Write the function of Mitochondria:** The classic role of mitochondria is oxidative phosphorylation, which generates ATP by utilizing the energy released during the oxidation of the food we eat. ATP is used in turn as the primary energy source for most biochemical and physiological processes, such as growth, movement and homeostasis.

ii) **Write the function of lymph:** Your lymphatic system, part of your immune system, has many functions. They include protecting your body from illness-causing invaders, maintaining body fluid levels, absorbing digestive tract fats and removing cellular waste.

iii) **Name different Blood Groups with Rh typing:**

- A RhD positive (A+)
- A RhD negative (A-)
- B RhD positive (B+)
- B RhD negative (B-)
- O RhD positive (O+)
- O RhD negative (O-)
- AB RhD positive (AB+)
- AB RhD negative (AB-)

iv) **What is Glomerular Filtration rate?:** Glomerular filtration rate (GFR) represents the flow of plasma from the glomerulus into Bowman's space over a specified period and is the chief measure of kidney function.

v) **Hormones secreted from Post. Pituitary:** The two hormones produced by the posterior pituitary gland are oxytocin and vasopressin, also known as antidiuretic hormone.

C) Differentiate between

a) Anterior & Posterior: Anterior means near or towards the front of something and posterior means near or towards the back.

b) **Mitosis & Meiosis:** Cells divide and reproduce in two ways, mitosis and meiosis. Mitosis results in two identical daughter cells, whereas meiosis results in four sex cells.

c) **Medial & Lateral**: **Medial and lateral:** *Medial* refers to being toward the midline of the body or the median plane, which splits the body, head-to-toe, into two halves, the left and right. *Lateral* is the side of the body or part of the body that is away from the middle.

d) **Ventral & Dorsal:** In general, ventral refers to the front of the body, and dorsal refers to the back.

e) **ECG & EEG:** Electroencephalography (EEG) and electrocardiography (ECG) are widely used clinical diagnostic tools to monitor for abnormal brain and cardiac rhythms in patients.

2. With a neat labelled diagram, describe the different parts of respiratory system. (7+8)
Briefly write down the physiology of respiration.

Answer:

Respiratory System:

1. 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.
2. 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

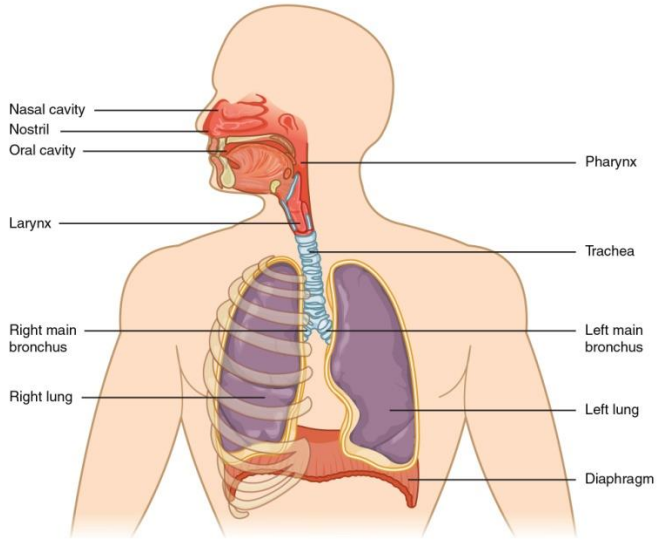
1. The trachea is a tube-like structure within the neck and upper chest.
2. The main function of the trachea is to provide a clear airway for air to enter and exit the lungs.

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

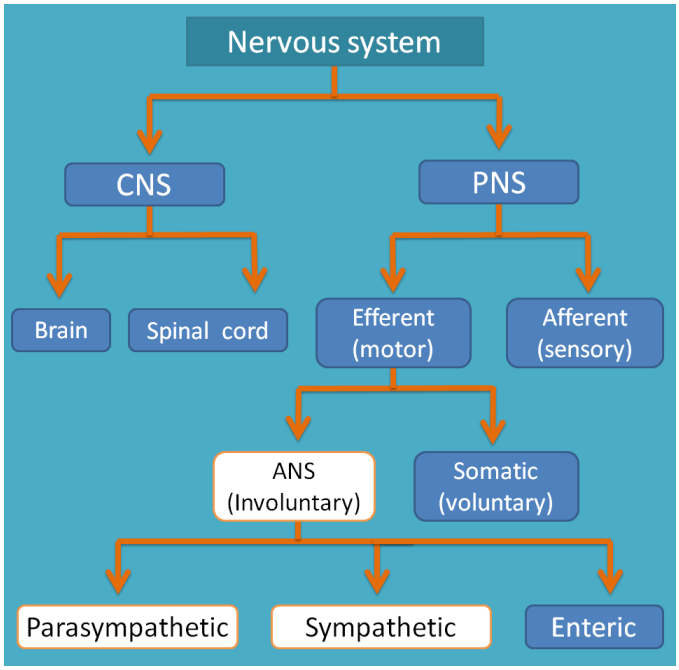
within the chest cavity reduces.

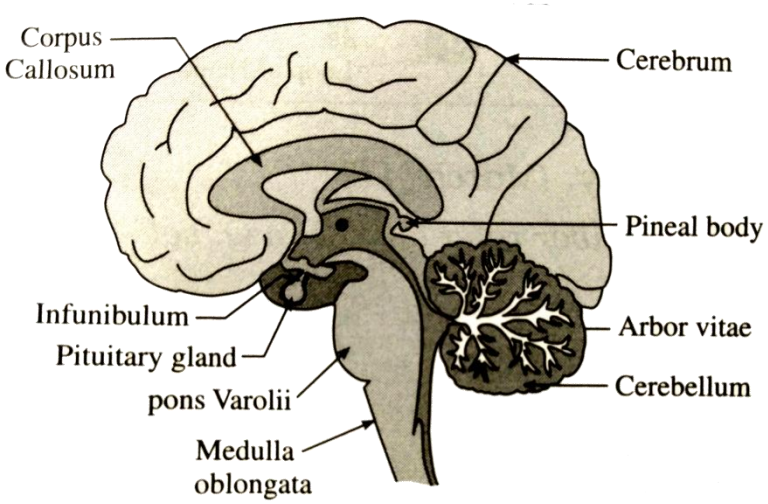
5. The oxygenated air present external to the body is at a high-pressure flow briskly into the lungs.
6. The oxygenated air in the lungs reaches the alveoli.
7. The passing of oxygen takes place via the walls of the alveoli into the blood found in the blood capillaries.
8. The oxygen is then innervated 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.

3. Classify nervous system. Draw a neat Labelled diagram of Brain (L.S). Write briefly function of different parts of brain.

Answer:

Classification of nervous system





Function of brain:

Cerebrum: is the largest part of the brain and is composed of right and left hemispheres. It performs higher functions like interpreting touch, vision and hearing, as well as speech, reasoning, emotions, learning, and fine control of movement.

Cerebellum: is located under the cerebrum. Its function is to coordinate muscle movements, maintain posture, and balance.

Brainstem: acts as a relay center connecting the cerebrum and cerebellum to the spinal cord. It performs many automatic functions such as breathing, heart rate, body temperature, wake and sleep cycles, digestion, sneezing, coughing, vomiting, and swallowing.

The cerebrum is divided into four lobes: frontal, parietal, occipital and temporal.

Frontal lobe

- Personality, behavior, emotions
- Judgment, planning, problem solving
- Speech: speaking and writing (Broca's area)
- Body movement (motor strip)
- Intelligence, concentration, self awareness

Parietal lobe

- Interprets language, words
- Sense of touch, pain, temperature (sensory strip)
- Interprets signals from vision, hearing, motor, sensory and memory
- Spatial and visual perception

Occipital lobe

- Interprets vision (color, light, movement)

Temporal lobe

- Understanding language (Wernicke's area)
- Memory
- Hearing
- Sequencing and organization

(3+4+8)

4. Define and classify joints. Write different movement of joint. Briefly discuss about Synovial joint.

Answer:

Defination: A joint generally means a point where two or more things are connected together. In this scenario, it is the point where two bones intersect. Joint means an articulation or in other words, a strong connection that joins the bones, teeth, and cartilage together.

Classification: Classification of Joints

There are two different types of joints- Structural and Functional classification of joints.

- **Structural classification of joints.**

According to the structural classification of joints, they are divided into 3 types, namely:

Fibrous Joints

Fixed joints, also called immovable joints, are found where bones are not flexible. In such joints, bones have been fused together in such a way that they are fixed to that part, most commonly to create a structure. A prominent example of a fixed joint is the skull, which is made up of a number of fused bones. Other examples include the upper jaw, rib cage, backbone, and pelvic bone, etc.

Cartilaginous Joints

Cartilaginous joints are partly movable joints comprising of symphysis or synchondrosis joints. These joints occur only in those regions where the connection between the articulating bones is made up of cartilage. Synchondrosis are temporary cartilaginous joints which are present in young children and last until the end of their puberty.

Synovial Joints

The synovial joints are the most common type of joint because this joint helps us to perform a wide range of motion such as walking, running, typing and more. Synovial joints are flexible, movable, can slide over one another, rotatable and so on. These joints are found in our shoulder joint, neck joint, knee joint, wrist joint, etc.

- **Functional classification of joints.**

Functional classification of joints is based on the type and degree of movement permitted. Based on the type and degree of movement permitted. There are six types of freely movable joint and are mentioned below with the examples:

Ball and Socket Joints

Here, one bone is hooked into the hollow space of another bone. This type of joint helps in rotatory movement. An example ball and socket joint are the shoulders.

Pivotal Joints

In this type of joint, one bone has tapped into the other in such a way that full rotation is not possible. This joint aid in sideways and back-forth movement. An example of a pivotal joint in the neck.

Hinge Joints

Hinge joints are like door hinges, where only back and forth movement is possible. Example of hinge joints is the ankle, elbows, and knee joints.

Saddle Joints

Saddle joint is the biaxial joint that allows the movement on two planes–flexion/extension and abduction/adduction. For example, the thumb is the only bone in the human body having a saddle joint.

Condyloid Joints

Condyloid joints are the joints with two axes which permit up-down and side-to-side motions. The condyloid joints can be found at the base of the index finger, carpals of the wrist, elbow and the wrist joints. This joint is also known as a condylar, or ellipsoid joint.

Gliding Joints

Gliding joints are a common type of synovial joint. It is also known as a plane or planar joint. This

joint permit two or more round or flat bones to move freely together without any rubbing or crushing of bones. This joint is mainly found in those regions where the two bones meet and glide on one another in any of the directions. The lower leg to the ankle joint and the forearm to wrist joint are the two main examples of gliding joints.

Synovial Joints

A joint, which is merged or combined with bones and is departed by a fluid present within the joint cavity are called synovial joints. They are freely movable and the most common type of joints. All limb joints and other joints are examples of synovial joints. Similar to other joints, synovial joints are directly connected to each other with fibrous connective tissue or cartilage and they help bones to move smoothly by providing increased joint mobility.

Structural Features of Synovial Joints

Synovial joints are described by the presence of a joint cavity and their walls are formed by articular capsules. These joints are more complex than other types of joints and their structural components include: :

- Synovial fluid
- Articular capsule
- Articular cartilage
- Reinforcing ligaments
- Joint cavity or capsules

Types of Synovial Joints

These joints are diarthrosis joints and almost all the joints present in our body are synovial joints. There are six different types of synovial joints and are mainly classified based on their shapes of the articulating surfaces of bones that form each joint.

- **Plane joints**

  These joints have essentially flat articular surfaces and are involved in slipping or gliding movements. Plane joints are present between carpals of wrist and in ankle joints that produce different types of movements such as:

  1. Twisting
  2. Back-and-forth
  3. Nonaxial movement

- **Hinge joints**

  A type of a joint with cylindrical projections, which hardly resembles the hinge of a door. They are uniaxial joints with a single plane motion that permit flexion and extension only. A hinge joint is present in the elbow and between interphalangeal joints.

- **Pivot joints**

  These joints comprise a cylindrical surface, which rotates within a ring of other bones. They are uniaxial joints with a single plane motion. A pivot joint is present between the axis and the proximal radioulnar joint.

- **Condyloid or Condylar or Ellipsoidal joints**

  A joint with an oval articular surface in which one bone fits into a complementary depression into another. They are biaxial joints with biaxial movement, which permit movements in all angular motions. i.e back and front, side to side. These joints are present between wrist joints, knuckle joints, metacarpals and phalanges joints.

- **Saddle joints**

  It is a joint with a convex or concave surface. They provide a biaxial movement and are quite similar to condyloid joints. These joints are present between the carpometacarpal joint of the thumb.

- **Ball-and-socket joints**

  A joint with a hemispherical or spherical head in which a bone forms a joint with a cuplike socket of

another. They provide multiaxial joints and are most freely moving synovial joints with the widest range of motion. They are present between shoulder and hip joints.

5. **Write short note on the followings. (Any three)** (5 x 3)

a) **Erythropoiesis**:

Defination: Erythropoiesis is red blood cell (erythrocyte) production. Your bone marrow makes most of your red blood cells. Once they're fully mature, they're released into your bloodstream, where they transport oxygen throughout your body.

Different Stages of Erythropoiesis

As mentioned earlier, erythropoiesis is a complex process, and the entire process can be divided into many different stages. These stages include:

Pre-erythroblast: The stage is also called megaloblast erythropoiesis, where the production or synthesis begins, and the very first cells are derived from CFU-E.

Early Normoblast: Unlike megaloblast erythropoiesis, in this stage, the nucleoli inside the nucleus disappear, and the condensation of the chromatin network begins.

Intermediate Normoblast: Here, the chromatin network condenses further, and the haemoglobin begins to appear.

Late Normoblast: The quantity of haemoglobin increases in this stage, and the nucleus begins to disintegrate and eventually disappears through a process called pyknosis.

Reticulocyte: This is the stage where the red blood cells are still immature, but the cytoplasm is equipped with a reticular network contributing to the name reticulocyte.

Matured Erythrocyte: This is the final step where the cell finally evolves into a mature red blood cell with a biconcave shape.

b) Blood coagulation

Mechanism of blood coagulation:

The three main steps of the blood coagulation cascade are as follows:

1. Formation of prothrombin activator
2. Conversion of prothrombin to thrombin
3. Conversion of fibrinogen into fibrin

1. Formation of prothrombin activator

The formation of a prothrombin activator is the first step in the blood coagulation cascade of secondary haemostasis. It is done by two pathways, viz. extrinsic pathway and intrinsic pathway.

Extrinsic Coagulation Pathway

It is also known as the tissue factor pathway. It is a shorter pathway. The tissue factors or tissue thromboplastins are released from the damaged vascular wall.

Intrinsic Coagulation Pathway

It is the longer pathway of secondary haemostasis. The intrinsic pathway begins with the exposure of blood to the collagen from the underlying damaged endothelium.

Common Pathway

The factor Xa, factor V, phospholipids and calcium ions form the prothrombin activator. This is the start of the common pathway of both extrinsic and intrinsic pathways leading to coagulation.

2. Conversion of prothrombin to thrombin

Prothrombin or factor II is a plasma protein and is the inactive form of the enzyme thrombin. Vitamin K is required for the synthesis of prothrombin in the liver.

3. Conversion of fibrinogen into fibrin

Fibrinogen or factor I is converted to fibrin by thrombin. Thrombin forms fibrin monomers that polymerise to form long fibrin threads. These are stabilised by the factor XIII or fibrin stabilising factor. The fibrin stabilising factor is activated by thrombin to form factor XIIIa. The activated fibrin stabilising factor (XIIIa) forms cross-linking between fibrin threads in the presence of

Ca^{2+} and stabilises the fibrin meshwork. The fibrin mesh traps the formed elements to form a solid mass called a clot.

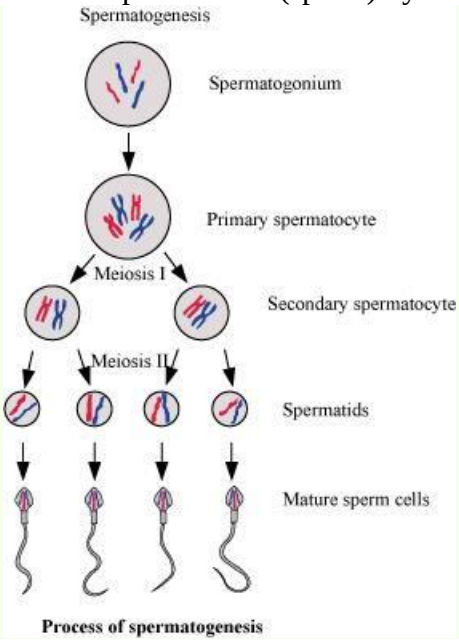
Clotting factor:

There are about thirteen known clotting factors:
Factor I - fibrinogen
Factor II - prothrombin
Factor III - tissue thromboplastin (tissue factor)
Factor IV - ionized calcium (Ca++)
Factor V - labile factor or proaccelerin
Factor VI - unassigned
Factor VII - stable factor or proconvertin
Factor VIII - antihemophilic factor
Factor IX - plasma thromboplastin component, Christmas factor
Factor X - Stuart-Prower factor
Factor XI - plasma thromboplastin antecedent
Factor XII - Hageman factor
Factor XIII - fibrin-stabilizing factor

c) **Spermatogenesis**

Answer:

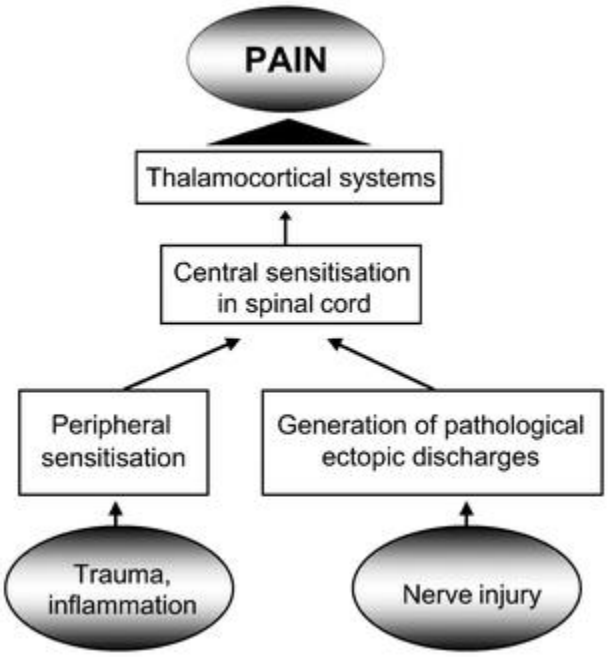
Spermatogenesis is the process of the production of sperms from the immature germ cells in males. It takes place in seminiferous tubules present inside the testes. During spermatogenesis, a diploid spermatogonium (male germ cell) increases its size to form a diploid primary spermatocyte. This diploid primary spermatocyte undergoes first meiotic division (meiosis I), which is a reductional division to form two equal haploid secondary spermatocytes. Each secondary spermatocyte then undergoes second meiotic division (meiosis II) to form two equal haploid spermatids. Hence, a diploid spermatogonium produces four haploid spermatids. These spermatids are transformed into spermatozoa (sperm) by the process called spermiogenesis.



Process of spermatogenesis

d) **Physiology of pain.**

Answer:



6. **Write short note on the followings. (Any three)** (5 x 3)

i) **Spinal Cord:**

Answer:

The spinal cord is a part of the central nervous system. 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. It is segmented with a pair of roots (dorsal and ventral roots) consisting of nerve fibres joining to form the spinal nerves.

Spinal Cord Anatomy

In adults, the spinal cord is usually 40cm long and 2cm wide. 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

Several spinal nerves emerge out of each segment of the spinal cord. There are 8 pairs of cervical, 5 lumbar, 12 thoracics, 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. Nerve tissue consists of the grey and white matter spread across uniformly. The smooth muscles and the skeletal system carrying nerve fibres liaise different reflexes when ventral horn projects axons which carry motor neurons. It also helps intercede autonomic control for visceral functions which consist of neurons with descending axons. It is a sensitive site, which is severely affected in case of a traumatic injury. Understanding the physiology of the spinal cord helps in detecting and determining the various methods to deal with diseases and damage related to the spinal cord.

Three layers of meninges surround the spinal cord and spinal nerve roots.

- Dura mater
- Arachnoid mater

- Pia mater

Dura mater consists of two layers- periosteal and meningeal. Epidural space is present between the two layers. Subarachnoid space lies between the arachnoid mater and pia mater. It is filled with cerebrospinal fluid.

ii) **Liver**:

Answer:

The liver is located in the upper right-hand portion of the abdominal cavity, beneath the diaphragm, and on top of the stomach, right kidney, and intestines.

Shaped like a cone, the liver is a dark reddish-brown organ that weighs about 3 pounds.

There are 2 distinct sources that supply blood to the liver, including the following:

- Oxygenated blood flows in from the hepatic artery
- Nutrient-rich blood flows in from the hepatic portal vein

The liver holds about one pint (13%) of the body's blood supply at any given moment. The liver consists of 2 main lobes. Both are made up of 8 segments that consist of 1,000 lobules (small lobes). These lobules are connected to small ducts (tubes) that connect with larger ducts to form the common hepatic duct. The common hepatic duct transports the bile made by the liver cells to the gallbladder and duodenum (the first part of the small intestine) via the common bile duct.

Functions of the liver

- Production of bile, which helps carry away waste and break down fats in the small intestine during digestion
- Production of certain proteins for blood plasma
- Production of cholesterol and special proteins to help carry fats through the body
- Conversion of excess glucose into glycogen for storage (glycogen can later be converted back to glucose for energy) and to balance and make glucose as needed
- Regulation of blood levels of amino acids, which form the building blocks of proteins
- Processing of hemoglobin for use of its iron content (the liver stores iron)
- Conversion of poisonous ammonia to urea (urea is an end product of protein metabolism and is excreted in the urine)
- Clearing the blood of drugs and other poisonous substances
- Regulating blood clotting
- Resisting infections by making immune factors and removing bacteria from the bloodstream
- Clearance of bilirubin, also from red blood cells. If there is an accumulation of bilirubin, the skin and eyes turn yellow.

iii) **Pituitary gland**

Answer:

The Pituitary gland, also known as the hypophysis, is a pea-sized endocrine gland situated at the base of our brain. It is often referred to as the ‘Master Gland’ because it produces some of the important hormones in the body. It is situated in a bony structure called the Pituitary fossa, just below the hypothalamus, close to the optic nerve. The pituitary gland is divided into three parts, also called lobes:

- Anterior pituitary
- Intermediate pituitary (Absent in adult human beings)
- Posterior pituitary

Function of Hormones Secreted By Pituitary Gland

A healthy adult human's pituitary gland consists of two parts – the Anterior and the Posterior parts. The Intermediate pituitary regresses during gestation and is absent in adult humans. Following are the major functions of hormones:

Anterior Pituitary Hormones

The anterior pituitary is responsible for the synthesis and secretion of several key hormones in the body. These hormones include:

Human Growth Hormone (HGH): Responsible for the growth and repair of all cells in the body.

Thyroid Stimulating Hormone (TSH): Influences the thyroid gland for the release of thyroxine, its own hormone. TSH is also called Thyrotropin.

Adrenocorticotropic Hormone (ACTH): Influences the adrenal gland to release of Cortisol or the "stress hormone". ACTH is also known as corticotropin.

Luteinising Hormone (LH) and Follicle-Stimulating Hormone (FSH): Collectively known as Gonadotropins, LH and FSH control the sexual and reproductive characteristics in males and females.

Prolactin (PRL): Produces milk in the breast. Though it is present at all times, the secretion is increased during and just after pregnancy.

Melanocyte-Stimulating Hormone (MSH): Involved in the stimulation of the production of melanin by skin and hair.

Posterior Pituitary Hormones

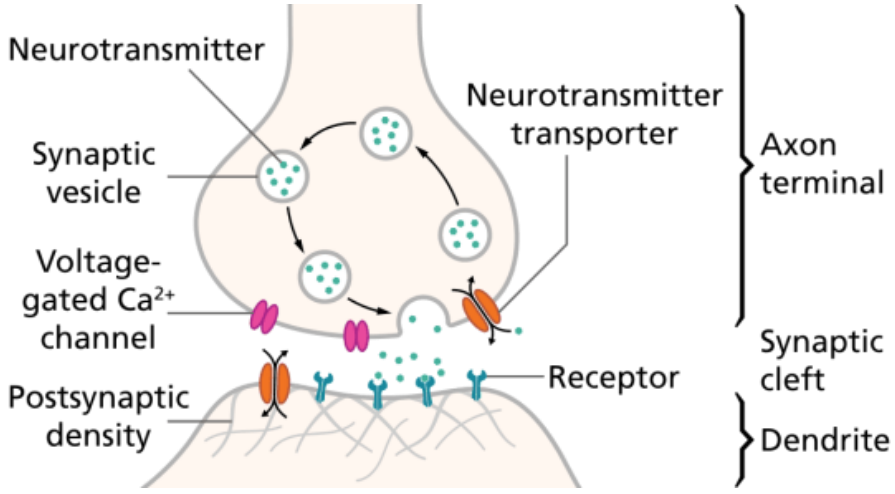
The posterior pituitary is responsible for the storage and secretion of two very important hormones:

Antidiuretic Hormone (ADH): Controls the water balance of the body by affecting reabsorption of water by the kidneys

Oxytocin: Controls certain aspects of pregnancy and childbirth such as uterine contraction and production of milk.

iv) **Neuromuscular junction**

Answer:

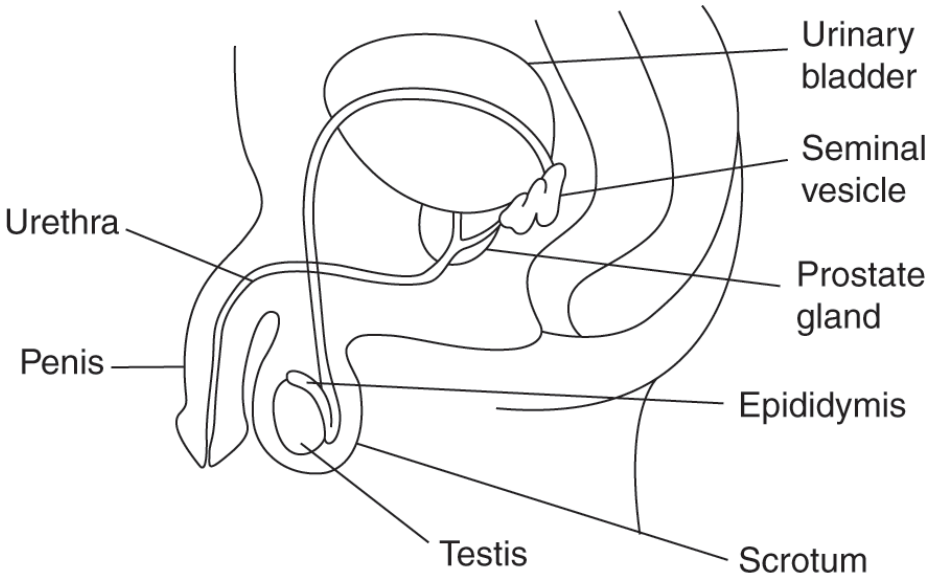


- The neuromuscular junction is a highly specialized synapse formed between a motor neuron and a muscle fiber.
- These junctions convert the electrical impulses generated by the motor neuron into electrical activity in the muscle fibers.
- Once the action potential enters a motor neuron, calcium enters the presynaptic terminal to stimulate the release of the neurotransmitters.
- The neurotransmitters then cross the synaptic cleft and bind to their specific receptors present on the surface of the muscle fiber.
- This initiates the muscle action potential that results in the muscle contraction or relaxation.

7. **Draw neat & clean labelled diagram (Any Three)** (5 x 3)

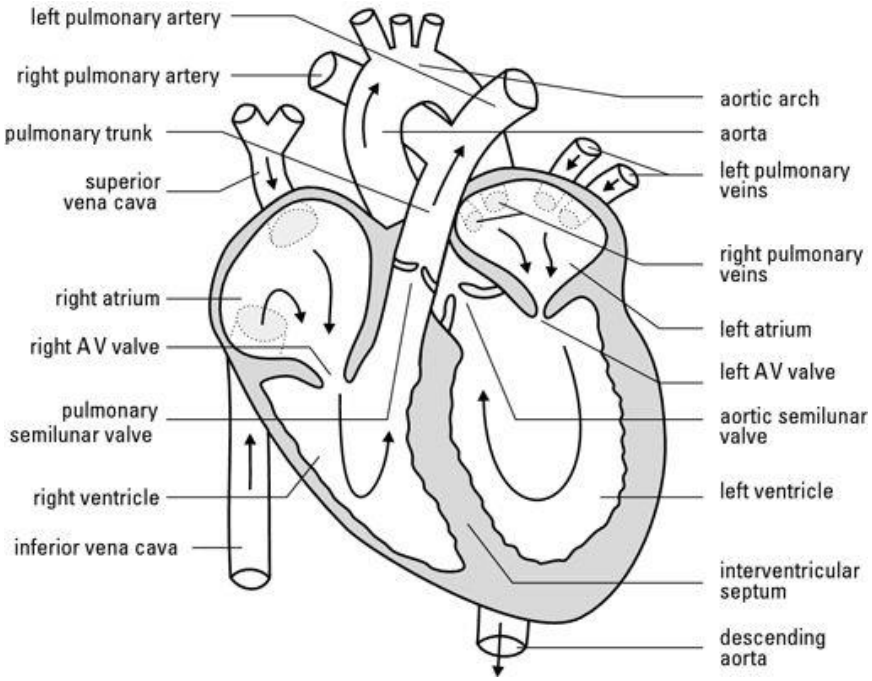
a) Male reproductive system.

Answer:



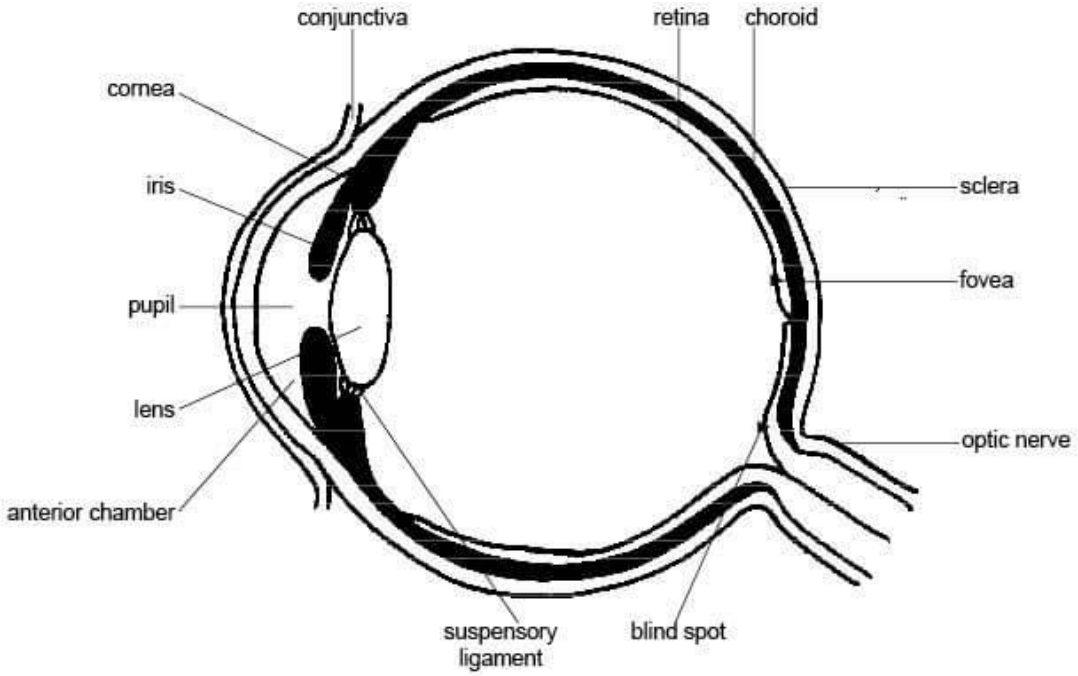
b) Blood flow through heart.

Answer:



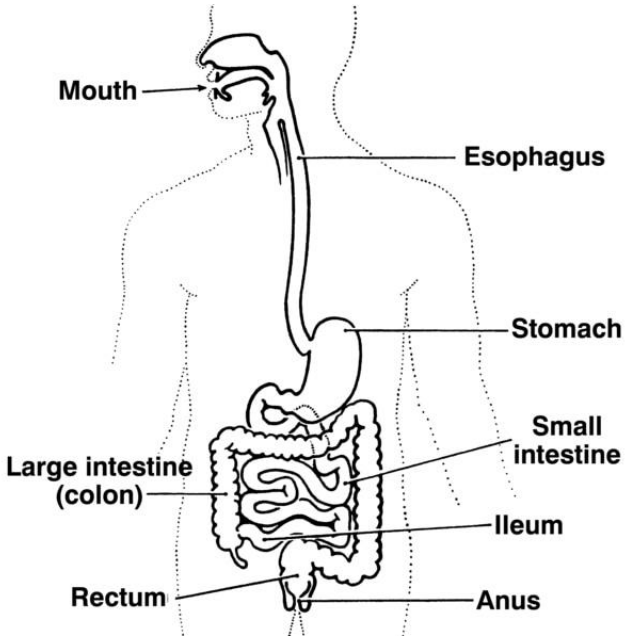
c) Human Eye

Answer:



d) Digestive system

Answer:



ODISHA STATE BOARD OF PHARMACY

D.PHARM PART-I 2022(I) E.R-1991

SUBJECT: - BIO-CHEMISTRY & CLINICAL PATHOLOGY (THEORY)

1. A) Define the Following Terms:

a) **Conjugated Protein**: - These are simple proteins combined with a non-protein group called Prosthetic Group. On the basis of Prosthetic group, the conjugated proteins are of different types------
- Nucleo Protein
- Phospho protein
- Glycoproteins, Lipo proteins etc.

b) **Kwashiorkor: -** It is a protein energy Mal nutrition. It occurs in children when they change from breast feeding to a diet low in protein. The features are------
- Retarded Growth
- Skin changes like pigmentation, thickening, cracks & Ulceration etc.

c) **Isoenzymes: -** These are the enzymes obtained from different sources and have different physical & chemical characteristics. But they catalyze the same chemical reaction. E.g :- Lactate dehydrogenase (LDH) exists in five different isoenzymes forms LDH_1, LDH_2, LDH_3. LDH_4 & LDH_5. But all of them catalyze the oxidation of Lactic acid to Pyruvic acid.

d) **Hypernatremia: -** Increase in plasma sodium concentration. It occurs in-----
- Dehydration as occurs in sever sweating
- Diabetes Insipidus
- Administration of Steroid hormones/ Saline

e) **Molisch's Test: -** 1 ml of aqueous suspension of sugar was taken in a test tube. To this 2 drops of an alcoholic solution of α- naphthol is added and shaken well. Then to this 2 ml of conc. Sulphuric acid was added to the side of the test tube. A reddish violet ring at the junction of two layers indicates the presence of carbohydrates.

f) **Osteomalacia:** - Calcium deficiency disease which occurs in Adults. Also occurs due to deficiency of vitamin-D. It is characterized by---------
- Deformities and easy fracture of bones
- Muscle weakness & pain
- Bending of vertebrae and bow legs

g) **Lymphocytosis: -** The condition in which the absolute count of lymphocytes exceeds 4×10^6/ ml. The conditions are-------
- Pertussis & Lymphatic leukemias
- TB & Infective hepatitis
- Measles, mumps, rubella & chicken pox etc.

h) Oligopeptides: - Oligopeptides, which are sometimes simply referred to as peptides, are short chains of amino acid monomers linked via peptide bonds. The term *oligopeptide* is used to refer to a peptide with fewer members of amino acids as opposed to a polypeptide, which is a peptide comprised of several amino acid residues.

i) Agranulocytosis: - Agranulocytosis, also known as agranulosis or granulopenia, is an acute condition involving a severe and dangerous lowered white blood cell count (leukopenia, most commonly of neutrophils) and thus causing a neutropenia in the circulating blood.

j) **Saponification value: -** It is the number of milligrams of KOH required to saponify 1 gram of fat/ oil.

1. B) Define & Differentiate the Following Terms:

i) Iodine Value: - It is the number of grams of Iodine absorbed by 100 grams of fat. It is the measurement of unsaturation of a fat.

Acid Value: - It is the number of milligrams of KOH required to neutralize the fatty acids in 1 gram of fat.

ii) **Glycogenolysis: -** It is the breakdown of glycogen to glucose in liver & muscle.
Gluconeogenesis: - Formation of glucose from non-carbohydrate precursors like Amino acids, Lactic acids & Glycerol in liver & Kidney.

iii) **Hodgkin's Lymphoma: -** It is a tumor of the Lymphoid tissues. It occur generally in adult age of 32 years. Fever is the main symptoms with Tumor. It is characterized by the presence of Reed-Sternberg cells in Lymph Node.

Non-Hodgkin's Lymphoma: - It is a tumor of Lymphoid Tissues/ generalized Lymphadenopathy.

It has a tendency to spread from one lymph to another so it spreads to Spleen, Liver & Bone marrow.

So finally malignant cells spread into blood.

iv) **Reducing Sugar: -** It can be oxidized by a weak oxidizing agent E.g tollen's reagent, in basic aqueous solution. In aqueous solution, they generate one or more compounds containing aldehyde or ketone group. After oxidization, they cause a reduction of other substances. For e.g. Maltose, Glucose, fructose, and galactose, or the disaccharides like lactose and maltose.
Non-Reducing Sugar: - Sugar which does not have free aldehyde or ketone functional group is the non-reducing sugar. Also, they do not get oxidized. Sucrose is their most common source. They give a negative reaction for Fehling's as well as Benedict's test. All polysaccharides are non-reducing sugars.

v) **Anabolism: -** It is a constructive / building up process. In this process, the food which is absorbed is used for the synthesis of macromolecules like like proteins, lipids & Nucleic acids. Synthesis of these macromolecules require energy which is supplied by ATP generate from catabolism.
Catabolism: - It is the breakdown process, in which macromolecules like carbohydrates, proteins & lipids are broken down.

2. **a)** Fats are the simple lipids. They are esters of fatty acids with glycerol.

Chemical Properties of Fat & Oil

- Describe **Hydrolysis**
- Describe **Hydrogenation**
- Describe **Halogenation**
- Describe **Rancidity**

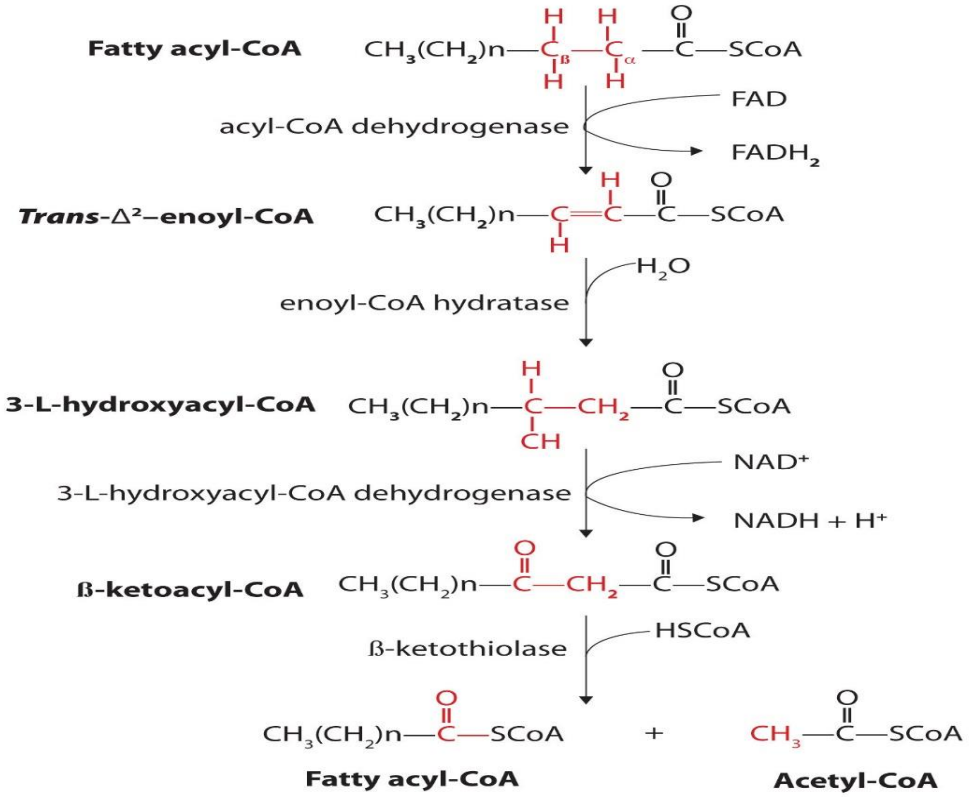
b) β-Oxidation of Fatty Acids

It means oxidation takes place at β-carbon of Fatty acids. The enzymes responsible for this present in Mitochondria of Liver.

I. Reactions of β-Oxidation of Fatty Acids

- Activation of Fatty acids to form Acyl CoA **(Describe each Steps in Brief)**
- Formation of α, β Unsaturated Acyl CoA
- Formation of β-Hydroxy Acyl CoA
- Formation of β-Keto Acyl CoA
- Formation of Acetyl CoA

II. Steps of β-Oxidation Process (Describe each Step)



c) Disorder of Fat Metabolism: -

It is divided into 2 types like ----------

- *Acquired Diseases*
  - ✓ Obesity (Increase in Body Weight above Normal)
  - ✓ Fatty Liver (Accumulation of Fat in Liver)
  - ✓ Ketosis (Formation of Ketone Bodies)
  - ✓ Atherosclerosis (Thickening of Arteries)
- Inherited Diseases
  - ✓ Hyper-Lipoproteinemia (Increase in Lipoprotein in Plasma)
  - ✓ Idiopathic Hyperlipidaemia (Inborn Error of High Levels of Lipid in Plasma)
  - ✓ Gaucher's Disease (Inherited disorder of Cerebroside metabolism)
  - ✓ Niemann Pick's Disease (Inherited disorder of Sphingomyelin metabolism)
  - ✓ Tay- Sach's Disease (Inherited disorder of Ganglioside metabolism)
  - ✓ Fabry's Disease (Inherited disorder of Sphingolipid metabolism)

3. Vitamins are the organic compounds present in food and are required in minute quantities for normal growth, maintenance & reproduction.

<u>Classification</u>

- **Fat Soluble Vitamins**: - Vitamin A, D, E & K
- **Water Soluble Vitamins**: - Vitamin B_1, B_2, B_3, B_5, B_6, Biotin, Folic Acid, Lipoic Acid, B_{12} & Vitamin C

Sl.No.	Sources	Chemistry	Physiological Function	Deficiency Disease
Vitamin-B_1	Unpolished Rice, Cereals, pulses, nuts, oils, seeds, meat, fish milk, vegetables & Fruits	Contain Pyrimidine ring and a thiazole ring	(i) TPP is the co-enzyme. (ii) Decarboxylation of pyruvic acid & α-ketoglutaric acid in Citric acid cycle (iii) Helps in Transketolase reaction in HMP shunt	Beri-Beri
Vitamin-B_{12}	Non-Veg foods like Liver, Kidney, Egg, Meat & Milk	Corin ring system which is made up of pyrrole rings. The pyrrole rings are connected to each other directly by methene bridges. Corin ring attached to DBI Nucleotides. A cobalt atom is connected to 4 pyrrole rings and also to the benzimidazole ring	(i)Cobamide act as Co-enzyme. (ii) It acts as Co-enzyme in the conversion of methyl malonyl CoA to Succinyl CoA	Megaloblastic Anemia
Vitamin- C	Lemons, Oranges, Berries, Melons, Leafy vegetables, Cabbages & Tomatoes	Structure similar to L-Glucose. Chemically it is enediol lactone of Gluconic acid	(i)Collagen Synthesis (ii) Helps in Oxidation-Reduction Reactions (iii) Helps in Absorption of Iron	Scurvy
Vitamin- D_3	Fish, Liver oils & Egg yolk	Known as Cholecalciferol. It is produced by irradiation of 7-dehydrocholesterol.	(i)Helps in absorption of Ca & P from intestine (ii) Development of teeth & Bones	Rickets in Children & Osteomalacia in Adults

4.a) Proteins: - High Molecular weight polypeptides containing alpha Amino acids joined together by Peptide

Linkage.

Classification of Proteins: - Based on Physical Properties, it is of **3** types

Simple Protein ----- On hydrolysis give only 1 amino acid. It is of different types like---------

- Albumin
- Globulin
- Glutelin
- Prolamine
- Histone
- Protamine etc.

Conjugate Protein ------ Simple protein combined with non-protein group. It is of different types like----

- Nucleo-proteins
- Phospho-proteins

- Glyco-Proteins
- Lipo-Proteins
- Metallo-Proteins
- Chromo-Proteins

Derived Protein ---------- Formed from Simple & Conjugated Proteins by any Physical & Chemical Factors. It is of different types like

- Primary Derived Proteins like Meta -Proteins
- Secondary Derived Proteins like Peptones & Peptides etc.

b) Biological Functions of Proteins: -

Proteins are a class of macromolecules that serve various functions in the body. These range from digestion, transportation and structural functions to Défense, storage and movement.

- **Digestive Enzymes**

Certain proteins act as digestive enzymes. In other words, they catabolize nutrients into constituent monomeric units. Examples of digestive enzymes include pepsin and amylase.

- **Structural Proteins**

Proteins are integral as they form components of certain structures. Examples include keratin and tubulin.

- **Hormonal Functions**

Hormones are paramount for regulating body functions. Insulin is one such example.

- **Transportation**

Proteins play a major role in transporting substances throughout the body. Examples of such proteins include haemoglobin

- **Defence and Protection**

Another major function of proteins is that they form a part of the immune system and protect the body from pathogens. Example of such a protein is immunoglobulin.

- **Storage Functions**

Proteins also provide nourishment for development of embryo – such as albumin, or the egg white.

Please note – enzymes and hormones are essentially types of proteins. Enzymes essentially function as catalysts for biochemical reactions. On the other hand, hormones serve as molecules for signalling and communication between cells.

c) Qualitative Test for Proteins: -

i. Biuret Test

Sample Protein + Biuret Reagent = Pink/ Purple colour which signifies the presence of Double Bond.

ii. Ninhydrin Test

Sample Protein warm with Ninhydrin Reagent = Purple colour which signifies presence of Amino acid

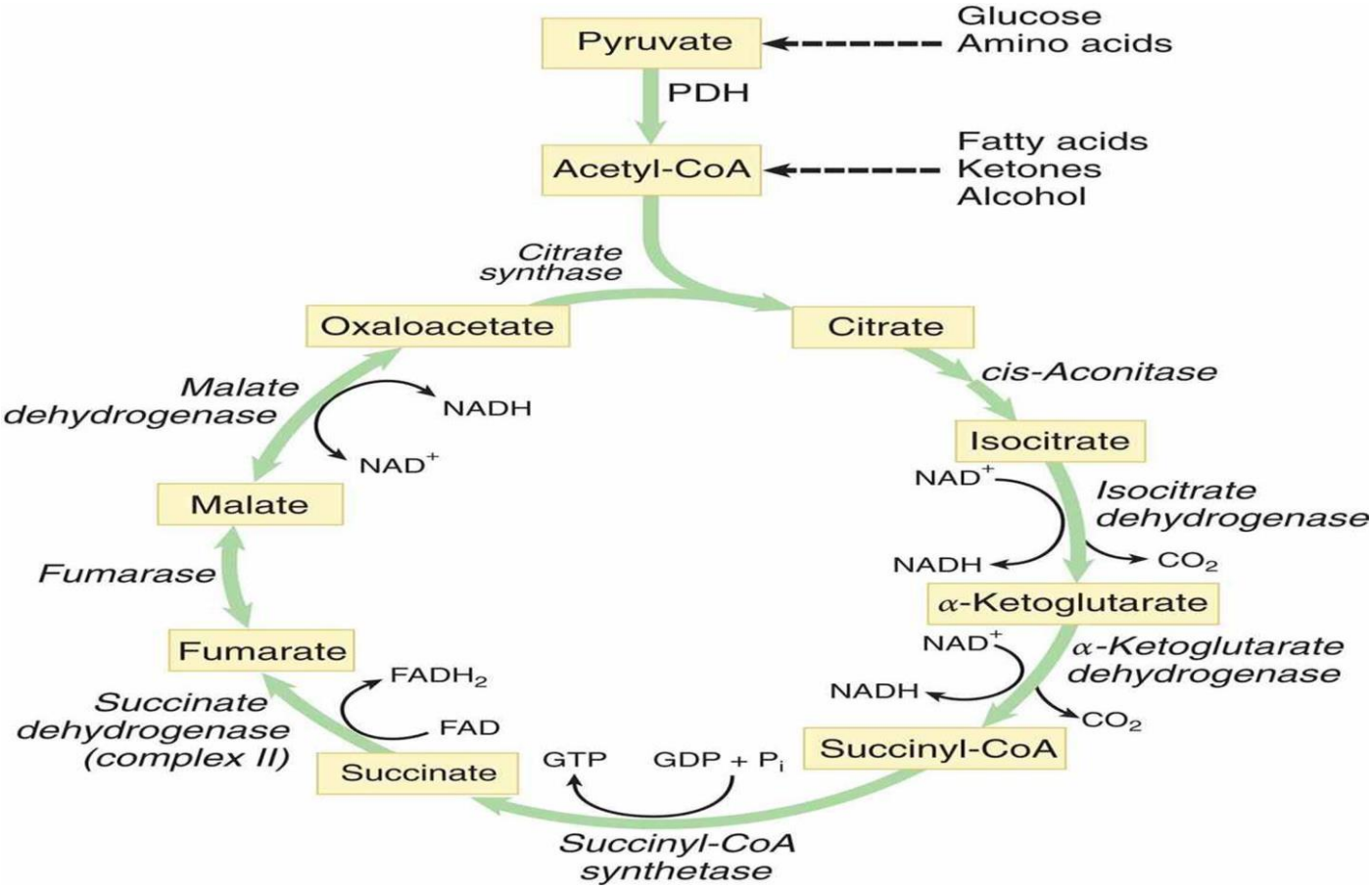
iii. Millon's Test

Sample Protein + Millon's Reagent = Produce White Precipitate which signifies the presence of Amino acid like Tyrosine

iv. Sakaguchi Test

Sample Protein + Sakaguchi Reagent = Red colour which signifies the presence of Amino acid like Arginine.

5.**TCA Cycle** is also known as Citric acid cycle/ Kreb's Cycle. In TCA cycle, metabolism of Acetyl CoA to CO2 & H2O. It is an Aerobic pathway. The reactions of Citric acid cycle are carried out in Mitochondria.



Steps of TCA Cycle

The TCA cycle is an eight-step pathway that plays a major role in the breakdown of organic molecules. Macromolecules like glucose, sugars, fatty acids, amino acids, etc. cannot directly enter the TCA cycle. Thus, they are first broken down into two-carbon compound Acetyl CoA. After Acetyl CoA enters the TCA cycles, it undergoes other chemical reactions to produce carbon dioxide and energy. Every step of the pathway is catalysed by a soluble enzyme.

Oxidation of Pyruvate

Pyruvate derived from glucose undergoes oxidation to give acetyl CoA. Acetyl CoA thus enters the cycle and a series of reactions follows

Step 1

Acetyl-CoA which is a two carbon molecules compound, combines with a four-carbon compound, oxaloacetate, resulting in the formation of a six-carbon molecule called citrate and releases the CoA group.

Step 2

In the next step, citrate gets converted into an isomer of citrate called- isocitrate. Two processes simultaneously occur in this step. At first, citrate loses a water molecule and again gains it to form isocitrate.

Step 3

The third step oxidation of isocitrate occurs. A five-carbon molecule called α-ketoglutarate is left behind with the release of a molecule of carbon dioxide is released. NAD^+ also gets reduced to NADH. This step is catalyzed by the enzyme isocitrate dehydrogenase.

Step 4

In this step, α-ketoglutarate is oxidized, releasing a molecule of carbon dioxide and reducing NAD^+ to NADH. Simultaneously, CoA is picked up by the remaining four-carbon molecules forming Succinyl CoA which is an unstable compound. This step is catalysed by the enzyme α-ketoglutarate.

Step 5

The phosphate group replaces CoA from succinyl CoA. It then gets transferred to ADP to give rise to the ATP molecule. This step also gives a four-carbon molecule- Succinate.

Step 6

In this step, Succinate is oxidized to give fumarate. Also, two hydrogen atoms are transferred to FAD giving rise to $FADH_2$. $FADH_2$ then transfers its electrons directly to the electron transport chain (ETC) as the enzyme that catalyses this reaction is embedded in the inner membrane of mitochondria.

Step 7

A water molecule is added to fumarate and fumarate gets converted to malate with the help of enzyme Fumarase.

Step 8

In this step of the cycle, the oxidation of malate regenerates oxaloacetate which is a four-carbon compound, and another molecule of NAD^+ is reduced to NADH. This step is catalysed by the enzyme Malate Dehydrogenase.

Energetics of TCA Cycle: -

Reaction Details	ATPs Formed
Pyruvate to Acetyl CoA	3
Iso-Citrate to Oxalosuccinate	3
α-ketoglutarate to Succinyl CoA	3
Succinyl CoA to Succinate	1
Succinate to Fumarate	2
Malate to Oxaloacetate	3
Total	**15**

In Glycolysis, 1 molecule of glucose gives 2 molecules of Pyruvate. These 2 molecules of pyruvate are converted to Acetyl CoA which enter into citric acid cycle. So, the total numbers of ATP formed in Citric acid cycle are ---------- $2 \times 15 =$ **30 numbers of ATP were formed in TCA Cycle.**

Abnormalities of Carbohydrate Metabolism

- ✓ **Hyperglycaemia** (Increase in blood sugar level above normal)
- ✓ **Hypoglycaemia (Decrease** in blood sugar level above normal)
- ✓ **Glycosuria** (Excretion of Detectable amount of Sugar in in Urine)
  - Hyperglycaemic Glycosuria
  - Alimentary Glycosuria
  - Renal Glycosuria
- ✓ **Diabetes Mellitus** (Occur due to deficiency of Insulin)

It is Characterized by different symptoms which are like----------

(i) Polyuria (ii) Polydipsia (iii) Polyphagia

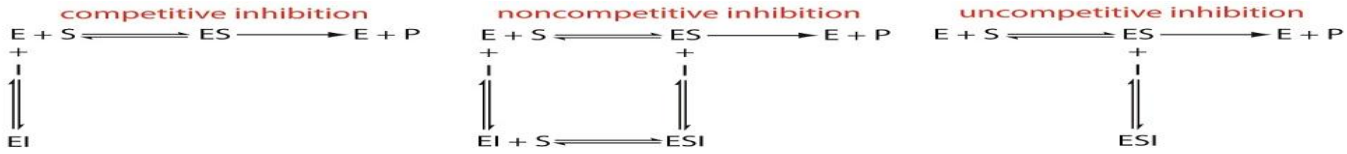
6.ENZYME INHIBITIONS: -

The process in which the rate of Enzyme Reaction low down. They either produce their effects by act on Co-enzyme, Apo-Enzyme. They also act by inhibiting the combination of the Substrate with enzymes. In some cases of enzyme inhibition, for example, an inhibitor molecule is similar enough to a substrate that it can bind to the active site and simply block the substrate from binding. When this happens, the enzyme is inhibited through competitive inhibition, because an inhibitor molecule competes with the substrate for active site binding. On the other hand, in non-competitive inhibition, an inhibitor molecule binds to the enzyme in a location other than an allosteric site and still manages to block substrate binding to the active site.

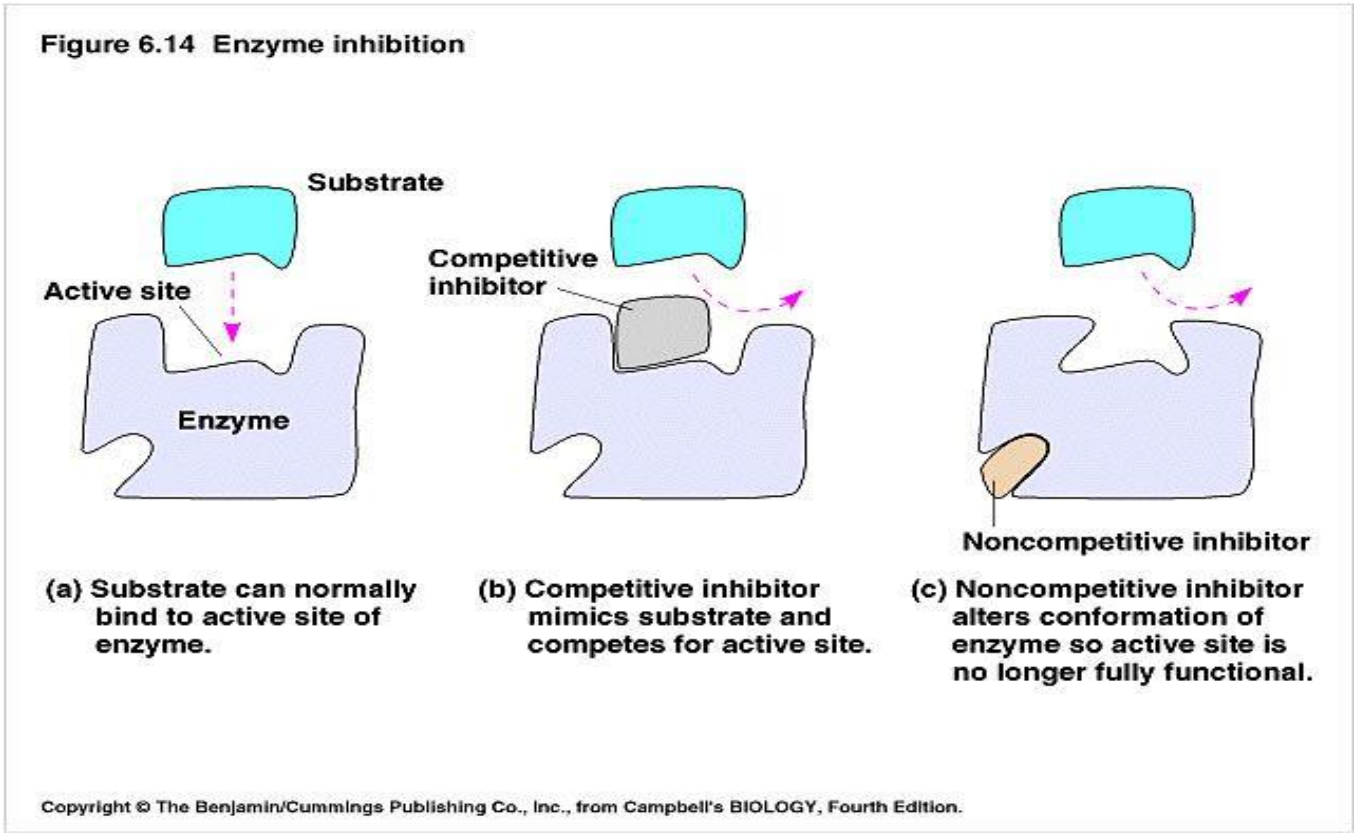
Types Of Enzyme Inhibition: - It is of 3 types like----------

- Competitive Inhibition
- Non-Competitive Inhibition
- Allosteric Inhibition

In **competitive inhibition** the substrate and the inhibitor compete for the same active site on the enzyme. Because the substrate cannot bind to an enzyme–inhibitor complex, EI, the enzyme's catalytic efficiency for the substrate decreases. With Non-**competitive inhibition** the substrate and the inhibitor bind to different active sites on the enzyme, forming an enzyme–substrate–inhibitor, or ESI complex. The formation of an ESI complex decreases catalytic efficiency because only the enzyme–substrate complex reacts to form the product. Finally, in **uncompetitive inhibition** the inhibitor binds to the enzyme–substrate complex, forming an inactive ESI complex.



Mechanisms for the reversible inhibition of enzyme catalysis. E: enzyme, S: substrate, P: product, I: inhibitor, ES: enzyme–substrate complex, EI: enzyme–inhibitor complex, ESI: enzyme–substrate–inhibitor complex.



Allosteric Inhibitions: - Allosteric site is a site other than active site which is present in the enzyme. The inhibitor binds to the allosteric site and produces confirmational changes in the enzyme. So the substrate cannot bind with the enzyme and a product cannot be formed.

Example:- ATP is an allosteric inhibitor of Hexokinase & ADP is an allosteric inhibitor of Pyruvate carboxylase.

Factors Affecting Enzyme Activity: -

Describe about the following factors

- **Temperature** (Describe it with Curve)
- pH **(-do-)**
- **Concentration of enzyme** **(-do-)**
- **Concentration of substrate** (Michaelis Curve & Lineweaver-Burk Plot)
- **Effect of Radiation** (Describe it with Example)
- **Effect of Activators** (Describe it with Example)
- **Effect of Inhibitors** (Describe it with Example)

7. a) Megaloblastic Anemia: -

Megaloblastic anaemia is a form of macrocytic anaemia. Macrocytic anaemia is a blood disorder that causes your bone marrow to make abnormally large red blood cells. It's also a type of vitamin deficiency anaemia

CAUSES

Megaloblastic anaemia happens when you don't have enough vitamin B12 or vitamin B9 to make sure your bone marrow develops enough healthy red blood cells to carry oxygen throughout your body.

What causes vitamin B12 deficiency?

Some people develop vitamin B12 deficiency because their diet doesn't include enough vitamin B12-rich foods like meat, fish, eggs and dairy products. Some people develop vitamin B12 deficiency because they have conditions or have had medical treatments that affect their ability to absorb vitamin B12. Those conditions include

- **Pernicious anemia:** This autoimmune disorder keeps your body from absorbing vitamin B12.
- **Gastrectomy**: This surgery removes part of your stomach, which may affect vitamin B12 absorption.
- **Zollinger-Ellison syndrome**: This rare condition keeps your body from absorbing vitamin B12.
- **Blind loop syndrome**: Blind loop syndrome happens when food you've digested stops moving through your intestines, causing bacteria overgrowth that uses up vitamin B12.
- **Fish tapeworm infestation**: You can get a tapeworm infection or infestation by eating infected fish that was undercooked. Tapeworms feed on vitamin B12.
- **Pancreatic insufficiency**: This condition affects your pancreas' ability to make enough digestive enzymes to break down food, which means you may not get all the nutrients you need, including enough vitamin B12 or vitamin B9.

Symptoms

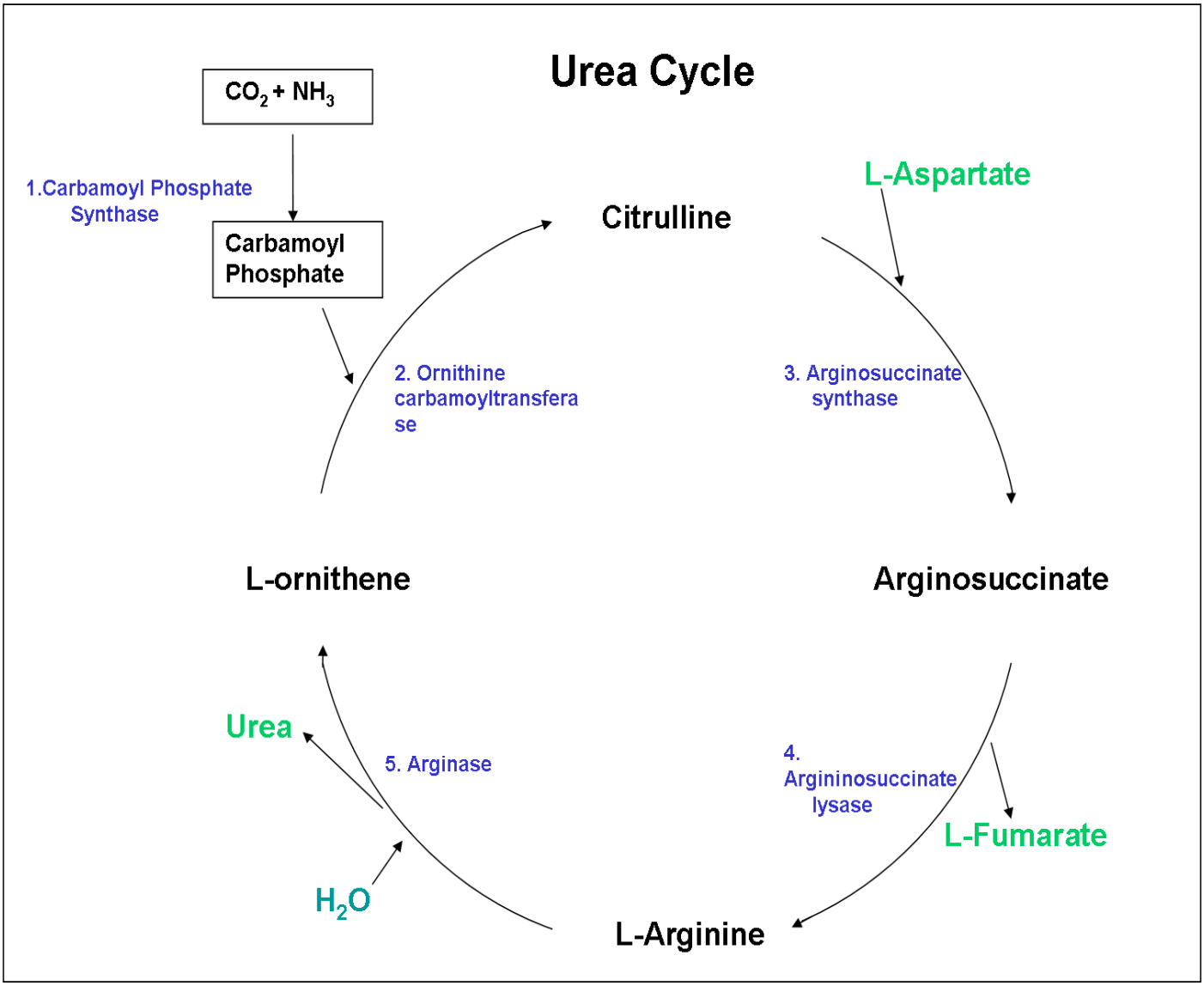
A wide variety of symptoms can develop, including:

- fatigue
- shortness of breath
- pale skin
- dizziness
- irregular heartbeat
- muscle weakness
- nausea
- unexplained weight loss
- yellowing of the skin

b) **) Urea Cycle: -**

Also known as **Krebs -Henseleit Cycle**. Urea Cycle occur in Liver. Urea cycle is a Défense mechanism. It converts Ammonia into Harmless, Non-toxic, Water-soluble Urea because Ammonia is highly toxic and is formed in the various Bio-Chemical Transformations of Amino Acids.

Describe the Following Cycle with its Steps



c) **ROLE OF BLOOD PLATELETS IN HEALTH: -**

They are round / oval shaped cells with biconcave surface. They are roughly1/4 th size of 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 bone marrow. They have an average life span of 5 to 10 days and are destroyed in spleen. The normal platelet count is 2 to 5 lakhs/cu mm of blood.

Functions: -

- Thromboplastin liberated from platelets is essential for clotting
- They help in body's defence mechanism against bacteria
- They contain histamine & Serotonin
- They contain some antigenic substance also

Describe other Points also

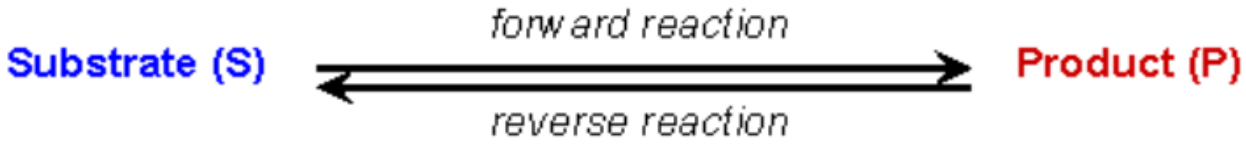
ROLE OF BLOOD PLATELETS IN DISEASES: -

- **Thrombocytosis: -** Increase in platelet count above the normal value of 4.5 lakhs/ cu. Mm of blood.
  It occurs in----------
  - Haemorrhage
  - After Splenectomy
  - Following Surgery & Trauma
  - Hodgkin's Disease

- **Idiopathic Thrombocythemia: -**
  - ❖ Also called as Haemorrhagic Thrombocythemia, generally occur in Middle age/ old age.
  - ❖ Characterised by repeated, excessive bleeding from mucous membranes
  - ❖ Platelet count is extremely high in this case i.e., 1000×10^6/ ml of blood
- **Thrombocytopenia: -** Reduction in the platelet count below 1.5 lakh/ cu. Mm of blood. Bleeding is common symptom. The following are the diseases associated with this disease.
  - ❖ Leukaemia
  - ❖ Aplastic Anaemia
  - ❖ HIV infections
  - ❖ Liver Diseases
  - ❖ Alcoholism
  - ❖ Drug Reactions
- **Idiopathic Thrombocytopenic Purpura (ITP): -** It is a disease involving immunologically mediated
  destruction of platelets. It is also called as Immune Thrombocytopenic purpura. In this case, bleeding may be occurred in the skin & mucous membrane. Bleeding under skin occur which produce characteristics lesions.

d) **Michaelis-Menten Equation: -**

The Michaelis Menten hypothesis or Michaelis Menten kinetics is a model that is designed to explain generally the velocity of enzyme-catalyzed reactions and their gross mechanism. The Michaelis-Menten equation is a mathematical model that is used to analyze simple kinetic data. The model has certain assumptions, and as long as these assumptions are correct, it will accurately model your experimental data. The derivation of the model will highlight these assumptions.



In an enzyme catalyzed reaction the substrate initially forms a reversible complex with the enzyme (i.e. the enzyme and substrate have to interact for the enzyme to be able to perform its catalytic function). The standard expression to show this is the following:

ASSUMPTION #1:

- There is no product present at the start of the kinetic analysis
- Therefore, as long as we monitor initial reaction rates we can ignore the reverse reaction of E+P going to ES

ASSUMPTION #2:

- During the reaction an equilibrium condition is established for the binding and dissociation of the Enzyme and Substrate (Briggs-Haldane assumption)
- Thus, the rate of formation of the ES complex is equal to the rate of dissociation plus breakdown

ASSUMPTION #3:

- [E] << [S]
- The enzyme is a catalyst, it is not destroyed and can be recycled, thus, only small amounts are required
- The amount of S bound to E at any given moment is small compared to the amount of free S
- It follows that [ES] << [S] and therefore [S] is constant during the course of the analysis (NOTE: this assumption requires that the reaction is monitored for a short period, so that not much S is consumed and [S] does not effectively change - see next assumption)

ASSUMPTION #4:

- Only the initial velocity of the reaction is measured
- [P] = 0 (reverse E + P reaction can be ignored)
- [S] » $[S]_{initial}$

ASSUMPTION #5:

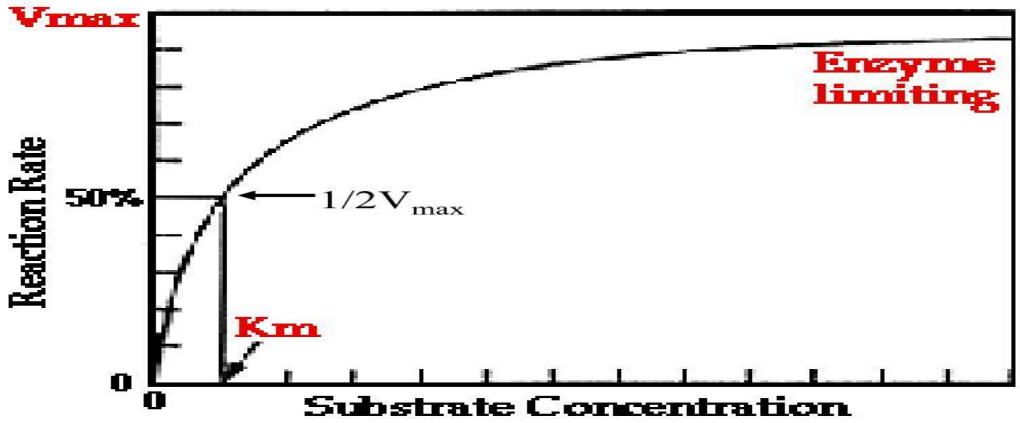
- The enzyme is either present as free enzyme or as the ES complex
- $[E]_{total} = [E] + [ES]$
- Rate of ES formation = $k_1[E][S] + k_{-2}[E][P]$
- Assumption #1 says we can ignore the k_{-2} reaction, therefore:
- Rate of ES formation = $k_1[E][S]$
- Assumption #5 says $[E] = [E]_{total} - [ES]$, therefore:
- Rate of ES formation = $k_1([E]_{total} - [ES])[S]$
- The rate of ES breakdown is a combination of the dissociation and the conversion to product:
- Rate of ES breakdown = $k_{-1}[ES] + k_2[ES]$
- Rate of ES breakdown = $(k_{-1} + k_2)[ES]$
- Assumption #2 says the rate of ES formation equals the rate of breakdown:
- $k_1([E]_{total} - [ES])[S] = (k_{-1} + k_2)[ES]$
- Rearrange to define in terms of rate constants:
- $([E]_{total} - [ES])[S] / [ES] = (k_{-1} + k_2) / k_1$
- $([E]_{total} [S] / [ES]) - [S] = (k_{-1} + k_2) / k_1$
- Define a new constant, $K_m = (k_{-1} + k_2) / k_1$
- $([E]_{total} [S] / [ES]) - [S] = K_m$
- Solve for the [ES] term (for reasons that will be given in the next step):
- $[ES] = [E]_{total} [S] / (K_m + [S])$
- The actual reaction velocity measured at any given moment is given by:
- $V = k_2[ES]$
- Multiple both sides of the above equation by k_2:
- $k_2[ES] = k_2[E]_{total} [S] / (K_m + [S])$
- thus
- $V = k_2[E]_{total} [S] / (K_m + [S])$
- The maximum possible velocity (Vmax) occurs when all the enzyme molecules are bound with substrate $[ES] = [E]_{total}$, thus:
- $V_{max} = k_2[E]_{total}$
- Substituting this into the prior expression gives:

$$\mathbf{V = V_{max} [S] / (K_m + [S])}$$

This is the mathematical expression that is used to model your experimental kinetic data. It is known as the Michaelis-Menten equation

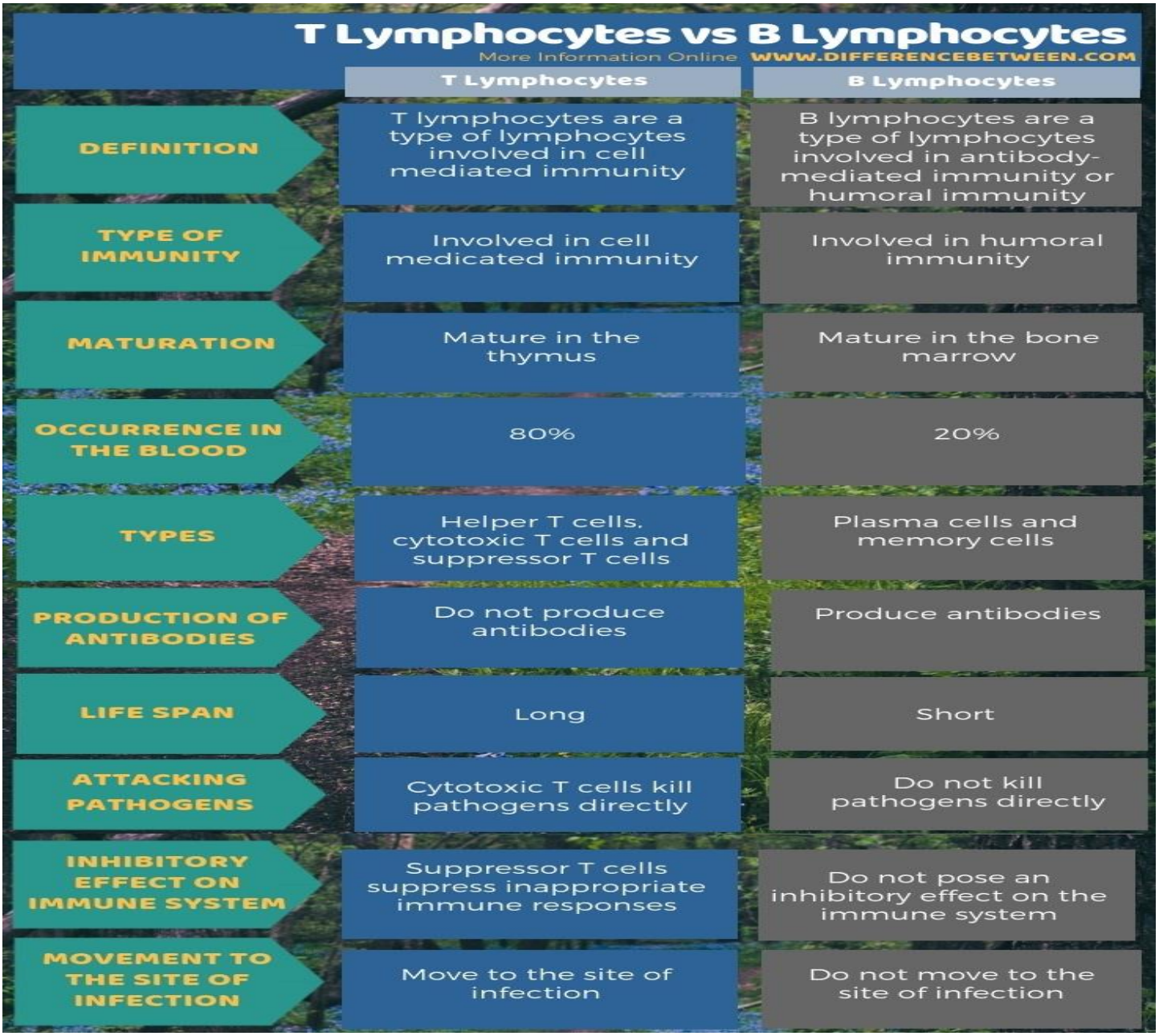
The Michaelis-Menten Equation

$$V = \frac{V_{max}[S]}{K_m + [S]}$$ Hyperbolic function



e) Difference Between T & B Lymphocytes:- T lymphocytes and B lymphocytes are two types of lymphocytes present in our blood. T lymphocytes involve in cell-mediated immunity while B lymphocytes involve in antibody-mediated immunity. So, this is the key difference between T lymphocytes and B lymphocytes. Furthermore, T lymphocytes produce cytokines while B lymphocytes produce antibodies. Also, a further difference between T lymphocyte and B lymphocytes is their maturation site. T lymphocytes mature in the thymus while B lymphocytes mature in the bone marrows.

Moreover, there are three types of T lymphocytes as helper t cells, cytotoxic T cells, and suppressor T cells while there are two types of B lymphocytes as plasma cells and memory cells. Besides, T lymphocytes move to the site of infection while B lymphocytes do not move. Therefore, we can consider this also as a difference between T lymphocytes and B lymphocytes. Furthermore, 80% of the circulating lymphocytes in the blood are T lymphocytes while only 20% are B lymphocytes. Hence, this is also a difference between T lymphocytes and B lymphocytes.


T Lymphocytes vs B Lymphocytes
More Information Online
WWW.DIFFERENCEBETWEEN.COM
T Lymphocytes
B Lymphocytes
DEFINITION
T lymphocytes are a type of lymphocytes involved in cell mediated immunity
B lymphocytes are a type of lymphocytes involved in antibody-mediated immunity or humoral immunity
TYPE OF IMMUNITY
Involved in cell medicated immunity
Involved in humoral immunity
MATURATION
Mature in the thymus
Mature in the bone marrow
OCCURRENCE IN THE BLOOD
80%
20%
TYPES
Helper T cells, cytotoxic T cells and suppressor T cells
Plasma cells and memory cells
PRODUCTION OF ANTIBODIES
Do not produce antibodies
Produce antibodies
LIFE SPAN
Long
Short
ATTACKING PATHOGENS
Cytotoxic T cells kill pathogens directly
Do not kill pathogens directly
INHIBITORY EFFECT ON IMMUNE SYSTEM
Suppressor T cells suppress inappropriate immune responses
Do not pose an inhibitory effect on the immune system
MOVEMENT TO THE SITE OF INFECTION
Move to the site of infection
Do not move to the site of infection

E.R. 1991 **PHARMACOGNOSY-I (Theory)**

PART- A

1.

A. Chemical constituents of Chemical crude drugs.

a) Guggul- gallic acid, quercetin, and guggulsterones E and Z.
b) Nux- Vomica- strychnine and brucine
c) Amla- Gallic acid, ascorbic acid, ellagic acid, rutin, quercetin, and catechol
d) Linseed oil- linolenic acid, linoleic acid, oleic acid and stearic acid
e) Ipecacuanha- emetine and cephaeline.
f) Digitalis- Digoxin, Digitoxigenin, Digoxigenin, and Saponins.
g) Dioscorea- Steroidal sapogenin, diosgenin.
h) Aconite- aconitine, mesacotine, hypaconitine, and jesaconitine
i) Neem- nimbolinin, nimbin, nimbidin, nimbidol, sodium nimbinate, gedunin, salannin, and quercetin.
j) Cannabis- cannabidiol, cannabidolic acid, cannabinol, cannabichromene, and trans-tetrahydrocannbinol.

B. Uses of crude drugs.

a) Vasaka- chronic fever, intrinsic haemorrhage, **cough and asthma**, leprosy, skin diseases and piles
b) Vinca- treat diabetes, high blood pressure, disinfectants and **anti-cancer**.
c) Black pepper- antioxidant, anti-fungal, anti-amoebic, anti-asthmatic, anti-diabetic and immunomodulatory activities
d) Arjuna- **ischaemic heart disease**, and hypertension.
e) Honey- **cold, cough,** fever, sore eye and throat, tongue and duodenal ulcers, liver disorders, constipation, diarrhoea, kidney and other urinary disorders, pulmonary tuberculosis, marasmus, rickets, scurvy and insomnia.
f) Clove- **antiseptic**, stimulant, carminative, aromatic, and as a **flavouring agent.**
It is also used as anodyne, antiemetic.
g) Curcuma- anti-inflammatory, anticancer, antibacterial, antiviral, antioxidant,

antiseptic, cardioprotective, hepatoprotective and digestive activities

h) Tulsi- anti-ulcer, anti- oxidant, anti-inflammatory, anti-cancer, antidiabetic, anti-arthritic, analgesic, antistress, anti-asthmatic, antifertility, immunomodulatory, and neuroprotective activity.

i) Colchicum- reduce the pain and inflammation of acute gout, **arthritis and rheumatism**.

J) Agar- emulsifying agent, thickening agent

Q2. Answer any three: -

A) Morphological classification of Crude drugs

The crude drugs are arranged (Grouped) according to the part of the plant or animal represented into organised (Cellular) drugs and unorganised (Acellular) drugs.

Organised (Cellular): Drugs are the direct parts of the plant and are divided into leaves, barks wood, root, rhizome, seed, fruit, flower, stem, hair and fibers.

Example of organised drug According to Plant parts –

- Leaves - Datura, Senna, Vasaka, Digitalis,
- Barks - Cinnamon, Cinchona, Kurchi,
- Wood- Quassia, Sandalwood
- Roots -Rauwolfia, Liquorice, Ipecac
- Rhizomes - Ginger, Podophyllum, Turmeric
- Flowers - Clove, Saffron, Pyrethrum
- Seeds - Nux vomica, Linseed, Isapgol
- Fruits - Fennel, Coriander, Dill
- Stems - Ephedra
- Hair and Fibres - Cotton, Hemp, Jute

Unorganised (Acellular):

- Drugs are the products of plant, animal and mineral sources like-
- dried latex, dried juice, dried extracts, gums, resins, fixed oils and fats, waxes, volatile oil, animal products, minerals (Solids, liquids, semi solids etc)

Example of unorganized drugs

- Plant, animal, Mineral Drugs Dried latex Opium, Papain
- Dried Juice - Aloe Vera

• Dried extracts - Agar, Catechu, Pectin Gums Acacia, Tragacanth, Stericulia • Resins – Benzoin, Colophony, Asafoetida Fixed oils and fats Castor, Chaulmoogra, Cotton seed

• Waxes- Beeswax, Spermaceti

• Volatile oils - Coriander, Cinnamon, Clove

• Animal products - Bees wax, Shark liver oil, Gelatin Minerals Bentonite, Kaolin, Talc

B) Regenerated fibre

Regenerated fibres are **artificial fibres transformed from plant cellulose into yarn**. The resulting fibre is even, soft, and infinitely recyclable.

Viscose, rayon, acetate, triacetate, modal, Tencel, and Lyocell are all regenerated fibres.

The Various Properties of Regenerated Fibres

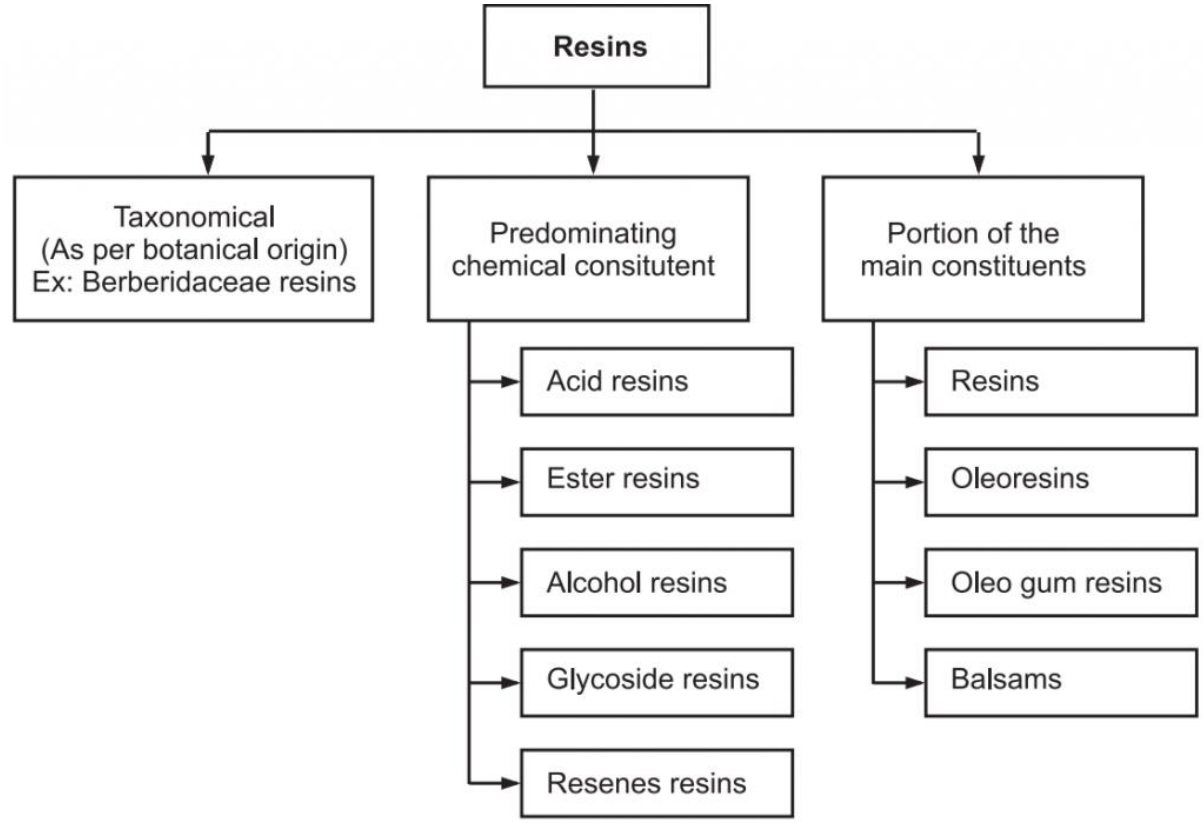
Regenerated fabric is now commonly used in making knitting yarn, weaving yarn, melange yarn and is derived from a plant-based source, giving it any good properties common to the cotton fabric. They are:

- Highly Absorbent
- Safe for Wash
- Soft to touch
- Smooth in texture
- Extremely comfortable to wear
- Holds a good drape
- Breathable fabric
- Eco-friendly
- Renewability

The Many Uses of Regenerated Fabrics

Regenerated fabric and yarn can be used in making various clothing as they have an excellent finish and texture, making them extremely comfortable to wear. They are used in making fashion clothing lingeries, and even ribbons. These blended yarns are perfect materials that will soon take over the market owing to their beautiful properties mentioned above.

D) Classification of Resins



2. Define Glycoside. Name five drugs acting on nervous system. Write the biological sources, chemical constituents, uses along with gross anatomical study of datura.

Glycosides can be defined as the compounds in which one or more sugars are combined with non-sugar molecules through glycosidic linkage.

Caffeine, amphetamines, Levoamphetamine (Benzedrine), dextroamphetamine (Dexedrine), and methamphetamine (Methedrine)

DATURA HERB

Biological Source

Datura herb consists of the dried leaves and flowering tops of Datura metel Linn and Datura metel var. fastuosa belonging to family Solanaceae.

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.

Chemical Constituents

Datura herb contains up to 0.5% of total alkaloids, among which hyoscine (scopolamine) is the main alkaloid, while l-hyoscyamine (scopoline) and atropine are present in very less quantities.

Uses- *D. metel* is used in the manufacture of hyoscine or scopolamine. It exhibits parasympatholytic with anticholinergic and CNS depressant effects. The drug is used in cerebral excitement, asthma and in cough.

4. **Source, preparation, identification and uses of silk**

Biological source:

The silk fibre is prepared from the cocoons of Bomyx mori Linn, commonly called the mulberry silk worm, and other species of bombyx and Antherae (Order- Lepidoptera).

Preparation:

Before the silkworm passes from the caterpillar to the chrysalis or pupa stage, it secretes around itself an oval cocoon about 2-5 cm long, consisting of a continuous thread up to 1200 m long. This thread consists of two silk or fibroin fibres cemented together by a layer of silk glue or sericin. Strands of semi liquid fibroin, produced by two gland in the insect, flow into a common exit-tube in the head, where they meet the secretion of silk glue produced by another pair of glands.

The double fibre with its coating of sericin emerges from a spinneret in the head of the worm, coagulates and hardens on contact with the air and is spun into the cocoon movements of the head. If the chrysalis were allowed to mature, the silk wound is damaged by the escaping insect.

It is therefore killed by heating at 60-80°C for a few hours or by a short exposure to steam. The cocoons are then graded, placed in hot water and beaten to facilitate removal of the outer layer of fibre, which is only of secondary value, and to soften the silk glue. The ends of the fibres from 2-15 cocoons are picked up and woven into a single thread.

Characters:

Silk fibres are soft, smooth and solid. They are usually yellow in colour and contain considerable tensile strength. It is soluble in concentrated HCI, ammonical copper oxide solution, cuoxam and 66% H_2SO_4.

Chemical constituents:

The silk is composed protein called fibroin, which on hydrolysis produced amino acids like glycine and alanine.

Microscopical examination:

Moisten a few fibres with alcohol and mount in water. Examine under high power microscope and observe the characters. Also note the behavior and solubility of the fibres when mounted in cuoxam (freshly prepared ammonical copper oxide solution); 5% potassium hydroxide solution and 80% w/w H_2SO_4. The protein material is almost cylindrical, ungrooved filaments; traces of adherent sericin, which stain dark brown with iodine.

Uses:

The silk fibre is used in the preparation of ligatures and sieves

B) Lycopodium spare 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:

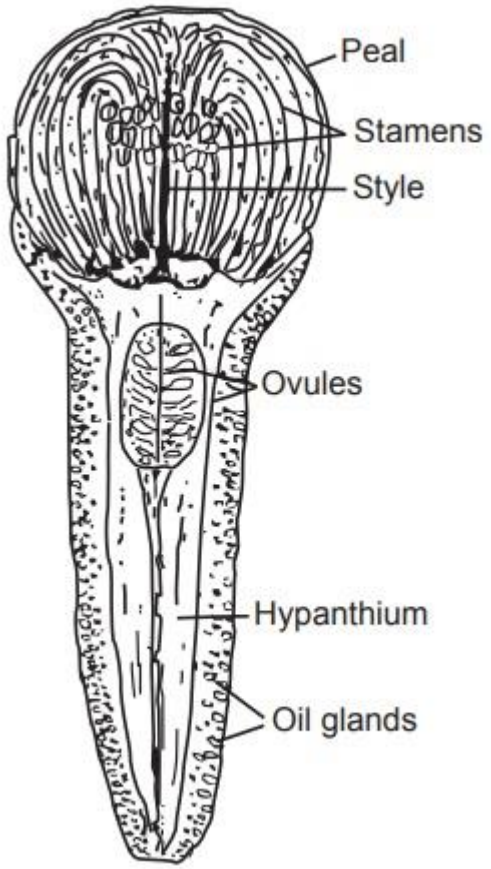
$$[N \times W \times 94{,}000 \times 100] / [S \times M \times P] = \% \text{ purity of drugs}$$

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.

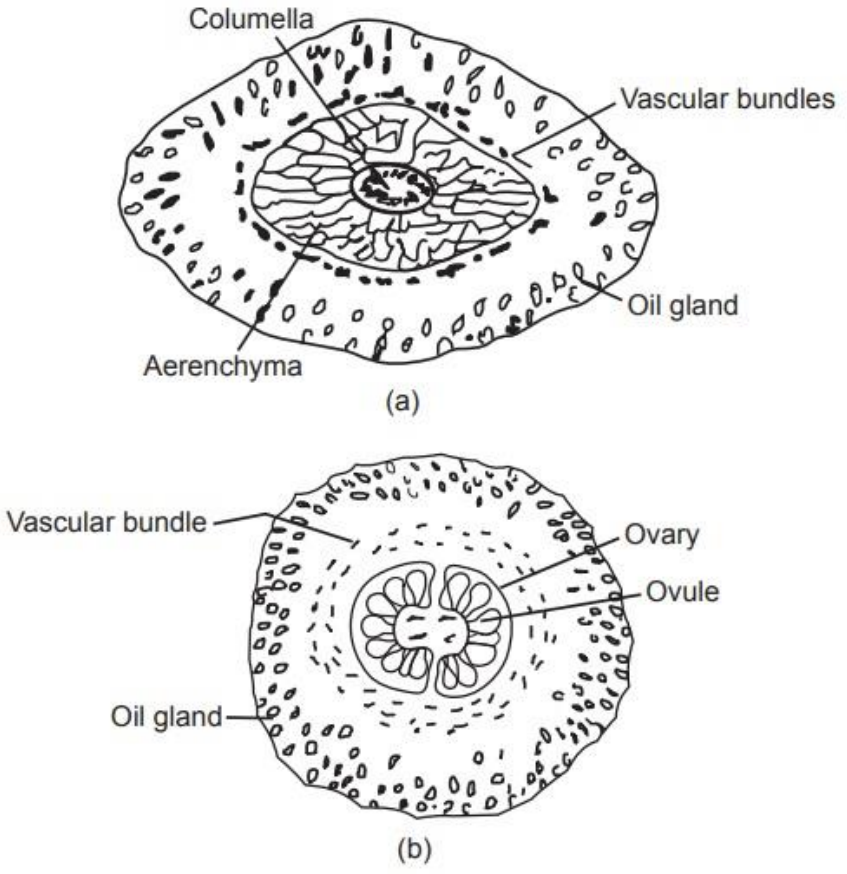
D) Anatomical studies of clove

Clove is reddish-brown in colour, with an upper crown and a hypanthium. The hypanthium is sub-cylindrical and tapering at the end. The hypanthium is 10 to 13 mm long, 4 mm wide, and 2 mm thick and has schizolysigenous oil glands and an ovary which is bilocular. The Crown region consists of the calyx, corolla, style and stamens. Calyx has four thick sepals. Corolla is also known as head, crown or cap; it is doineshaped and has four pale yellow coloured petals which are imbricate, immature, and membranous. The ovary consists of abundant ovules. Clove has strong spicy, aromatic odour, and pungent and aromatic taste.



Microscopy

The transverse section should be taken through the short upper portion which has the bilocular ovary and also through the hypanthium region. The transverse section through the hypanthium shows the following characters. It has a single layer of epidermis covered with thick cuticle. The epidermis has ranunculaceous stomata. The cortex has three distinct region: the peripheral region with two to three layers of schizolysigenous oil glands, embedded in parenchymatous cells. The middle layer has few layers of bicollateral vascular bundle. In the inner portion it has loosely arranged aerenchyma cells. The central cylinder contains thick-walled parenchyma with a ring of bicollateral vascular bundles and abundant sphaeraphides. The T.S. through ovary region shows the presence of an ovary with numerous ovules in it.



(a) T.S. passing through hypanthium. (b) T.S. passing through ovary

5)

A) **Gold beater skin test**

Goldbeater's skin is a membrane produced from the intestine of Ox. It behaves just like untanned animal hide. A piece of goldbeaters skin previously soaked in 2% hydrochloric acid and washed with distilled water is placed in a solution of tannin for 5 minutes. It is then washed with distilled water and transferred to 1% ferrous sulphate solution. A change of the colour of the goldbeater's skin to brown or black indicates the presence of tannin.

B) **Collection and Preparation of Opium**

Raw opium is the dried milky exudation obtained by incising the unripe but fully grown capsules of Papaver somniferum Family – Papaveraceae.

- The cultivation is done in the months between September and April. A gap of 25 cm should be maintained between two consecutive plants.
- Before sowing the seeds, they are mixed with sands properly.
- About five to six capsules appear on each plant and it flowers in the month of May-June. After the petals fall from the poppy, the pod, which is about the size of a golf ball, is lanced, and the opium latex is exuded.
- What you see here is one lancing, made with a special knife which has four blades about 1/16th inch apart, clearly visible in the photo.
- Initially the latex is pink; later it changes to black.
- Poppies are lanced in the afternoon and the latex is scraped off the next morning. Pods ripen (soften) at different times in the field.
- Each pod can be lanced from 4 to 7 times. The lancing takes a great deal of time and attention. Several pods can be scraped before the opium is placed into a container. So many pods to cut and scrape.
- The opium collected is weighed on a daily basis before an officer of the Narcotics Dept.
- After the latex has been collected, all the peasants from an area take their opium to a weighment center. Their opium has been scraped into standard containers of known weight.
- One-tenth of a hectare produces small amounts of latex.

C) Borntrager'S test

1gm of drug sample + 5-10 ml of dilute HCl + 10 min. boil on water bath and filter + extract of filterate with CCl4 or benzene + equal amount of ammonia solution to filterate + shake → appearance of pink to red colour → indicate presence of anthraquinone moiety.

The Borntrager test is used for the identification and determination of anthraquinones or glycosides.

D) Keller- Killani test

Killer-killani test:

The test is based on the specificity of action of the acid hydroliysis of deoxy-sugars like digitoxin (glycoside) that is transformed to digitoxigenin (aglycone) and 3-digitoxose (sugar residue) and eventually cymarose. digitoxin is obtained at first by alkaline hydrolysis from acetyldigitoxin. Take chloroform extract and dry it. Then add glacial acetic acid (0.4 ml) along with traces of ferric chloride. Transfer the content to a small test tube and add concentrated sulphuric acid (0.5 ml) by the sidewall of the test tube. The acetic acid solution slowly turns bluish-green indicates the presence of deoxy sugars.

6) Write the biological source, Chemical constituents and uses of the following crude drug

A) Black catechu

Biological source:

Black catechu consists of the dried aqueous extract prepared from heart wood of Acacia catechu willed and Acacia chundra willd., family-Leguminosae.

Chemical Constituents:

1. It contains tannins like catechins, catechu tannic acid,
2. It is also contains flavonoids like quercetin and it derivatives.
3. Others-Catechu red and gum, etc.

Uses:

1. Astringent
2. Cooling and digestive agents.
3. It is used in relaxed conditions of throat, mouth and gums.
4. It is also used in diarrhoea and in preparation of lozenges.

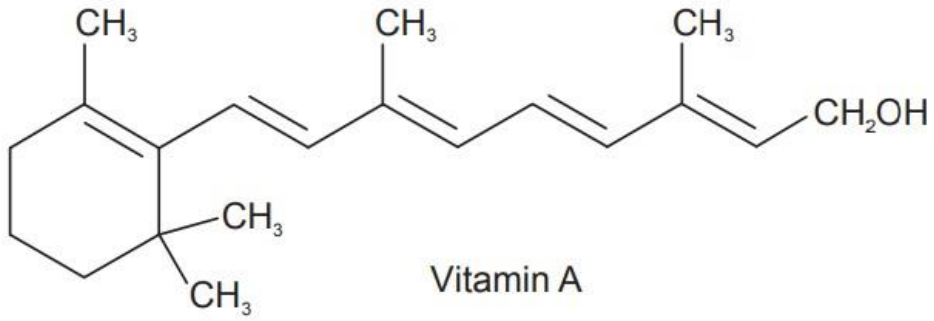
B) Shark liver oil

Biological Source

Shark liver oil is the fixed oil obtained from the fresh and healthy livers of shark fish *Hypoprion brevirostris*, belonging to family Carcharhinidae.

Chemical Constituents

The active principle of Shark liver oil is vitamin A which varies from 15,000 to 30,000 I.U. per g of the oil. It contains glycerides of saturated and unsaturated fatty acids.



Vitamin A

Uses

Shark liver oil is used to treat xerophthalmia (abnormal dryness of the surface of conjunctiva) occurring due to deficiency of vitamin A. The oil is nutritive and used as a tonic.

C) Cinchona

Biological Source

Cinchona is the dried bark of the stem or of the root of *Cinchona calisaya* Wedd., *Cinchona ledgeriana* Moens., *Cinchona officinalis* Linn., and *Cinchona succirubra* Pavon., or hybrids of any of the first two species with any of the last two species, belonging to family Rubiaceae.

Chemical Constituents

More than 30 alkaloids have been reported in cinchona. The chiefly identified alkaloids are quinidine, quinine, cinchonine and cinchonidine. These constituents are the stereoisomers of each other like quinine is stereoisomer of quinidine and cinchonine is stereoisomer of cinchonidine. The other constituents available are quiniarnine, cinchotine, hydroquinine, hydrocinchonidine, cinchotannic acid, etc. Quinine and quinidine has a methoxy group in it but cinchonine and cinchonidine do not have a methoxy group. Other than these it also consist of bitter glycoside, starch grains, calcium oxalate crystals and crystalline acid like quinic acid.

Uses

It is mainly employed as antimalarial drug, but it is also used as analgesic, antipyretic, protoplasmic, bitter stomachic and tonic. Quinidine is cardiac depressant and Cinchonidine is used in rheumatism and neuralgia.

D) Ashwagandha

Biological Source

It consists of the dried roots and stem bases of *Withania somnifera* Dunal, belonging to family Solanaceae.

Chemical Constituents

The plants contain the alkaloid withanine as the main constituent and somniferine, pseudowithanine, tropine and pseudotropine, hygrine, isopellederine, anaferine, anahygrine and steroid lactones. The leaves contain steroid lactone, commonly known as withanolides.

Uses

All plant parts are used including the roots, bark, leaves, fruit and seed are used to treat nervous disorders, intestinal infections and leprosy. Ashwagandha is one of the most widespread tranquillizers used in India, where it holds a position of importance similar to ginseng in China. It acts mainly on the reproductive and nervous systems, having a rejuvenative effect on the body, and is used to improve vitality and aid recovery after chronic illness. It is also used to treat nervous exhaustion, debility, insomnia, wasting diseases, failure to thrive in children, impotence, infertility; multiple sclerosis, etc. Externally it has been applied as a poultice to boils, swellings and other painful parts. Withania is considered as an adaptogen and so is used in number of diseases.

7. Differentiate between raw cotton & adsorbable cotton.

Raw cotton (gin output) **contains cotton fiber along with small plant parts and field trash that are not removed by the ginning process**. At this stage, the cotton fiber has a coating of oils and waxes that make it hydrophobic. **Raw cotton contains about 90% of cellulose, 7 to 8% of moisture, wax, fat, and remains of protoplasm.** Ammoniacal copper oxide solution dissolves raw cotton fibres with the formation of balloons.

ii) Write the biological source, Chemical constituents and uses along with gross anatomical studies of fennel.

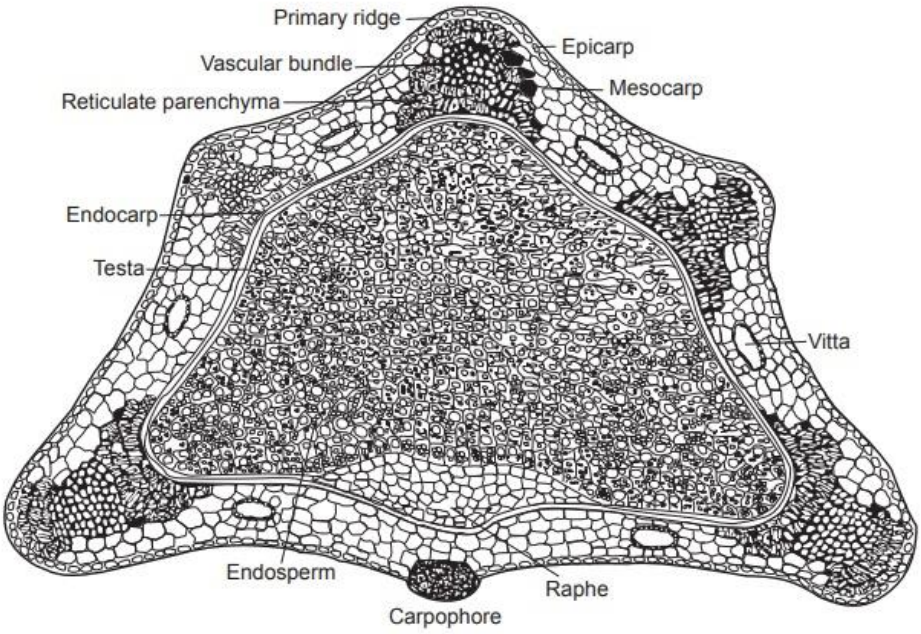
FENNEL

Biological Source: Fennel consists of the dried ripe fruits of *Foeniculum vulgare* Miller., belonging to family Umbelliferae.

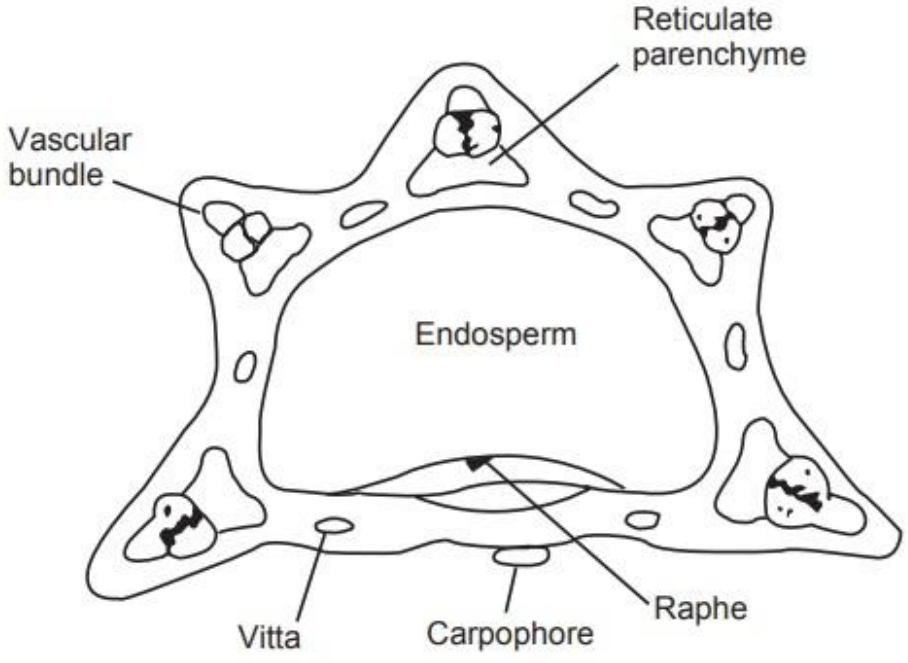
Microscopy

The transverse section of mericarp region of fennel shows two prominent surfaces, the dorsal and the commissural surface. The commisural surface has a carpophore and two vittae, and

the dorsal surface has a total of five ridges. The mericarp is divided into pericarp, consisting of the epicarp and mesocarp; the testa and the endocarp. Epicarp consists of polygonal cells of epidermis which are tangentially elon-gated and covered by the cuticle. Mesocarp has parenchyma cells with five bicollateral vascular bundles; below each primary ridge a lignified reticulate parenchyma surrounds the vascular bundles. There are four vittae on dorsal surface and two vittae on commisural or the ventral surface. Inner Epidermis or Endocarp shows parquetry arrangement (a group of four to five cells arranged parallelly at acute angles with groups of similar cells in different direction). Testa is a single-layered tangentially elongated cell with yellowish colour. Endosperm consists of thick-walled, wide polyhedral, colourless cells. Cells contain fixed oil, aleurone grains, and rosette crystals of calcium oxalate.



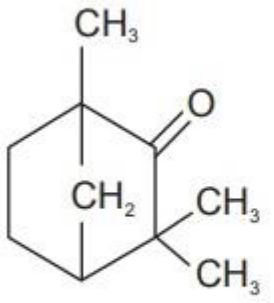
Transverse section of Fennel fruit (Mericarp)



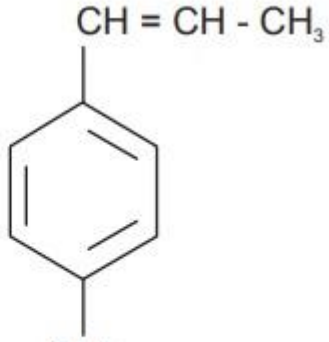
T.S. (schematic) of Fennel fruit

Chemical Constituents

The best varieties of Fennel contain 4 to 5% of volatile oil. The primary constituents of volatile oil are 50 to 60% of anethole, a phenolic ester; and 18 to 22% of fenchone, a ketone. Fenchone is chemically a bicyclic monoterpene which is a colourless liquid and the odour and taste is pungent and camphoraceous. The oil of Fennel has β-pinene, anisic acid, phellandrine, and anisic aldehyde. Fennel also contains about 20% fixed oil and 20% proteins.



Fenchone



Anethole

Uses

Fennel is used as stomachic, aromatic, diuretic, carminative, diaphoretic, as a digestive, pectoral, and flavouring agent. Anethole may have estrogen-like activity and inhibit spasms in smooth muscles. Fennel can increase production of bile, used in the treatment of infant colic, to promote menstrua-tion in women, can increase lactation, act as antipyretic, antimicrobial and antiinflammatory.

iii) Define Resin with suitable examples. Write the official source, chemical constitution, along with collection and preparation of senna.

Resin: "any of various solid or semisolid amorphous fusible flammable natural organic substances that are usually transparent or translucent and yellowish to brown are formed especially in plant secretions are soluble in organic solvents (such as ether) but not in the water, are electrical nonconductors, and are used chiefly in varnishes, printing inks, plastics, and sizes and medicine."

Resin, any natural or synthetic organic compound consisting of a non crystalline or viscous liquid substance. Natural resins are typically fusible and flammable organic substances that are transparent or translucent and are yellowish to brown in colour.

Examples of such types of Resins are guggul, asafoetida, and myrrh.

SENNA LEAF

Synonyms

Alexandrian senna, Tinnevelly senna, Folia senna.

Biological Source

Senna leaf consists of the dried leaflets of *Cassia acutifolia* Delile (*C. senna* L.) known as Alexandrian senna and of *C. angustifolia* Vahl., which is commercially known as Tin-nevelly senna. It belong family Leguminosae.

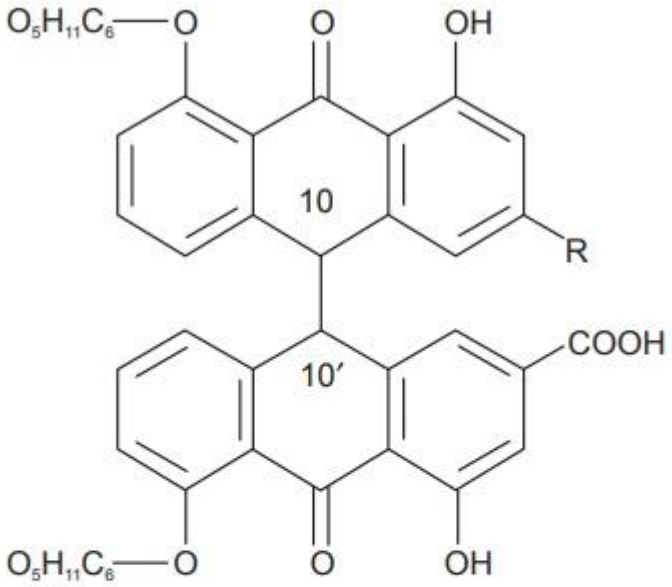
Cultivation and Collection

Senna plant is a small shrub of 1–1.5 m height with paripinnate compound leaves. Tinnevelly senna is mostly cultivated in well-ploughed, levelled, rich clayed semiirrigated land sometimes after paddy crop in South India. Propagation is done by seeds which are rubbed with coarse sand and sown thinly by broadcasting or in rows 30 cm apart, first during February–March and second after rain in July. Seeds germinate on the third day. The crop becomes ready for harvesting after about 2 months but first plucking of leaflets is done after 3 months of sowing when the leaves appears mature, thick and bluish in colour. Second plucking is fol-lowed after a month and subsequent pluckings after 4–6 weeks. The plant can survive for two to three years, but it is grown as an annual. After third plucking the plants are uprooted. Plant shows great tolerance for salinity. It some-times shows die-back symptoms in which the branches or shoots die from the tip inward, which is caused by parasites or environmental conditions. Leaflets of Tinnevelly senna are collected by careful plucking from luxuriantly grown plants and compressed into bales.

Alexandrian senna is obtained almost entirely from the wild and sometimes from the cultivated plants. At the stage of fully formed fruits, branches are cut off and rapidly dried in the sun. Pods and large stalks are first separated by using sieves. Leaves separated from stalks are graded into whole leaves, whole and half leaves and shiftings. Whole leaves and shiftings are generally used for making galenical preparations. The leaves are packed loosely in bales for marketing.

Chemical Constituents

Senna contains sennosides A and B (2.5%) based on the aglycones sennidin A and B, sennosides C and D which are glycosides of heterodianthrones of aloe-emodin and rhein are present. Others include palmidin A, rhein anthrone and aloe-emodin glycosides. Senna also contains free chryso phanol, emodin and their glycosides and free aloe-emodin, rhein, their monoanthrones, dianthrones and their glycosides. Mucilage is present in the epidermis of the leaf and gives red colour with ruthenium red.



Glycoside	10 - 10′	R
Sennoside A	trans	COOH
Sennoside B	meso	COOH
Sennoside C	trans	CH_2OH
Sennoside D	meso	CH_2OH

Model answers

Annual examination 2022(I), E.R. 1991

PHARMACEUTICAL CHEMISTRY-I

1A. Write the chemical formula & uses of the following.

(i) Alum

Chemical Formula: $KAl(SO_4)_2 \cdot 12H_2O$ **Use:** Astringent to stop bleeding from minor cuts.

(ii) Bleaching Powder

Chemical Formula: $CaOCl_2 . H_2O$ **Use:** Disinfectant

(iii) Epsom Salt

Chemical Formula: $MgSO_4 . 7H_2O$ **Use:** Saline cathartics

(iv) Caustic Soda

Chemical Formula: KOH **Use:** Cleansing agent

(v) Green Vitriol

Chemical Formula: $FeSO_4 . 7H_2O$ **Use:** Iron deficiency anemia

1B. Define the following terms:

(i) Astringent: Astringents are locally applied protein precipitants which make the cells shrink by precipitating proteins from their surfaces.

Deodorant: Deodorants are topical formulations used to cover up the smell of body odor, usually with fragrances.

(ii) Molarity: Number of moles of the solute present per liter of the solution.

Normality: Number of gram equivalents of the solute present per liter of the solution.

(iii) Electrolytes: The inorganic ions and elements present in the various body fluids.

ORS: Oral rehydration salts used in electrolyte replacement therapy.

(iv) Bacteriostatic: Antimicrobial agents which prevent the growth of bacteria and reduce them to a non-harmful level.

& Bactericidal: Antimicrobial agents which kill the bacteria along with their spores.

(v) Hygroscopic: substances that can take and hold moisture from the surroundings.

& Deliquescent: substances that absorb moisture from the air and becomes liquid.

Q2. Short notes on (Any Three)

i) Cyanide Poisoning: Cyanide poisoning is poisoning that results from exposure to different forms of cyanide like sodium cyanide (NaCN), potassium cyanide (KCN), hydrogen cyanide (HCN), cyanogen chloride (CNCl), and other cyanide salts. The early symptoms of cyanide poisoning include overall weakness, nausea, confusion, headache, difficulty breathing, seizure, loss of consciousness, and cardiac arrest. How severely you're affected by cyanide poisoning depends on the dose, the type of cyanide, how long you were exposed. However acute cyanide poisoning has immediate, often life-threatening effects whereas chronic cyanide poisoning results from exposure to smaller amounts over time. Cyanide poisons act by combining with ferric ion of cytochrome oxidase which stop electron transport system and thus stops cellular respiration, resulting in the body's tissues being unable to use oxygen.

Cyanide poisoning is treated with different nitrite salts and sodium thiosulphate. The nitrites oxidize some of the hemoglobin's iron from the ferrous state to the ferric state, converting the hemoglobin into methemoglobin. Cyanide now binds avidly to methemoglobin, forming cyanmethemoglobin, thus releasing cyanide from cytochrome oxidase. Sodium thiosulphate react with cyanide to form the non-toxic thiocyanate ion which is excreted in urine.

$$Na_2S_2O_3 + CN^- \longrightarrow SCN^- + Na_2SO_3$$

Cyanide poison — Thiocyanate

ii) Stages of General Anaesthesia

Stage I. stage of analgesia or disorientation: This sage starts from the beginning of induction of general anesthesia to loss of consciousness.

Stage II. Stage of excitement or delirium: Starts from loss of consciousness to onset of automatic breathing. Eyelash reflex disappear but other reflexes remain intact and coughing, vomiting and struggling may occur. Due to inhibition of inhibitory neurons, the patient may show excitement like, violent behavior, and shouting. Involuntary micturition may occurs.

Stage III. Stage of surgical anesthesia: Starts from onset of automatic respiration to respiratory paralysis. This stage was the desired plane for surgery when muscle relaxants were not used. This stage is characterized by,

- Cessation of eyeball movements.
- Loss of Eyelid reflex.
- Secretion of tears increases
- Pupils dilated and light reflex is abolished

Stage IV. Stage of respiratory paralysis: Starts from stoppage of respiration till death. This stage may arise due to anesthetic overdose which causes medullary paralysis with respiratory arrest and vasomotor collapse. Pupils are widely dilated and muscles are relaxed.

iii) Radioisotopes

Atoms of some chemical element that releases radiation as it breaks down and becomes more stable are called radioisotopes. Radioisotopes may occur in nature or be made in a laboratory.

Natural radioisotopes: Emit radiation spontaneously without any external help. Ex. Uranium, Plutonium etc.

Artificial radioisotopes: Don't emit radiation of their own but forced to emit such radiation by artificial process. Ex. I, Na, P, Co, Au etc.

Uses of radioisotopes:

1. Medicinal application:

I^{131} is used in the treatment of hyperthyroidism in thyroid cancer.

Radioisotopes like Co^{60}, Ir^{192}, Au^{198} are directly implanted in sealed source into tumor tissues for treatment of tumor.

2. Diagnostic application:

Labeled cyanocobalamine is used for measuring glomerular filtration rate.

Ferric citrate (Fe^{59}) injection find use for diagnosis of haematological disorders.

I^{131} is used for thyroid scanning and diagnosis of thyroid functioning.

3 Analytical application:

Different radioisotopes are used as marker in radio immune assay (RIA) to study antigen-antibody reaction.

Radiochemical methods have been used for assay of enzymes.

4. Sterilization:

Radiation sources are used for sterilization of pharmaceuticals in their final packed container and surgical instruments in hospitals.

5. Study of reaction mechanisms: To understand complex reaction mechanism radioisotopes can be used.

6. Research: Study of various biochemical process in the body is carried out by radioisotopes.

iv) Primary Standard

In chemistry, a primary standard is a reagent that is very pure, stable, not hygroscopic, and has a high molecular weight. Ideally, it's also non-toxic, inexpensive, and readily available. A primary standard provides a reference to find unknown concentrations in titrations and is used to prepare secondary standards and working solutions.

Features of a primary standard include:

- High purity
- Stability (low reactivity)
- Low hygroscopicity (to minimize weight changes due to humidity)
- High equivalent weight (to minimize weighing errors)[3]
- Non-toxicity
- Ready and cheap availability

Some examples of primary standards are sodium chloride, sodium carbonate, Arsenic trioxide, benzoic acid, Potassium hydrogen phthalate, Sulfanilic acid etc.

Q3. Write short notes on (Any Three)

(i) Dental Products

Dental products are used for the purpose of cleaning, polishing, preventing tooth decay and give the freshness and cleanness to the mouth and teeth. Inorganic dental product includes cleaning agents, polishing agentas, anti-caries agents and desensitizing agents.

On the basis of their activity it is divided into five parts

1.Antiplaque agent: Triclosan, delmiopinol, phenolic compounds

2. Anticaries agent: Sodium fluoride, stannous fluoride.

3. Cleaning/dentifrice agent: Calcium carbonate, calcium phosphate, sodium metaphosphate.

4. Desensitizing agent: Strontium chloride, zinc chloride.

5. Mouth washes: Chlorhexidine gluconate, potassium nitrate.

Dental products also include Denture cleaner and Denture adhesive. A denture cleaner (or denture cleanser) is used to clean dentures when they are out of the mouth. The main use is to control the growth of microorganisms on the dentures, especially Candida albicans, thereby preventing denture-related stomatitis. Denture adhesives are pastes, powders or adhesive pads that may be placed in/on dentures to help them stay in place.

Calcium carbonate:

Chemical formula— $CaCO_3$

Synonyms: Precipitated chalk

Properties:

Calcium carbonate occurs as a white microcrystalline powder insoluble in water and alcohol but its solubility in water increases in presence of carbon dioxide due to formation of water soluble calcium bicarbonate. it is odorless with bitter taste.

$$\underset{\text{Water insoluble}}{CaCO_3} + CO_2 + H_2O \longrightarrow \underset{\text{water soluble}}{Ca(HCO_3)_2}$$

Its aqueous solution is basic in nature due to hydrolysis. It neutralizes gastric HCl and forms calcium chloride.

$$CaCO_3 + HCl \longrightarrow CaCl_2 + CO_2 + H_2O$$

Storage condition: It is stored in well closed air resistance unopened container and keep away from incompatible materials at room temperature and also away from the light and moisture.

Uses: Calcium carbonates acts as antacid and neutralizes the acidic PH and prevents the indigestion, heartburn, and gastric problems. Also used as dentifrices and a source of calcium.

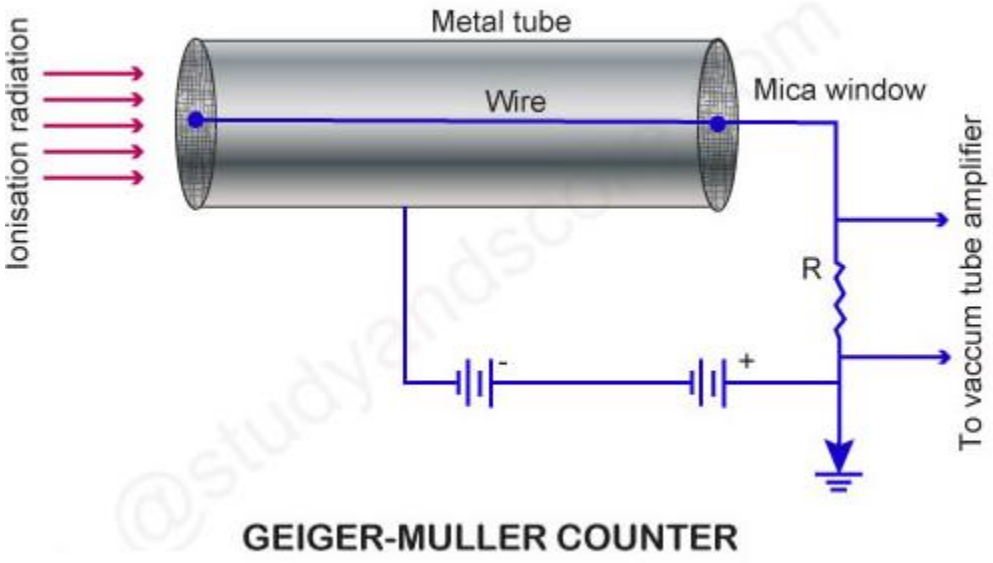
(ii) Geiger-Muller counter:

Geiger counter is also called as Geiger tube. This instrument is actually used for detecting and measuring ionizing radiation like alpha particles, beta particles, and gamma rays. A Geiger-Müller counter can count individual particles at rates up to about 10,000 per second and is used widely in medicine and in prospecting for radioactive ores.

Construction of Geiger-Muller counter

It consists of a hollow metal case enclosed in a thin glass tube. This hollow metal case acts as a cathode. A fine insulated tungsten wire is stretched along the axis of the tube and acts as anode. The tube is filled with an inert gas mixture of argon and ethyl alcohol vapours. The fine tungsten wire is connected to positive terminal and the negative terminal is connected to the metal tube.

The direct current voltage is kept slightly less than that which will cause a discharge between the electrodes. At one end of the tube a thin window of mica is arranged to allow the entry of radiation into the tube.



GEIGER-MULLER COUNTER

Working of Geiger-Muller counter

Radiation when enters the tube through a thin mica wall causesionisation of atoms of the gas. When a high voltage is maintained between two electrodes, the electrons and positively charged ions are attracted by the anode and cathode resulting in a flow of current. Each particle of radiation produces a pulse of current which can be recorded by a scaler showing the total number of pulses.

(iii) Saline cathartics

Saline cathartics are agents that quicken and increase evacuation of the bowl in constipated patients. These are water soluble loosely absorbable cations and anions which draw water from surrounding tissues in intestine because of their hypertonic nature. This increases the bulk of the stool. The stool formed stimulates the intestinal muscles to contract naturally, causing the feces to move along. Examples include magnesium citrate, magnesium sulfate, sodium sulfate, and magnesium hydroxide.

Magnesium Sulphate:

Mol. Formula: $MgSO_4.\ 7H_2O$

Synonyms: Epsom salt

Properties: Occurs as colourless, odourless crystalline powder with a saline bitter test. It is freely soluble in water and very slightly soluble in alcohol. On heating it decomposes to give sulphur trioxide.

$$MgSO_4 \longrightarrow MgO + SO_3$$

Uses: Act as a purgative. When given parentally produces tranquilising effect.

(iv) Combination of Antacids

No antacid meets all the requirment for an ideal antacid. So, several combination antacid preparations are available to counter act one's limitation with other's beneficial effect.

Most of these combination products are attempt to balance the constipative effect of Ca and Al with the laxative effect of Mg. Some combination preparations are an attempt to combine the rapid onset of action of an antacid with longer duration of action of another antacid.

Some antacids are combined with an alginate [an insoluble substance that increases surface tension in liquid] to form a compound that floats on gastric fluids to protect the esophagus from acid exposure. The combination preparation may also contain antiflatuents or defoaming agents like semethicone. They act by reducing the surface tension of bubbles in the stomach.

Examples of combination antacid preparations

Aluminum Hydroxide and Magnesium Hydroxide

Calcium carbonate and magnesium hydroxide

Q4. (a) Give Properties, Uses & Storage condition of the following compounds:

(i) Hydrogen peroxide

Properties: It is a clear colourless and odourless liquid having a slightly acidic taste. It behaves as a weak acid and ionizes primarily to form peroxide ion.

$$H_2O_2 \rightleftharpoons 2H^+ + O_2^{-2}$$

It act as a oxidising agent (electron acceptor) in acidic solution.

$$H_2O_2 + 2H^+ + 2e^- \longrightarrow 2H_2O$$

It also act as a reducing agent(electron donor).

$$H_2O_2 \longrightarrow 2H^+ + O_2 + 2e^-$$

Uses: Antiseptic, germicide and bleaching agent.

Storage conditions: Hydrogen peroxide is decomposed by the rough surfaces of glass, alkali oxides present in it, and light. Therefore, to prevent its decomposition, H_2O_2 is usually stored in coloured paraffin wax-coated plastic or Teflon bottles.

(ii) Sodium thiosulphate

Properties: It occurs as a colourless crystalline powder saline taste. When react with dilute acids it get decomposed to produce sulphur.

$$Na_2S_2O_3 + 2HCl \longrightarrow 2NaCl + S + SO_2 + H_2O$$

Despite being stable at standard conditions, the sodium thiosulfate salt decomposes at high temperatures to yield sodium sulfate along with sodium polysulfide.

$$4Na_2S_2O_3 \longrightarrow 3Na_2SO_4 + Na_2S_5$$

Uses: Treatment of cyanide poisoning, metal poisoning, calciphylaxis, and cisplatin toxicity.

Storage conditions: Store in a cool, dry place in a tightly closed light resistant container. Do not store near acids.

(b) Write short notes on Anticaries Agent.

Formation of caries is attributed to the action of acids mostly lactic acid obtained from oral bacterial metabolism of dietary carbohydrate. This results in the buildup of plaque on the tooth

surface which aids the decay process by forming pockets on the tooth surface in which food particles lodged and degraded by the bacteria.

Anticaries agents prevent formation of caries and tooth decay. Currently accepted and documented approaches to prevent cavities include flossing and brushing accompanied by fluoride and phosphate. Fluoride is used in trace amounts in the fluoridation of drinking water to prevent tooth decay, and in toothpastes and topical pharmaceuticals for the same purpose. Fluoride appears to bind to calcium ions in the hydroxyapatite of surface tooth enamel, preventing corrosion of tooth enamel by acids. Although council on dental therapeutics has not recognized any phosphate product for the purpose of reducing the incidence of caries, still studies shows that use of 2% soluble phosphate like calcium monohydrogen phosphate has marked anticaries effect.

Example of anticaries agents: Sodium fluoride, stannous fluoride, sodium monofluorophosphate

Sodium fluoride

Molecular formula: NaF

Properties: Sodium Fluoride is a white to greenish solid and has no odour at all. It is freely soluble in water. It is corrosive to aluminum. Hydrogen fluoride and sodium hydroxide are formed when sodium fluoride combines with water.

$$HF + NaOH \longrightarrow NaF + H_2O$$

Use: Fluoride works by stopping or even reversing the tooth decay process—it keeps tooth enamel strong and solid.

(c) Explain only the principle of limit test for Iron

Limit test for Iron is based on the reaction of iron with thioglycollic acid in the presence of citric acid in an ammonical solution to form a pale pink to deep reddish purple colour. The intensity of colour produced from a specified amount of substance is compared with a standard colour obtained by a similar reaction in a solution containing a definite quantity of ferric ammonium sulphate.

$$2Fe^{3+} + 2HSCH_2COOH \longrightarrow 2Fe^{2+} + \begin{matrix} SCH_2COOH \\ | \\ SCH_2COOH \end{matrix}$$

Thioglycollic acid

$$Fe^{2+} + 2HSCH_2COOH \longrightarrow Fe(HSCH_2COO)_2 + 2H^+$$

Ferrous thioglycolate

If the colour produced by the test solution has been less than that of standard, the sample passes limit test for iron and vice versa.

Q5. (a) Define Antidote. Classify them with examples. Write Physical & Chemical properties & uses of Sodium Thiosulphate.

Antidote: Antidotes are the agents which react specifically with an ingested poison or toxic substance or an overdose of a potent drug and neutralize their effect.

Classification of antidotes: Depending upon their mechanism of action antidotes are classified as follows.

(1) Physical antidote: Act by countering the effect of a poison by producing other effects. Ex. Sodium nitrite.

Cyanide poison act by combining with ferric ion of cytochrome oxidase which stop electron transport system and thus stops cellular respiration. Sodium nitrite causes oxidation of ferrous ion of Hb to ferric ion of methemoglobin which then combine with serum cyanide and now cyanide can't enter the cell.

(2) Chemical antidote: Act by changing the chemical nature of the poison. Ex. Sodium thiosulphate.

Sodium thiosulphate react with cyanide to form the non-toxic thiocyanate ion which is excreted in urine.

$$Na_2S_2O_3 + CN^- \longrightarrow SCN^- + Na_2SO_3$$

Cyanide poison — Thiocyanate

(3) Mechanical antidote: Act by adsorption of poison prior to their absorption across the intenstinal wall. Ex. Kaolin, Activated charcoal.

Sodium thiosulphate

Physical properties: Sodium thiosulfate is a white crystalline solid which is odorless and highly water soluble. It has a density of 1.667 g/mL and a melting point of 48.3°C.

Chemical properties: Sodium thiosulfate is a neutral salt which readily dissociates in water to give sodium and thiosulfate ions. $Na_2S_2O_3$ is a stable solid under normal conditions, but decomposes upon heating to give sodium sulfate and sodium polysulfide:

$$4Na_2S_2O_3 \longrightarrow 3Na_2SO_4 + Na_2S_5$$

When reacts with dilute acids it get decomposed to produce sulphur.

$$Na_2S_2O_3 + 2HCl \longrightarrow 2NaCl + S + SO_2 + H_2O$$

Uses: Treatment of cyanide poisoning, metal poisoning, calciphylaxis, and cisplatin toxicity.

(b) What are antioxidants? Write Physical & Chemical character & uses of Sodium Bisulphite.

Pharmaceutical preparations containing readily oxidisable substances or groups undergo deterioration on storage because of atmospheric oxidation. Antioxidants are the substances which function chemically as reducing agent and prevent oxidation and subsequent deterioration of pharmaceutical preparations.

Antioxidants act by two different mechanisms.

(1) Antioxidants get oxidized in place of active drug constituents

(2) If the active constituentis oxidized, the antioxidant reduce it back to its normal oxidation.

Theory of antioxidant action: The theory behind antioxidant action is same as that involved in any oxidation-reduction or redox reaction.

Antioxidant (Red_2)lose electron and undergoes oxidation.

$$Red_2 \rightleftharpoons Ox_2 + e^-$$

This electron is accepted by the compound (Ox_1) so oxidation is prevented.

$$Ox_1 + e^- \rightleftharpoons Red_1$$

So the net reaction can be written as:

$$Ox_1 + Red_2 \rightleftharpoons Red_1 + Ox_2$$

Here the antioxidant and the compound can be written as a conjugate pair.

Sodium Bisulphite: $NaHSO_3$

Sodium bisulfite is a common inorganic salt, also called as sodium hydrogen sulfite.

Physical properties: Sodium bisulfite is a white solid with a mild sulfurous odor. Its density is 1.48 g/mL and melting point is 150 °C.

Chemical properties: Sodium bisulfite dissociates in water to give the bisulfite and sodium ions. It is a weak acid and attacks metals. It acts as a mild reducing agent and is used to reduce many functional groups in organic synthesis. It decomposes on heating or in the presence of acids to release sulfur dioxide gas.

$$NaHSO_3 + HCl \rightarrow NaCl + H_2O + SO_2$$

It can react violently with strong oxidants and acids, causing fires or explosions.

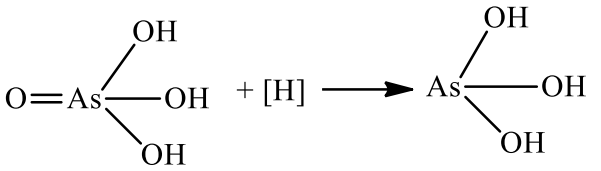
Uses: Sodium bisulfite is used as a food additive and a food preservative.

Q6. (a) Define limit test. Write down the principle, procedure & apparatus used in the limit test for Arsenic.

Limit tests are quantitative or semi quantitative tests designed to identify and controle small quantities of impurities which are likely to be present in the substance.

Principle of limit test for arsenic: Limit test for As is based on the fact that As in the arsenious state can be easily reduced to arsine (AsH_3). The arsenic impurity present in the sample is first

converted into arsenious acid by the action of reducing agents like potassium iodide, Zinc, HCl and stannous chloride.

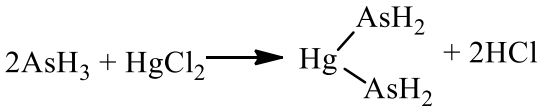


Arsenic acid in sample — Arsenious acid

$$H_3AsO_3 + 6[H] \longrightarrow AsH_3 + 3H_2O$$

Arsenious acid — Arsine gas

When this gas is passed over mercuric chloride paper, it produces a stain, which ranges in colour from yellow to brown, the intensity and length of which are proportional to the amount of arsenic.



yellow to brown stain

The intensity of sample stain prepared from a fixed quantity of sample, is compared with the standard stain prepared from a definite quantity of arsenic.

Procedure:

Test solution	Standard solution
1. The test solution is prepared by dissolving specific amount in water and stannated HCl (arsenic free) and kept in a wide mouthed bottle.	1. A know amount of dilute arsenic solution is kept in the wide mouthed bottle of the apparatus.
2. To this solution 1 gm of KI, 5 ml of stannous chloride acid solution and 10 gm of zinc is added (all this reagents must be arsenic	2. To this solution 1 gm of KI, 5 ml of stannous chloride acid solution and 10 gm of zinc is added (all this reagents must be arsenic

free).	free).
3. Keep the solution aside for 40 min	3. Keep the solution aside for 40 min
4. Compare the stain obtained on mercuric chloride paper with standard solution.	4. Compare the stain obtained on mercuric chloride paper with standard solution

Apparatus:

1. A 120 ml capacity, wide-mouthed bottle fitted with a rubber bung through which passes a glass tube of approx. 20 cm and 6-8 mm diameter is used. One end of this tube is constricted like that of a pipette with mm diameter having a hole of 2 mm diameter.

2. When the bung is inserted in the bottle containing 70 ml of liquid, the constricted end of the tube should be above the surface of the liquid, and the hole in the side is below the bottom of the bung.

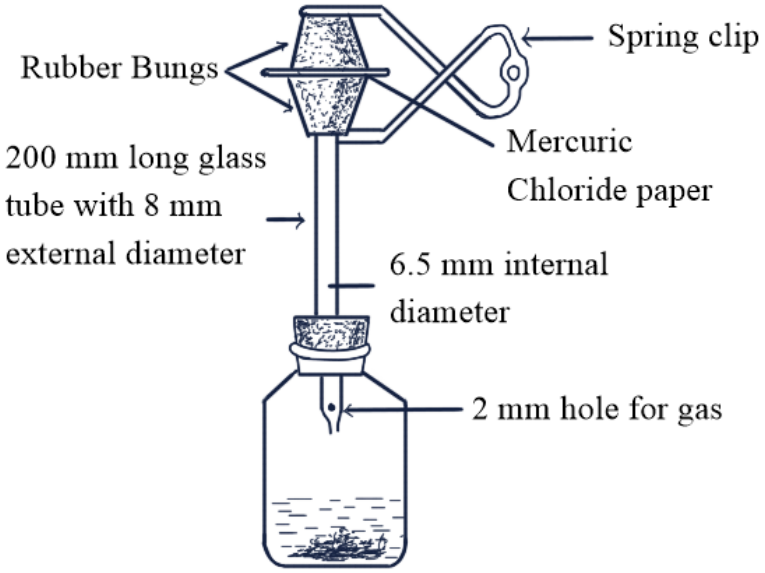
3. The upper end of the tube is cut off square, and is either slightly rounded or ground smooth.

4. The rubber bungs (about 25 mm x 25 mm), each with a hole bored centrally and through, exactly 6.5 mm in diameter, are fitted with a rubber band or spring clip for holding them tightly in place.

5. The glass tube is lightly packed with cotton wool, previously moistened with lead acetate solution and dried, so that the upper surface of the cotton wool is not less than 25 mm below the top of the tube.

6. The upper end of the tube is then inserted into the narrow end of one of the pair of rubber bungs; to a depth of 10 mm (the tube must have a rounded-off end).

7. A piece of mercuric chloride paper is placed flat on the top of the bung and the other bung placed over it and secured using the spring clip in such a manner that the holes of the two bungs meet to form a true tube 6.5 mm diameter interrupted by a diaphragm of mercuric chloride paper.



Arsenic test apparatus

(b) Enumerate the method of preparation, physical & chemical properties & uses of Iodine. Briefly describe about different preparations of Iodine.

Method of preparation of Iodine: Sea-weed is dried and burned to remove organic matter. The ash is extracted with water. The solution is concentrated and sulphate and chloride of sodium and potassium get crystallised out. After removal of the crystals, the concentrated liquor is heated with MnO_2 and con. H_2SO_4. Iodine distils off and is condensed and purified by sublimation.

$$2NaI + MnO_2 + H_2SO_4 \longrightarrow MnSO_4 + 2NaHSO_4 + I_2 + H_2O$$

Physical Properties: Iodine is a heavy, dark-gray/purple-black non-metallic solid element having a metallic lusture and pungent odour. It sublimes at room temperature into a violet-blue gas with an irritating odor. It is insoluble in water but soluble in alcohol and chloroform.

Chemical Properties:

It readily dissolves in potassium iodide solution to form potassium periodide.

$$KI + I_2 \longrightarrow KI_3$$

Iodine is a electronegative elements therefore accept electron and act as a oxidising agent.

$$I_2 + 2e \longrightarrow 2I^-$$

It oxidises sodium thiosulphate and hydrogen sulphide.

$$2Na_2S_2O_3 + I_2 \longrightarrow 2NaI + Na_2S_4O_6$$

$$H_2S + I_2 \longrightarrow HI + S$$

Uses: Iodine is used to treat and prevent iodine deficiency and as an antiseptic.

Formulations of Iodine:

Weak iodine solution (tincture of iodine), Providone iodine, Lugol's iodine (aqueous iodine orstrong iodine solution).

Q7. (a) Explain Bronsted-Lowry & Lewi's Acid – Base Theory.

Bronsted-Lowry Acid – Base Theory: According to this theory, acid is a substance (molecule or ion) which has a tendency to donate a proton (H^+) and base is a substance which has a tendency to accept a proton.

Ex. HCl, H_3O^+, HNO_3, H_2SO_4 etc. are acids as they can lose proton.

$$HCl \rightleftharpoons H^+ + Cl^-$$

$$H_3O^+ \rightleftharpoons H^+ + H_2O$$

NH_3, CO_3^{2-},H_2O, HS^- etc are bases because they can accept a proton.

$$NH_3 + H^+ \rightleftharpoons NH_4^+$$

$$H_2O + H^+ \rightleftharpoons H_3O^+$$

Limitations of Bronsted-Lowry Acid – Base Theory:

1. This theory fails to explain the acidic character of $AlCl_3$, $FeCl_3$, BF_3, etc.

2. It fails to explain the acidic character of CO_2, SO_2 etc.

Lewi's Acid – Base Theory

According to this theory, an acid is a substance (molecule or ion) which can accept a pair of electrons while base is a substance which can donate a pair of electrons.

Types of Lewis acid:

1. All negative ions are Lewis base. e.g. OH^-, CN^-, F^-, Cl^- etc.

2. Neutral molecules having one or more lone pair of electrons e.g. NH_3, H_2O, $R\text{-}NH_2$ etc.

Types of Lewis acid:

1. All cations like CU^{2+}, Ag^+, Ca^{2+}, Fe^{3+} etc.

2. Molecule in which the central atom has incomplete octate or the central atom is electron deficient. e.g. $AlCl_3$, $FeCl_3$, BF_3, etc.

3. Molecule in which the central atom has vacant d-orbitals in the valency shell. e.g. $SiCl_4$, SiF_4, PF_5 etc.

4. Molecules having multiple bond between atoms of different electronegativity. e.g. CO_2, SO_2 etc.

Limitations of Lewi's Acid – Base Theory:

1. This theory does not explain the acidic nature of HCl, H_2SO_4 etc.

2. It fails to explain the basic character of NaOH, KOH etc.

3. It fails to explain the acidic and basic strength.

4. Acid shows catalytic activity in reaction due to H^+, but Lewis acid which do not have H^+ also act as catalyst.

5. According to this theory base donate a pair of electron to acid and form co-ordinate bond. But no such bond is formed when HCl react with NaOH.

(b) What do you mean by Buffer Solutions & Buffer Capacity & Write a note on application of Buffers in Pharmacy.

Buffer solution: A buffer solution may be defined as a solution whose P^H value does not change appreciably even upon the addition of small amounts of acids, bases and water from outside. Upon addition of acids and bases the P^H changes to a very small extent which is considered as no change.

Buffer capacity: It is defined as number of moles of acids or alkali added to 1 liter of buffer solution in-order to change its P^H by unity. Mathematically it is given by:

$$\text{Buffer capacity} = \frac{\text{NO. of moles of acid or alkali added per liter}}{\text{Change in } P^H}$$

Application of Buffer in Pharmacy:

1. Solubility: Solubility of compounds can be controlled by providing a medium of suitable P^H using buffer. e.g. Amines and alkaloids are soluble in acidic media but insoluble in alkaline media.

2. **Colour**: Colour of certain indicators and drugs are P^H dependent which is maintained by buffers. e.g. Colour of phenopthaline is P^H dependent. Red colour of cherry in syrup has been maintained at acidic P^H which becomes pale yellow to colourless at alkaline P^H.

3. Stability: Suitable buffers are added to prevent degradation of drugs. e.g. Penicillin and ascorbic acid are unstable in alkaline medium.

4. Oxidation: Certain compound undergoes autoxidation within certain P^H. E.g. Nitrites become brown in acidic media because of formation of coloured nitrogen oxides.

5. Patient comfort: Injectable and preparations for internal or external use become irritating if their P^H is different from the P^H of the particular tissues involved.

6. Laboratory use: Calibration of PH meter, preparation of mobile phase in HPLC require use of buffer.

7. Analytical use: Maintaining P^H by buffer is useful in qualitative and quantitative analysis.

(c) Describe about tests for purity.

The Pharmacopoeias of the various countries prescribes “Tests of purity” for substances to ensure that substances contain reasonable amount of undesirable impurities. The tests include;

1. Colour, odour and taste: Physical comparison is very useful in revealing large impurities such as colored impurities and dirt. Smell tests will also reveal the differences between the chemical undergoing tests and the actual and pure state of a particular compound. However, it’s important to note that only non-toxic chemicals can be tested through touch, taste, and smell.

2. **Physico-chemical constants**: Measurement of physicochemical properties like melting point, boiling point, optical rotation, acid value, iodine value, saponification value, ester value etc ensures presence of impurities in the compounds. For example, pure chemicals are known to boil and melt at specific temperatures, and that is documented. However, if the melting point of a particular chemical is lowered, there is a great sense that the chemical is not pure.

3. Analytical Testing: Analytical testing involves a standard procedure that is used in testing various chemicals. These procedures are applied in drug and chemical industries, and they indicate the presence and the number of impurities. Some of the analytical purity testing methods include titration, infrared spectroscopy, paper chromatography, and optical rotation, among others. These are some of the strategies used in testing the presence of impurities in chemical compounds.

4. Limit tests: This is desined to identify and control the amount of impurities likely to be present in the substances.

5. Determination of acidity, alkalinity, PH and tests for cations and anions can also helps in ensuring purity.

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Subject-Pharmaceutics-1(Theory)

Q1-(A) Define following:

1: Isotonic solution- Solutions that contain the same concentration of water and solutes as the cell cytoplasm are called isotonic solutions.

2: Sublimation- Conversion of a substance from the solid to the gaseous state without its becoming liquid. An example is the vaporisation of frozen carbon dioxide (dry ice) at ordinary atmospheric pressure and temperature.

3: Capping- 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.

4: Meta filter- A pressure filter is what a meta filter is. The product is fed into the pressure filter at a higher pressure than would be produced by gravity alone. For particle separation, the Meta filter acts as a strainer (service filtration). The metal rings are made up of semi-circular projections that are nested together to form channels on the edges. This channel resists the passage of solids (it acts as a strainer) (forced particles). The transparent liquid is gathered from the top into a receiver.

5: Pasteurization- The process of heating every particle of milk or milk product in properly designed and operated equipment to any of the one specified pasteurization time–temperature combinations.

(B) Differentiate the following:

1: Exotoxin and Endotoxin- Exotoxins are usually heat labile proteins secreted by certain species of bacteria which diffuse into the surrounding medium.

Endotoxins are heat stable lipopolysaccharide-protein complexes which form structural components of cell wall of Gram Negative Bacteria and liberated only on cell lysis or death of bacteria.

2: Double maceration and Triple maceration- In double maceration process, the whole of the. drug is macerated for 48 hours with the quantity of the menstruum required for first maceration. • The liquid is strained and the marc is pressed. • The marc is macerated again for 24 hours with.

Triple maceration process: In this maceration process, the drug is macerated thrice by using the menstruum which is divided. into three parts in such a manner that the same volume for three parts in such a manner that the. same volume is used for each maceratin. The quantity of menstruum required for three.

3: Hard gelatine capsule and soft gelatine capsule- Soft gelatin capsules can perhaps function more quickly than other types of capsules because they dissolve easily in the gastric juices of the stomach.

A soft gelatin capsule is used to contain medication that is in the form of a liquid or powder because it dissolves more rapidly than a hard gelatin capsule.

-When compared to soft gelatin capsules, which are sealed up one-piece capsules that cannot be detached, hard gelatin capsules feature two distinct parts: a body and a cap.

-Soft gelatin capsules normally hold liquids and semisolids while hard gelatin capsules frequently contain dry powders, plugs that have been slightly compressed, granules, or tablets.

-While soft gelatin capsules come in round, oval, and tubular shapes, hard gelatin capsules are cylindrical.

-A hard gelatin capsule contains less plasticizer than a soft gelatin capsule.

-While the production of hard shell capsules requires two separate machines—one for the shells and another for the filling—the production of soft gelatin capsules only requires one equipment for the feeding and sealing steps.

4: Syrups and elixirs-

Syrup-The syrup is a thick concentrated aqueous preparation of sugar or sugar substitutes containing or not containing flavoring agents and medicinal substances. It is an oral suspension in liquid form that comes in three types such as simple syrup, medicinal syrup, and flavored syrup, and these are best suited for pediatric use. The pharmaceutical syrup is used as a flavored vehicle for medicine and is formulated by mixing active ingredients, water, aromas, sweeteners, thickener, flavors, and other ingredients, etc.

Elixir:

An elixir is a clear, sweet-tasting, hydro-alcoholic solution that is used for medical purposes, which is taken orally and is intended to cure different types of diseases. Pharmaceutical elixir contains at least one or more active ingredients with excipients, their alcohol content ranges from 10% to 40%. The alcohol concentration is determined by the amount necessary to maintain the drug or volatile oil in the solution. Reducing the amount of alcohol by adding the aqueous solution to the elixirs can lead to turbidity or separation.

5: Emulsion and suspension-

Suspension:

A suspension is an evenly dispersed mixture of substances consisting of two components: the dispersed material and the dispersion medium. The dispersed material is usually in a solid phase, although it can take the form of any phase. The dispersion medium is what the dispersed materials are distributed in. For example, in an example using muddy water, the dispersed material would be soil or dirt, and the dispersion medium would be water. Particles in a suspension are typically visible to the naked eye, and with filtration, one component can

be separated from the other. Other examples of suspensions include sand in water, dust in air, or even droplets of oil in air.

Emulsion:

An emulsion is similar to a suspension only in that it is a mixture of two components. That is where the similarities end, however. Unlike a suspension, which can consist of two components of any phase, an emulsion is a mixture of two liquids.

What makes an emulsion interesting is the fact that these two liquids are immiscible – that is, they are not able to be mixed without help. In other words, emulsions do not form spontaneously, and need an external force – mixing, shaking, stirring, or the addition of an emulsifier – to maintain its stability.

2-What do you mean by extraction?

Describe briefly the process of simple maceration for organized and unorganized drugs used in the preparation of tincture.

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). Expression is the physical act of applying pressure to squeeze out oils or juices from plants.

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 the 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

3-Define sterilization. Why the moist heat sterilization is most effective than dry heat method? Write in details about moist heat sterilization method.

Sterilization can be defined as: any process that effectively kills or eliminates transmissible agents (such as fungi, bacteria, viruses and prions) from a surface, equipment, foods, medications, or biological culture medium. Steam sterilization is carried out in an autoclave. The pressurized steam produced has a high latent heat. This intense heat leads to hydrolysis and coagulation of proteins, which kills off microbes, spores, and viruses. Steam sterilization typically involves exposing an item to steam at a temperature of 121℃ for 15 to 30 minutes. As the temperature and pressure are increased, the time required to sterilize items can be greatly reduced.

Compared with dry heat sterilization, steam sterilization is the more efficient method because the moisture in steam is a good conductor of heat and is superior at penetrating the load. With less energy needed, steam sterilization offers increased productivity with lower energy expenditure, resulting in cost savings. Steam is a widely accepted method for items that can accept both heat and moisture; thus, most materials are conducive to sterilization with steam.

Sterilization by moist heat is also known as steam sterilization. Moist heat sterilization destroys microorganisms in a product with steam under pressure. Sterilization by moist heat is the most common method for medical device and medical product sterilization. Items traditionally sterilized by moist heat include rubber, durable plastic materials, mixing tanks, surgical equipment, filling equipment, freeze-dryer chambers, and filled product containers that can withstand high-temperature exposure.

sterilization by moist heat is performed by steam under pressure. The most common devices used for sterilization by moist heat are autoclaves (pressurized vessels). Steam for moist heat sterilization must be pure and contain no air or other non-condensable gases. Autoclaves specialize in removing air from the chamber and replacing it with pure saturated steam. The removal of air is critical to steam sterilization. Effective air removal depends on the

availability of moisture (steam) to displace air, the air removal system used (e.g., vacuum), the configuration of the load being sterilized, and the absence of air leaks in the autoclave.

In autoclaves thermocouples monitor temperature. Bowie–Dick or Dart indicators verify that the temperature measured is steam heat vs. dry heat. Dark brown stripes appear across the Bowie–Dick tape when enough steam penetration has occurred. Other indicators for sterilization validation of moist heat sterilization processes are temperature, pressure, and biological indicators.

4-Define size reduction. Write down the different factors affecting the size reduction. Write short note on hammer mill.

Size Reduction or Comminution is a pharmaceutical process where bigger drug particles are converted into smaller drug particle as per requirement.

Importance:

To increase the rate of a solution: Size reduction reduces particle size and increases effective surface area which in turn increases the rate of solution.

To increase the rate of extraction: Rate of extraction is directly proportional to Size reduction. Smaller particle size allows faster penetration of menstruum and hence fastens the extraction process.

Mixing: Smaller particle size ensures effective mixing which is an essential thing for many pharmaceutical dosage forms.

Bioavailability: As particle size decreases the rate of absorption increases. Hence size reduction ensures good bioavailability e.g Griseofulvin.

Drying: Reduction in particle size increases effective surface area and fastens the process of drying.

To facilitate Filtration: Rate of filtration depends upon the size of particles to be separated.

Stability: Reduction in particle size increases the stability of certain pharmaceutical preparations such as suspensions and emulsions.

Factors Affecting Size Reduction

Various factors which affect process of size reduction are as follows,

Hardness: It is easy to reduce the size of soft materials as compared to hard materials.

Toughness: The crude drugs having fibrous nature containing more moisture content are more difficult for size reduction than hard but brittle substances.

Stickiness: The gummy materials such as resins tend to adhere to grinding surfaces or sieves of the mill and produce a lot of problems during operation. In such cases complete drying of materials is useful.

Material Structure: Materials with a special structure such as plant materials and minerals with weakness lines produce fibers and flakes during operation and produce problems.

Moisture Content: The moisture content of material influences many properties like hardness, toughness, stickiness etc. Usually, 5% moisture in dry grinding and 50% moisture in wet grinding is considered good for size reduction.

Softening Temperature: The fatty or waxy drugs softens during the process due to heat generation by process and jams the mill. However, this can be avoided by employing a cooling mechanism in the mill.

Purity Required: The grinding surfaces of mills may wear off and appear in the final product and compromise the purity of final product. This can be avoided by proper selection of mills and cleaning of mill between batches.

Physiological Effect of Material: Some drugs are very potent, their dusting during operation may harm the operator this can be avoided by enclosing completely the mill.

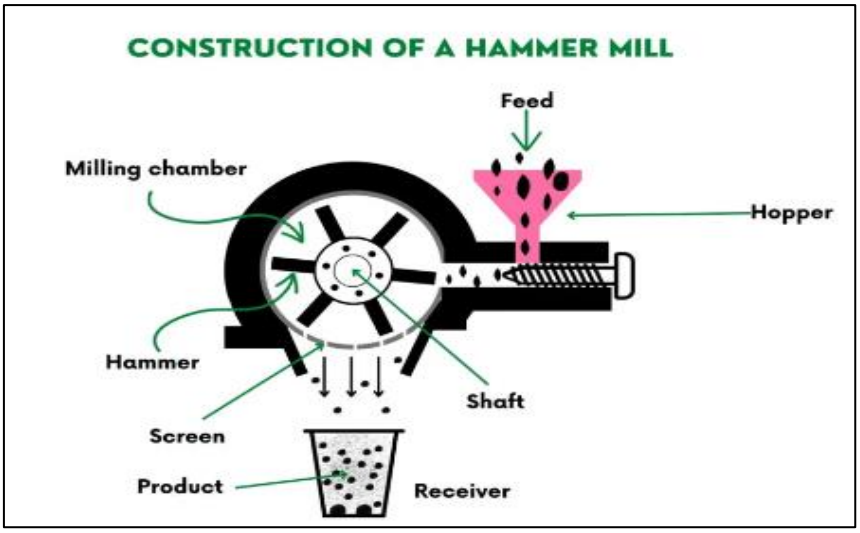
Hammer Mill –

Principle: Hammer mill works on the principle of impact between rapidly moving hammers mounted on a motor and the material to be milled.

Construction of Hammer Mill:

The construction of the hammer mill is shown in the illustration below. This construction can either be of vertical or horizontal shaft type. This article discusses the horizontal type of mill often used in the industry. A typical hammer mill consists of a hopper, horizontal shaft, rotor, hardened steel or stainless-steel hammers, and removable.

- Hammers are usually made of hardened steel or stainless steel with an impact surface of extremely abrasive material such as haystellite and carbaloy; however, pharmaceutical use hammers are made of stainless steel SS316.
- Hammers are made of two shapes; bar-shaped or stirrup-shaped; where bar-shaped hammers are widely used in the pharmaceutical industry.
- Depending on the purpose, the edges of the hammers can be either flat, sharp or both on each side. Hammers may be of swing or rigid type.
- Usually, free swing-type hammers have an advantage over rigid ones in that there will be an increased clearance between the hammer and the screen. This increased clearance helps to overcome excessive build occurring in the mill.
- Hammers are pinned to a rotor disk, and this disk is mounted on a single horizontal shaft. Several such rotor disks carrying 4 to 8 hammers are mounted on the central shaft in a conventional hammer mill. The diameter of the rotor disk ranges from 150mm to 250mm.



Working of Hammer Mill:

The shaft is rotated at high speed in continuous motion between 6000 to 15000 rpm. The material is fed from the top of the casing vertically through the hopper and is passed into the milling chamber while the hammers are in continuous motion. The rotating hammers beat the material to yield smaller particles. These particles then pass through the screen holes. Since the particles exit the holes tangentially, the size of the particles is considerably smaller than the holes (Refer to the figure below). A Hammer mill operating under lower speed generates larger-sized particles than the mill operating at high speed. Similarly, the screen thickness influences the size of the particles exiting the screen apertures. Under constant milling speed, the size of particles exiting the thicker screen is smaller when compared to the ones from the thin screen.

The fineness of the particles can further be regulated by altering the following:

- Rotor speed
- Feed rate
- Clearance between the hammers and the screen.
- Number of hammers on rotor
- No of rotors attached to a shaft.
- Type of hammers used
- Screen size

Screens used in the hammer mill are always interchangeable and can be changed based on the particle size requirement. Since the mill operates with great speed, much heat gets generated; however, hammers act as centrifugal fans where large amounts of air are drawn through the mill. In most cases, this is sufficient to counteract the heat generated.

Advantages of Hammer Mill:

- Hammer mill is easy to install, operate, dismantle and clean up.
- It occupies less space and can be easily placed in one corner of the manufacturing area.
- Various grades of material can be handled using screens of different sizes.

- It is versatile, and speed and screens can rapidly change based on milling requirements.
- Scale-up problems are minimal, provided the same type of mill is used.
- Operational costs are minimal while processing materials using a Hammer mill.
- As milling operation is carried out under closed conditions, dust generated can be reduced, and explosion hazards can be prevented.
- Hammer mill produces particles of varied size distribution with a minimum of fines.

Disadvantages of Hammer Mill:

- Milling operation involves heat build-up, so product deterioration is possible in a few cases.
- Milling of abrasive materials could make the screens and hammers susceptible to wear and damage.
- Low melting sticky, fibrous and hard materials are not suitable for milling operation. It might result in mill fouling due to heat generation.
- An uncontrolled feed rate could choke the mill, leading to damage.
- Screen clogging with process material is the most common problem encountered in milling.

Pharmaceutical uses of Hammer mill:

- Used to process wet and dry granulation process materials and also disperse powder mixtures
- Used in milling pharma API, excipients like sugar and herbal medicine
- Hammer mill is used to powder barks, leaves and roots of medicinal plants.

5-Define vaccines and toxoids.Describe the types of immunity.Write down method of preparation of two bacterial vaccines.

Vaccine-

Vaccine is an antigenic material. Antigenic is from the term ‘antigen,’ which is a substance that is introduced and brought to one’s body. Its purpose is to be able to produce the antibody internally. The antigens that are injected or introduced to your body can be toxins. It can also

be bacteria, foreign blood cells, and even cells of transplanted organs. The main purpose of a vaccination is to stimulate, increase, or even promote your body's immune system to come up with an adaptive immunity to whatever vaccine it is that you are about to take it for. Examples of vaccines that have been created are influenza vaccine, chicken pox vaccine, polio vaccines, measles, and many more.

Toxoids-Toxoid, on the other hand, is introducing a bacterial toxin to your body. The toxic has been made 'inactive' by use of a chemical or heat treatment. The most common toxoid that is probably being administered is the diphtheria, botulism, and tetanus. Toxoids are used as vaccines because they help the individual in stimulating an immune response to the toxin. Another reason for using toxoid as vaccine is to increase the antigen in one's body.

With those different definitions above, it might be easier to now grasp how one is different from the other. Then again, as one layman to another, it is really easier to comprehend medical terms when used as examples. Simply put, vaccines help your body by increasing the antibodies. Toxoid helps your body by putting the virus in, in a modified version, and allowing your body to produce the antibody to deflect and kill it, naturally.

Two types of immunity exist — active and passive:

Active immunity occurs when our own immune system is responsible for protecting us from a pathogen.

Passive immunity occurs when we are protected from a pathogen by immunity gained from someone else.

6-Explain the help of a neat diagram the theory, construction, working and application of the following:

1-filling of aerosol-

Both manufacturing procedures and packaging are carried simultaneously. To prepare and package pharmaceutical aerosols successfully, special knowledge, skills, and equipment are required. The concentrate which contains the active ingredients, solvents and co-solvents, and

other inert ingredients and may even contain a small portion of the propellant, is compounded separately and then mixed with the remainder of propellant. The following methods are used to fill containers with specialized equipment that are capable of handling and packaging materials at relatively low temperatures (about – 40oF) or under high pressure.

Pressure filling apparatus-The product concentrate is prepared at room temperature. The measured volume of the product concentrate is then added to the can. The valve assembly is crimped to the can. A cylinder of propellant is connected to the valve assembly of the can. The desired amount of propellant is added through the inlet valve located at the bottom of the cylinder under pressure. Trapped air is allowed to escape through the upper valve. When the pressure is equalized between the burette and the container, the propellant stops flowing.

To fill additional propellant a cylinder of nitrogen or compressed air is attached to the upper valve so that the added nitrogen pressure causes the propellant to flow.

Advantages:

1. Less propellant escapes into the atmosphere. Therefore it is environmentally friendly.

2. The filling procedure is carried out at room temperature.

3.Solutions, emulsions, suspensions can be filled successfully which are not possible with cold filling methods.

Disadvantages:

1. This method is not suitable to fill inhalation aerosols fitted with a metered valve.

2. This process is slower than the cold filling process.

3. High production speeds can be achieved.

Solution: Pressure filling equipment that fills through metered valves under high pressure of about 300 to 600 psig are available.

Precaution: Air entrapped in the container must be removed. Otherwise, this air may cause decomposition of the active ingredient or may give excessive pressure. This can be done by

adding one or two drops of propellant into each can before adding the concentrate. The propellant will vaporize and expel most of the air from the can. Alternatively, the can must be actuated several times after filling to expel air (in the inverted position for the dip tube products and an upright position for products without a dip tube).

Production rate: 35 – 160 cans per minute.

2-Colloidal mill-

Pharmaceutical companies work with small compound particles. They seek to separate chemical compounds to get to the smallest state of the compounds. That is why the colloidal mill is important in the pharmaceutical manufacturing industries. This is a machine that is used to reduce the size of particles of solids that are suspended in a liquid. When a liquid is suspended in another liquid, meaning that they are immiscible, this machine is used alternatively to reduce the size of this droplet.

Simply put the colloidal mill is used to solids present in suspensions and emulsions or even the suspensions size. It is used in the reduction of almost all types of materials. The end result of this type of mix is a very stable mix which is able to resist contamination by water or bleed. In fact, this is the method used in mixing cement based grout. The colloidal mill uses a method known as shearing.

Principle of the Colloidal Mill -The basic principle used in the colloidal mill is known as rotor-stator which is placed in a cylindrical vessel. The rotor and stator are placed close enough to create a narrow passage where the material to be reduced in size are passed through. That is why the process is known as shearing, because of you literary shear the material into smaller particles.

The solid is first fed into a compartment known as a hopper which guides the product to the gap that is between the rotor and the stator. The rotor and stator surface is covered with two metal toothed coverings which cut and shear the solid.

The rotor rotates at a speed of between 3,000 and 20,000 RPM. This, in turn, distorts the fluid or solid structure as it rubs between these two rough-edged surfaces. The resultant product is then passed through to the discharge area. The drain pipe then removes the final product from the colloidal mill. If the final product has not been sheared to the desired size, it can be re-circulated back to the machine for further shearing.

Working of the Colloidal Mill -The product to be shared is passed through the inlet which is on top of the mill known as a hopper. It is then passed through to the narrow gap between the rotor and stator. The rugged edges shear the material into the tiniest particles depending on the rotation speed. This mill uses a hydraulic system to shear the material into the final product. It mainly works on the material that will be suspended on the liquid or emulsion. As you continue to add the heavier liquid, the suspension floats to the narrow gap and the shearing process continues. As the process continues, the two viscous elements continue to mix. There are models where both the stator and rotor rotate together and there are other models where only the rotor rotates and the stator remains still. This mechanism is used for various purposes in the pharmaceutical field like dispersing of solid particles in an emulsion, emulsification, milling, homogenization, and improving the stability of emulsions.

3-Simple distillation-

Simple distillation is a unit operation in which two liquids with different boiling points are separated.

Principle of simple distillation

Simple distillation is a process of heating and cooling liquids in order to separate and purify them. As the liquid being distilled is heated, the vapors that form are richest in the component of the mixture that boils at the lowest temperature. Purified component boils, and thus turns into vapors, over a relatively small temperature range (2 or 3 °C). A careful observation of the temperature in the distillation flask helps to carry out a good separation. As distillation

progresses, the concentration of the lowest boiling component steadily decreases. Eventually, the temperatures within the apparatus begin to change and a pure compound is no longer being distilled. As the temperature continues to increase the boiling point of the next-lowest-boiling compound is approached. When the temperature again stabilizes, another pure fraction of the distillate can be collected. This fraction of distillate is primarily the compound that boils at the second-lowest temperature. This process can be repeated until all the fractions of the original mixture are separated. In order for simple distillation to perform, the two liquids' boiling points must have a difference of at least 25 °C (or about 77 °F).

Construction of simple distillation

The set of simple distillation consists of a distillation flask with a side arm sloping downwards, Shown in the Figure below. The mouth of the flask is fitted with a cork closure with the inserted thermometer. The condenser is attached to the sloping arm for cold water circulation with inlet at the lower side and an outlet at the upper side. The cold water pipe is attached to inlet while the outlet discharges water to waste. The condenser outlet delivers a liquid product that is collected in a collector or receiver.

Working of simple distillation

1-Calibration of thermometer: Calibration can be done by placing the thermometer in an ice bath of distilled water. Allow thermometer to reach thermal equilibrium. Now remove from ice water and place it in a beaker of boiling distilled water and again allow it to reach thermal equilibrium. If the temperatures measured does deviate from the expected values by more than two degrees then use it for recording temperature in distillation process.

2-Filling the distillation flask: The flask is filled with not more than two third of its volumes to have sufficient space above the liquid surface so that when boiling begins the liquid will not be propelled into the condenser. This is important in view point of purity of the distillate. Porcelain chips should be placed in the distillation flask to prevent superheating of

the liquid and to cause a more controlled boiling, eliminating the possibility of liquid to bump into the condenser.

3-Heating the distillation flask: The distillation flask is heated slowly until the liquid begins to boil. The vapours rise up through the neck of the distillation flask and pass through the condenser and condense and drip into the collection receiver, Fig. 6.3. Generally rate of distillation is approximately 20 drops per minute. Distillation must occur slowly enough that all the vapours condense to liquid in the condenser. Many organic compounds are flammable and if vapours pass through the condenser without condensing, they may ignite as they come in contact with the heat source.

4-Condensation of vapours: As the distillate begins to drop from the condenser, the temperature changes steadily. When it is stable, new receiver is used to collect all the drops that form over a two to three degree range of temperature. As the temperature begins to rise further, a third receiver is used to collect the distillate. This process is repeated; using a new receiver every time the temperature stabilizes or begins changing, until all of the distillate has been collected in discrete fractions. All fractions of the distillate should be saved until it is shown that the desired compound has been effectively separated by distillation.

Handling Precautions

(i) If direct heating is used stop the heat source from the distillation flask before all of the liquid is vaporized.

(ii) When all of the liquid is evaporated, the temperature of the glass of the distillation flask rises very rapidly, possibly ignites whatever vapors still are present in the distillation flask.

(iii) Never distill to dryness. The residue left in the distillation flask may contain peroxides, which could ignite or explode after all the liquid has distilled away.

(iv) Make sure that all joints are secured very tightly. If any vapor escapes at the connection points, it may come into direct contact with the heat source and ignite.

(v) Never heat a closed system, the increasing pressure will cause the glass to explode.

(vi) If the distillation flask has a tapered neck, the thermometer may be placed in such a way as to block the flow of vapors up the neck of the flask; in effect creating a closed system; make sure that if using a tapered neck flask, the thermometer is not resting in the lowest portion of the neck.

(vii) If the liquids comprising the mixture that is being distilled have boiling points closer than 25 °C to one another, the distillate collected will be richer in the more volatile compound but not to the degree necessary for complete separation of the individual compounds.

Advantages

(i) It is simple, cheap, easy and economic method.

(ii) It requires less energy.

(iii) This process requires single run and thus is comparatively faster.

Disadvantages

(i) The final product may contain impurities.

(ii) Azeotropic mixtures cannot be separated by simple distillation.

(iii) Not suitable for mixtures containing thermolabile components.

(iv) The volume of mixture should be not more than 2/3rd of the container.

Applications of simple distillation

(i) Simple distillation is primarily used for the production of distilled water.

(ii) Many volatile oils are separated by simple distillation.

(iii) It is also used in the separation of organic solvents from mixtures.

(iv) It is used to separate non-volatile components from volatile ones.

(v) It is used in preparing pharmaceutical spirits.

7-What are different types of containers commonly used in Pharmacy? Write in brief about Glass container.

A pharmaceutical container can be defined as a device that holds the drug or it may or may not be in direct contact with the pharmaceutical preparations.

Based on the utility for different pharmaceutical doses forms, containers are divided as following.

1. Well closed Containers

⦿ Protects the content from loss due to transportation, handling, sale and Storage.

2. Air-tight containers

⦿ Also called hermetic containers.

⦿ These have air-tight sealings or closings to avoid air contact.

Protect the product from dust, moisture and air.

3. Tightly-closed containers:

⦿ These containers are capable of being tightly re-closed after use i.e. gas cylinder, which is a metallic tightly-closed container and holds gas under pressure.

⦿ Protects the contents from contamination by liquids, solids or vapours, from loss or deterioration of the material from effervescence, deliquescence, or evaporation under normal condition of handling, storage and distribution.

4. Single dose containers:

⦿ Single dose containers are generally used to hold parenteral products (injectables) i.e. ampoules and vials.

⦿ single dose containers are used to supply only one dose of medicaments.

5. Multi-dose containers :

⦿ Hold more than one dose and allow withdrawal of dose at various intervals without changing the strength, quality, and purity of the remaining portion.

⦿ Multi-dose containers are used for injectables i.e. ampoules.

6. Light-resistant containers:

⦿ Protect the medicaments from the harmful effect of light.

⦿ These are used to store medicaments which are photo-sensitive.

7. Aerosol containers

⦿ Used to hold aerosol products.

⦿ These containers should have adequate mechanical strength in order to bear the pressure of aerosol packaging.

8. Temper evident containers

⦿ These Containers are fitted with a device or mechanism which irreversibly reveals whether the container is opened or closed.

Glass containers for pharmaceutical use are intended to come into direct contact with pharmaceutical products. Glass used for pharmaceutical containers is either borosilicate (neutral) glass or soda-lime-silica glass. Borosilicate glass contains significant amounts of boric oxide, aluminum oxide and alkali and/or alkaline earth oxides. Glass is also classified as Type I, II or III based on intended use. Glass Containers for Pharmaceutical Use deal with the Glass Grains Test and the Surface Glass Test. The Glass Grains Test, combined with the Surface Glass Test for hydrolytic resistance, determines the type of glass being used in the packaging of pharmaceutical preparations.

Type I

Borosilicate Glass

This type of glass has borosilicate structure. It is ideal for containing all injectable preparations with acid, neutral and alkaline pH. It has good resistance to thermal shocks and can be sterilized **before or after filling. Container of USP type I glass (Neutral borosilicate glass)**

Type II

Soda-Lime-Silica Glass but with a suitable treatment on the inner surface to increase the hydrolytic resistance

This type of glass is a soda-lime glass which, by means of a special treatment, reaches the hydrolytic stability of type I glass on its surface layer of 0.1-0.2 um. It is suitable for acidic and neutral parenteral preparations. Type II glass container can be sterilized before or after filling. Container of USP type II glass (Treated soda-lime glass)

Type III

Soda-Lime-Silica Glass

This type of glass has average hydrolytic resistance. It is suitable for containing non-aqueous injectable preparations and those in powder form. It can also be used for non-parenteral preparations. Type III glass container should be sterilized by dry heat before filling. Container of USP type III glass (Soda-lime glass)

D.Pharm Part-II **E.R 1991**

2022(I)

MODAL ANSWERS

HOSPITALAND CLINICL PHARMACY

1. A. Definition

i) Drug Information Bulletin : It is defined as the information which includes new advancement in medicines ,new researches, detailed analytical procedures abstracts for new developments etc. which should communicate to all the medical staff for the patient care . It with stands between information and the clinical practices.It should be updated time to time .

Or

Drug Information Bulletin: The Drug Information Bulletin is our quarterly magazine published with a vision of imparting & updating knowledge of pharmacists. Every issue is been designed to update and motivate pharmacists to provide better healthcare to patients.

ii) Drug dependence : Drug dependence 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 in order to experience its psychic effect and at times to avoid the discomfort of its absence.

1. Desire to continue
2. Avoid the discomfort of its absence.

iii) Hospital Formulary: It is defined as the list of pharmaceutical agents with its informations which reflects current clinical views of the medical staff. Hospital formulary system is a method whereby the medical staff of a hospital with the help of pharmacy and therapeutic commitee , selects and evaluates medicinal agents and their dosage forms which are considered to be most useful in the patient care.

iv) Surgical equipment: A **surgical instrument** is a tool or device for performing specific actions or carrying out desired effects during a surgery or operation, such as modifying biological tissue, or to provide access for viewing it.[1] Over time, many different kinds of surgical instruments and tools have been invented. Some surgical instruments are designed for general use in all sorts of surgeries, while others are designed for only certain specialties or specific procedures.

v) High Efficiency particulate Air: It is an acronym for "high efficiency particulate air filter. This type of air filter can theoretically remove at least 99.97% of dust, pollen, mold, bacteria, and any airborne particles with a size of 0.3 microns (µm).

vi) Inventory Control: Inventory control is the process of managing inventory in order to meet customer demand at the lowest possible cost and with a minimum of investment. Unlike many factors in pharmacy, inventory is controllable.
Objecives :
To reduce the Investment in inventories.
To minimiise the wastage of time by avoiding “out of stock” situation.

vii) Sterilization : Sterilization: Sterilization is defined as a process of complete elimination or destruction of all forms of microbial life (i.e., both vegetative and spore forms), which is carried out by various physical and chemical methods.
Dry heat sterilization
Moist heat sterization

viii) Antidote: An antidote is a substance that can counteract a form of poisoning.
Mechanical, Chemical, Systemic and Universal antidotes

ix) Idiosynncrasy: Drug idiosyncrasy" refers to untoward reactions to drugs that occur in a small fraction of patients and have no obvious relationship to dose or duration of therapy. The liver is a frequent target for toxicity.

x) Bed side Pharmacy: It is the drug distribution system in hospital in which drugs are kept near the bed of the patient so the patient can utilize the drug himself. In a hospital, pharmacists deliver medications straight to a patient's bedside from the facility pharmacy. After the technician has delivered the drug to the patient's bedside, the pharmacist will counsel her or him about the medication.

B) Define the abbreviation :

1. MRI :Magnetic resonance imaging (MRI) is a medical imaging technique that uses a magnetic field and computer-generated radio waves to create detailed images of the organs and tissues in your body.
2. EEG: An electroencephalogram (EEG) is a test that measures electrical activity in the brain using small, metal discs (electrodes) attached to the scalp. Brain cells communicate via electrical impulses and are active all the time, even during asleep. This activity shows up as wavy lines on an EEG recording.
3. ECG: An electrocardiogram records the electrical signal from the heart to check for different heart conditions. Electrodes are placed on the chest to record the heart's electrical signals, which cause the heart to beat. The signals are shown as waves on an attached computer monitor

4. ICCU: Intensive Coronary Care Unit – It is a unit which is focused on the treatment heart issues suh as coronary heart disease.

5. CHF: **Congestive heart failure** (**CHF**) occurs when the heart is unable to pump blood throughout the body efficiently.

6. TLC: Total Leukocytes Count. The normal number of WBCs in the blood is 4,500 to 11,000 WBCs per microliter .

7. DIC: Drug Information Centre .

8. BMR: Basal Metabolic Rate the number of calories you burn as your body performs basic (basal) life-sustaining function. Commonly also termed as Resting Metabolic Rate (RMR), which is the calories burned if you stayed in bed all day.

9. ESR: Erythrocytic sedimentation rate - An erythrocyte sedimentation rate (ESR) is a blood test that that can show if you have inflammation in your body.

10. OTC: Over the counter- 'Over-the-Counter (OTC) Medicines' means drugs which are legally allowed to be sold by pharmacists without need for a prescription. The term does not have a legal definition in India. Technically, drugs are OTC unless they are specifically stated as prescription only drugs.

2. a. Drug distribution system on out patient system:

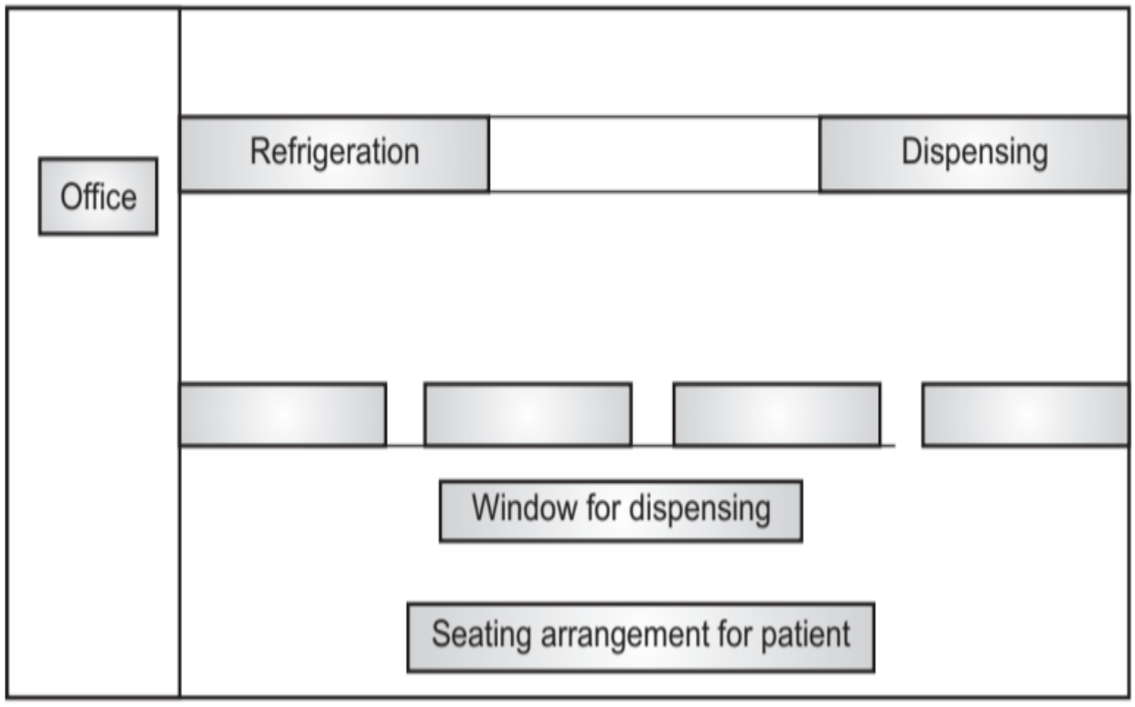
It is also called ambulatory services and refers to those patients who are not occupying beds in hospitals or in clinics , health centers and other places when they come for consultation and diagnosis, treatment.

Categories of Ambulatory Services:

1. **Emergency Outpatients:** For emergency outpatient, 24 hours services are given who requires immediate care for the survival.
2. **Referred Outpatient:** These patients are reffered to the hospital for a specific purpose due to lack of facilities available with the private clinic practioners or patient needs extra care.
3. **Special outpatient :** After compilation of general check up the paitents are asked to go for accurate diagnosis by the cinical , pathological or radiological examination. After receiving the test report of examination medicine is given to him.
4. **General outpatient:** These patients come for the general checkup and medicines are prescribed to him. They may either undertake minor surgery ,superficial surgery or dressing at hospital.
5. **Referral**
6. PrimaryCare
7. Ambulatory

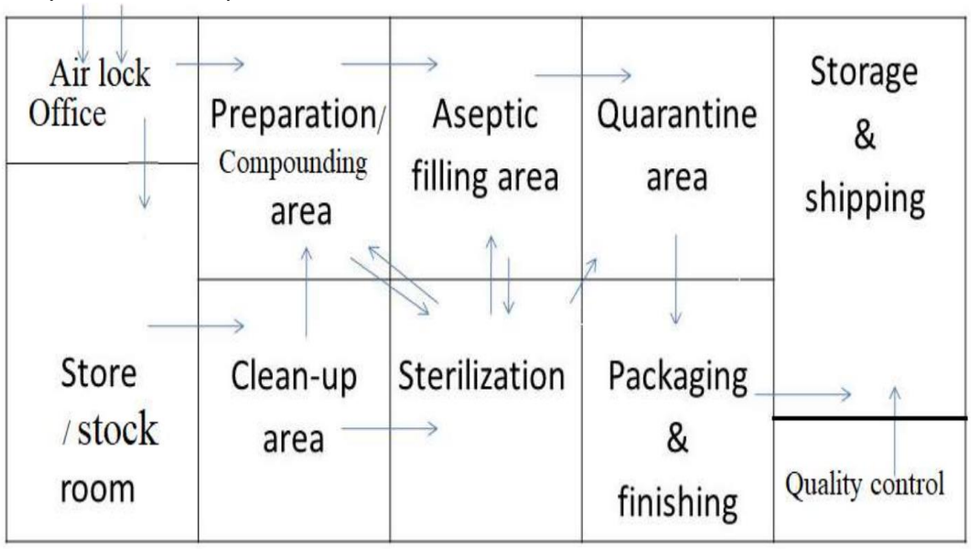
- Patients take written prescription by the the physician, which is given to the pharmacist where it is dispensed.
- Pharmacist guarantees that patient gets right medication.
- Pharmacist gives instructions to patient about dispensed medicine.
- Labelling of medicine.
- Manufacturing of payments by pharmacist.
- Finally, Payment by medicine.

b. Location and lay out of out patient dispensing along with figure.



There is no set rule regarding the location of out patient dispensary area.
It should be located on the ground floor of the building and near to the entrance of building for easy access by the patient.
It should be close to the central registration and out patient departments so that the patient do not find any difficult in its location.
Proper seatin arrangement is required.

c. Lay out of sterile product area :



1. Clean Area
2. Prepaation or comounding area
3. Aseptic Area
4. Quarantine Area
5. Labelling and Packing area

3. Brief description about Factors bioavailability.

Drug bioavailability after oral administration is affected by anumber of different factors, including physicochemical properties of the drug, physiological aspects, the type of dosage form, food intake, biorhythms, and intra- and interindividual variability of the human population.

1. Physical prorties of drugs:
a. Particle size
b. Partition coefficient
c. Physical Form
2. Pharmaceutical factors
   a. Dissolution Rate
   b. Drug product formulation
      Properties of the drug product (Salt form , Crystallinne structure)
      Commposition of the finished dosage form (presence or absence of excipients)
      Mfg variables (Tablet Compessionn force, absence of excipients)
3. Physiological and other factors affecting Bioavailability:
   a. Contents of GIT
   b. Rate of GIT transit
   c. Low blood flow,condition of GIT membrane
   d. Age, Sex, Body size, time of a day
4. Other factors

b.Pharmacokinetic drug interaction:

Pharmacokinetic drug-drug interactions occur when a drug alters the disposition (absorption, distribution, metabolism,elimination) of a coadministered agent. Pharmacokinetic interactions may result in the increase or the decrease of plasma drug concentrations.

1. Alteration of GIT Absorption
   a. Alteration of P^H
   b. Phenobarbital with Antacid
   c. Aspirin and antacid

2. Complexation and adsorption

Tetracycline with metal ions

Antidiarrhoeal mixtures

3. Alteration of Distribution
4. Alteration of Metabolism

C.Symptoms of arsenic poisoning:

Acute – Nausea, Cramps in legs, dilated pupil, Vomiting,diarrhea,pale anoxious face

Pulmonary oedema, cyanosis.

Treatment: Stomach wash with sodium and magnesium sulphate.

Morphine and atropine to relief pain

EDTA as chelating agent

d.Role of pharmacist in health care system:

Taking medication history of the patient

At the time of dispensary

Selection of proper drug Therapy

Drug Monitoring

Adverse drug reaction

Management of drug policy

Research and development programs

Drug Information

4.

Diabetes:

It is characterized by elevated blood glucose levels or hyperglycemia, which results from abnormalities in either insulin secretion or insulin action or both. Hyperglycemia manifests in various forms with a varied presentation and results in carbohydrate, fat, and protein metabolic dysfunctions.

Pathophysiology:

The pathophysiology of diabetes is related to the levels of insulin within the body, and the body's ability to utilize insulin. There is a total lack of insulin in type 1 diabetes, while in type 2 diabetes, the peripheral tissues resist the effects of insulin. Normally, the pancreatic beta cells release insulin due to increased blood glucose concentrations. The brain in order for normal functions to occur continually requires glucose. Hypoglycemia, or low plasma glucose levels, is usually caused by drugs used in the treatment of diabetes, including insulin and oral antihyperglycemics. The pathophysiology of diabetes involves plasm concentrations of glucose signaling the central nervous system to mobilize energy reserves. It is based on cerebral blood flow and tissue integrity, arterial plasma glucose, the speed that plasma glucose concentrations fall, and other available metabolic fuels. Low plasma glucose causes a surge in autonomic activity. Diagnosis of hypoglycemia requires verification of low plasma glucose levels. Immediate treatment is the intake of glucose. The responses to hypoglycemia include decreased insulin secretion, increased secretion of glucose counter-regulatory hormones such as glucagon and epinephrine, a greater sympathoadrenal response, related symptoms, and finally, cognitive dysfunction, seizures, or coma.

Manifestation :

Extreme hunger, unintended weight loss, fatigue and weakness, blurred vision, irritability, and other mood changes.

Hepatitis:

Pathophysiology:

Hepatitis B virus replicates in the liver cells and virus cells get incorporated in the liver cell membrane.

Antibodies are formed against these viruses.

These antibodies attack the foreign plasma membrane .

The immune system damages the liver.

Manifestation:

fever, fatigue, loss of appetite, nausea, vomiting, abdominal pain, dark urine, light-colored stools, joint pain, and jaundice.

Peptic ulcer:

Pathophysiology:

Peptic ulcer disease is characterized by discontinuation in the inner lining of the gastrointestinal (GI) tract because of gastric acid secretion or pepsin. It extends into the muscularis propria layer of the gastric epithelium. It usually occurs in the stomach and proximal duodenum.
Duodenal ulcer
Gastric ulcer

Manifestation:

These symptoms include epigastric pain that worsens with eating, postprandial belching and epigastric fullness, early satiety, fatty food intolerance, nausea, and occasional vomiting

5.
a.Drug Induced disease.
Overdose
Drug Interactions
Secondary effects
Idioosyncrasy
Hypersensitvity
b.Role of PTC in Drug safety
Drug safety is he major are of responsibility of the hospital pharmacist
1.The pharmacists should be aware of narcotic and psychotropic drugs
2. is there proper regulation dangerous drugs
3. Does the hospital provide adequate , safe work spaceand storage facilities for the pharmacy.
4. is there any physical verfiction of drug expired
5. Does the pharmacy have equipment necessary for safety and adequatey care about the modern practice of pharmacy.
6. Is there any training programe for the pharmacist to teach other professionals about new drugs.

Factors contributing Non compliance:
Route of Admnistration
Type of therapy
Forgetfulness
Cost
Poor Instruction
Side effects

Medical Complication and treatment of addictive drug alcohol:
High blood pressure, heart disease, stroke, liver disease, and digestive problems. Cancer of the breast, mouth, throat, esophagus, voice box, liver, colon, and rectum. Weakening of the immune system, increasing the chances of getting sick. Learning and memory problems, including dementia and poor school performance.

Alcoholism Complications

Over time, alcohol can permanently affect the brain, such as by causing dementia and the serious brain disorder Wernicke–Korsakoff syndrome.

About 80 percent of alcoholics have a deficiency in thiamine, which causes Wernicke–Korsakoff syndrome, according to the National Institute on Alcohol Abuse and Alcoholism (NIAAA).

Aside from brain issues, alcoholism — and sometimes just drinking too much on a single occasion — can cause:

- Cardiomyopathy (heart muscle disease), arrhythmias (irregular heartbeat), stroke, or high blood pressure

- Steatosis (fatty liver), alcoholic hepatitis, fibrosis (thickening of liver tissue), or cirrhosis (scarring of and permanent damage to the liver)
- Gastrointestinal problems, such as ulcers, varices (swollen veins in the esophagus), and esophagitis (esophagus inflammation)
- Pancreatitis (pancreas inflammation)
- Cancer of the mouth, esophagus, throat, liver, or breast
- An increased risk of infections, particularly pneumonia and tuberculosis

Alcoholism can also cause mental health problems (depression and anxiety), as well as problems with relationships and work.

Alcoholism Treatment

There are several treatment options available for AUD, but there's no one-size-fits-all solution.

A mutual support group, AA teaches you to adopt 12 spirituality-based principles in an effort to help you overcome your compulsion to drink alcohol.

Other support groups include SMART Recovery, LifeRing Secular Recovery, Women for Sobriety, and Moderation Management.

Rehab, on the other hand, is usually a month-long treatment program in a facility that completely removes you from situations and circumstances that perpetuate substance abuse.

Some treatment options for AUD are guided by mental-health professionals.

For example, alcohol counseling can help you identify and change behaviors that lead to drinking, build a stronger support system, develop attainable goals, and handle triggers that lead to relapses.

Treatment may also involve standard therapies used to treat other mental illnesses, including cognitive-behavioral therapy, which is commonly used to treat depression, among other disorders.

In addition to counseling and support groups, several medications are available to help you curb your drinking.

Drugs for alcoholism approved by the U.S. Food and Drug Administration (FDA) include:

- Antabuse (disulfiram), which helps you avoid drinking alcohol by causing nausea, skin flushing, and other unpleasant symptoms when you drink alcohol, by blocking the metabolism of alcohol in your body
- Campral (acamprosate calcium), which can help you continue to abstain from drinking and is thought to work by restoring brain chemical imbalances caused by heavy drinking
- Revia or Vivitrol (naltrexone), which helps reduce heavy drinking by blocking the euphoric effects and feelings of intoxication
-

6 objectives of hospital pharmacy:

1. To professionalize the functioning of pharmaceutical services in hospitals.

2. To ensure the availability of the required medication at an affordable cost at the required time.

3. To plan, organize, and implement the policies of the pharmacy.

4. To perform functions of the management of material, purchase, and storage of essential items.

5. To maintain a strict inventory of all items received and issued.

6. To counsel the patient, medical staff, nurses, and others involved in patient care on the use of drugs, possible side effects, toxicity, adverse effects, drug interactions, etc.

7. To serve as a source of information on drug utilization.

8. To manufacture drugs, large/ small volume parenterals are critical for use in patients.

9. To participate in and implement the decisions of the pharmacy and therapeutics committee.

10. Organize and participate in research programs, and educational programs.

11. To provide training to various members of the patient team on various aspects of drug action, administration, and usage.

12. To engage in public health activities to improve the well-being of the population.

13. To interact, cooperate and coordinate with various other departments of the hospital.

Functions of hospital pharmacy:

It attains a supply of drugs, chemicals, and biological and pharmaceutical formulations only from licensed vendors and manufacturers.
2) It inspects the received items and maintains an inventory for the same.
3) It dispenses drugs, chemicals, and pharmaceutical preparations to the patients. The pharmacists repack the medicament in appropriate containers and label them.
4) It keeps a record of all the narcotic drugs and alcohol received and issued.
5) It predicts the demand for drugs, chemicals, antibiotics, biologicals, radiopharmaceuticals, etc., and takes suitable steps to fulfill the demand.
6) It keeps a record of each supply dispensed.
7) It manufactures large volumes parenteral and other drug preparations in case of unavailability, high cost, or lack of authentic vendors or caution.
8) It implements strict control on the quality of the supplies received, manufactured, and dispensed.
9) It discusses the drug-related information with the medical staff, resident nurses, health care team, and the patients.
10) It participates in minimizing the incidence of illness and improves the general health of the population.
11) It provides patient counselling.
12) It implements the recommendations of the pharmacy and therapeutic committee.

b.Advantages of Drug distributionsystem for inpatieent

1.Contaminationdue to handling is eliminated
2. It emlimintes stage of drug and pilferage.
3.More efficient utilizationof professional and nnon professional personnel is promoted
4. more space is available in nursing units by eliminating buky floor stock

Disadvantages

It requires more space
It require increased number of skilled and lay personnels in pharmacy
Cost of medicine is increased to the patient dueto increased handling charges.

Different application of computer in pharmacy
Maintenance of Records
Inventory control
Medicationn monitoring
Drug Information service
Data storage and retrieval
Marketing and distribution
Pharmaceutical industries
Hospital pharmacy and retail pharmacy

District head quarter hospital
District hospitals often have a direct role in the primary training of health workers, particularly clinical assistants, nurses, and health aides, as well as an ongoing role in providing continuing medical education.

Functions of District hospital

The term District Hospital is used here to mean a hospital at the secondary referral level responsible for a district of a defined geographical area containing a defined population.

A district hospital has the following functions:
It provides effective, affordable health care services (curative including specialist services, preventive and promotive) for a defined population, with their full participation and inco-operation with agencies in the district that have similar concern. It covers both urban population (district head quarter town) and the rural population in the district.

Function as a secondary level referral centre for the public health institutions below the district level such as Sub-divisional Hospitals, Community Health Centres, Primary Health Centres and Sub-centres.

To provide wide ranging technical and administrative support and education and training for primary health care.

7.a. Physiological parameters can be defined as the gauges used to check normal physiological form of organ /organelle system.

Human physiological parameters, such as blood pressure, body temperature, breathing rate, heart rate, blood oxygen saturation, and various electrophysiological signals, represent the operation of a human body and are thus useful as reference values in human health monitoring [57].

Table 1. Basic human physiological parameters

The measured parameter	The analyzed physiological parameters	The character of the measured signal
1. ECG	Variation of electrical heart vector, heart work rate	Time function, mean numerical value
2. Pulse	Heart work rate	Mean numerical value
3. Respiratory rate	Respiratory rate	Numerical value
4. Respiratory volume	Minutely respiratory volume gauge	mean numerical value
5. Body temperature	Temperature	Numerical value
6. Blood pressure	Systolic and diastolic blood pressure, heart rate	Time function, numerical value

b. Parameters normal value significance

ESR 0-16mm/hr in male increase in ESR - polycythaemia

0-21mm/hr in fmale Decrease inn ESR- pregnancy anaemia

Basophils 0-100 increase in Basophils number indicated in Mumps, chicken pox.

Haemoglobin For men, 13.2 to 16.6 g/dl increase- polycythaemia

For women, 11.6 to 15 g/dl.

Decrease-anaemia

Specific gravity of urine 1.003 to 1.025 Diabetes Mellitus

Blood Cholesterol level 100-240mg/100ml Coronary disease

Model Answers:

D. Pharm Part – II 2022(I)

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: (Answer all)** **(1 x 15)**

i) ***ABC Analysis:*** Always Better Control according to cost of materials and money value of consumption (10%, 20% and 70%)

ii) ***Acid test Ratio:*** It compares a company's "quick assets" (cash and accounts receivable) to its current liabilities.

iii) ***Bank:*** A number of institutions carrying on certain kinds of financial business, dealing money. (Sell and buys money). It provides facilities for exchange and transmission of funds.

iv) ***Balance Sheet:*** A statement of assets and liabilities of a business enterprise at a given date.

v) ***Buffer Stock:*** (Safety stock / Minimum stock level) this is the lower limit below which the stock of any item should not normally be allowed to fail.

vi) ***Contra entry:*** A contra entry is recorded when the debit and credit affect the same parent account and resulting in a net zero effect to the account. These are transactions that are recorded between cash and bank accounts.

vii) ***Cash Credit:*** A bank fixes a limit to which a customer may borrow money from it against some security.

viii) ***Cheque:*** It is a document that orders a bank to pay a specific amount of money from a person's account to the person in whose name the cheque has been issued.

ix) ***Codification:*** A process of assigning of code symbol or a number to a particular material for easy identification.

x) ***Debenture:*** An acknowledgement under seal of debt or loan.

xi) ***Entreport***: When a trader purchases goods from one country and sell the same to another country.

xii) ***Fixed capital:*** It is the capital which is invested in permanent assets such as land and building, plant and machinery, furniture, fixtures, etc.

xiii) ***Lead Time:*** It is the total time consumed between the recognition of the need of an item, till the time it is received for use.

xiv) ***Master budget:*** It is a comprehensive financial planning document that includes all of the lower-level budgets, cash flow forecasts, budgeted financial statements, and financial plans of an organization.

xv) ***Nominal Partner:*** A partner who allows the partnership firm to use his/her name but does not contribute any capital or take part in the management and affairs of the business. He does not share the profits and losses of the firm but he is liable to the creditors for the repayment of the firm's debts.

B) Define the following abbreviations: (Answer all) (1 x 5)

a) ***EOQ*** (Economic order quantity): Techniques used to find out how much of inventory to be ordered.

b) ***FIFO*** (First in first out): The materials which are received first are issued first.

c) ***GAAP*** (General Accepted Accounting Principle): A general guidelines for preparing the financial statements.

d) ***LIFO*** (Last in first out): the raw materials, or components, acquired most recently were sold first.

e) ***ROI*** (Return on Investment): A calculation of the monetary value of an investment versus its cost.

****

2. **Write short notes on following questions. (Any THREE) (5 x 3)**

a) Advertisement:

Advertising is an art, used to familiarize public with the product by informing of its description, uses, its superiority over other brands, sources of its availability and price etc. Advertising is not merely propaganda but is a paid form of communication. The advertiser has to pay for the space or time used to communicate the message to his customers.

Objectives of Advertising

- To create a demand for a new product by explaining its utility.
- To increase its sales by attracting new customers.
- To maintain the existing demand by fighting competition.
- To assist the salesmen in their selling efforts.
- To warn the public against imitation of the products of the firm.
- To enhance goodwill of the firm.

Parts of an Advertisement

- ❖ Heading: The heading or caption is used to attract the attention of the people. It may be a word, a phrase or even a question about the product or service being advertised. It should not be very long.
- ❖ Theme: Theme gives the basic idea about the product and highlights its distinctive advantage. It conveys an image of the product being advertised
- ❖ Picture: Generally, an advertising copy contains a photo of the product being advertised. Photo of a product is often combined with a photo of the model/star possessing or using the product. It enables the customers to recognize or identify the product.
- ❖ Arguments: Nowadays, arguments in favor of the advertised products are given in

the advertisement. The purpose of giving the argument is to convince the customers about the utility of the product.

- ❖ Closing part: The closing part of an advertising copy is very often repeats in brief the contents of the advertisement. In some cases, the name and address of the drug store where the product is available are given in this part.

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b) Recruitment:

Recruitment is the process of exploring the source of supply of the required personnel and stimulating the prospective employees to apply for jobs in the organization. Its purpose is to create a pool of candidates from which the most suitable persons may be selected for the job.

Sources of recruitment: -

- Internal sources: The recruitment is done among the personnel already on the pay roll of an organization. Whenever any vacancy occurs, somebody from within the organization is upgraded, transferred, and promoted.
- External sources: These sources lie outside the organization. They usually include young mostly inexperienced potential employees, trained unemployed and retired experienced person.

Methods of Recruitment:

- ➢ Direct methods: In this method, a team is sent to colleges/ which conducts pharmacy course (Degree/Diploma) by placement cell of a college.
- ➢ Indirect methods: An advertisement is generally given in leading daily newspapers, popular magazines and professional journals. The application form usually provides for giving full name, father's name, age, address, education, training, personal data, such as, height, weight, place of birth, nationality, religion,

habits, character and details of past experience, salary demanded and other benefits expected.

- Third party methods: These include the use of commercial or private employment agencies, stage agencies, placement office of the institutions, recruiting firms and management consulting firms.

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c) Triple column Cash book:

- It is a popular form of cash book.
- In this type of cash book, three columns are provided on each side of the cash book
    - 1st column is for discount
    - 2nd column is for cash
    - 3rd column is for bank
- When amount is received in cash, it is recorded in the cash column of the **debit** side and the discount allowed to the party concerned in this connection is recorded in the discount column of the **debit** side.
- All the cash payments are to be recorded in the cash column of the **credit** side and the discount received from the party concerned in this respect shall be recorded in the discount column of the **credit** side.
- When cash is received and then sent to bank for deposit, then in the **debit** side, bank account is **debited** and cash account is **credited** in the **credit** side.
- Similarly, When cash is withdrawn from the bank for office use, the cash account is **debited** in the **debit** side and bank account is **credited** in the **credit** side.
- Such entries are called "Contra entries" and letter "**C**" is recorded in the ledger folio columns of both side.

Formats of Triple column Cash book

"Dr" Receipts Payments "Cr"

Date	Particulars	L.F.	Discount (Rs.)	Cash (Rs.)	Bank (Rs.)	Date	Particulars	L.F.	Discount (Rs.)	Cash (Rs.)	Bank (Rs.)

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d) VED analysis

- VED analysis is very useful in controlling and maintaining the stock of various types of formulations of a particular group of drugs.
- The older the brand, the greater will be its requirement.
- The past trends are not useful in calculating the requirements of a particular brand.
- The best way to solve this problem is to classify the different brands of drug formulation into any one of the following categories:

V = Vital items, E = Essential items, D = Desirable items

For example, acetyl salicylic acid is available as disprin tablets, Anacin tablets, Micropyrin tablets.

There is a great demand of disprin tablets, so these are classified as vital items, followed by Micropyrin tablets which are covered under essential items due to its less demand than disprin tablets. Anacin tablets may be considered as desirable items because there are hardly a few prescriptions of it. In a drug store, there should be maximum stock of disprin tablets, followed by Micropyrin tablets and then of Anacin tablets.

****

3. **a) Write down the salient features of "Sole Proprietorship of Business" (7)**

Sole proprietorship of Business:

- It is the simplest form of business organization and is known as 'one man business'.
- In this form of business organization, one person is solely responsible for providing capital, for bearing the risk of the enterprise and also for day-to-day management of the business.
- In retail pharmacy business (chemist shop) individual professional skill is essential.
- Therefore, this form of business is best suited to a sole proprietor.

Salient Features of Sole Proprietorship:

- ❖ Sole proprietor has full authority over the affair of business. He has to act according to his ability and skill.
- ❖ The ownership lies with one person only. There is no partnership or association. The proprietor and the business enterprise are one and the same.
- ❖ No legal formalities are required to start the business, except in certain business, where legal formalities are required to be fulfilled. For example, to start a retail drug store, a license is needed from the drug administration.
- ❖ The proprietor has to arrange the necessary capital and assets which are essential to run its business smoothly.
- ❖ The profit earned in the business entirely belongs to the proprietor. Similarly, losses in the business are also to be borne by him. 6. The liability of the sole proprietor is unlimited.

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3. b) Describe the advantages & disadvantages of this form of organization. (4+4)

Advantages of Sole Proprietorship

- It is most easily formed of all forms of business organizations, since no legal formalities are necessary for setting up this type of business.
- The secrecy of the business affairs can be maintained.
- The sole proprietor is free to take any decision.

- The sole proprietor is able to establish a personal contact with his customers.
- The incentive of greater profits and fear of losses induce the proprietor to work to the best of his ability as well as the capacity.
- It encourages professionally qualified persons to set up their own business under self-employment scheme.
- The sole proprietor is free to change the pattern of management at any time.
- The capital investment in the business can be increased or decreased at will.
- Comparatively, there is little expenditure involved in managing the enterprise.

Disadvantages of Sole Proprietorship

- The individual proprietor generally suffers due to lack of adequate financial resources. As such, he usually finds it difficult to expand his business.
- It is very difficult for a single person to look after every aspect of the business viz., production, sale, finance, advertising and keeping the accounts competently.
- The business ends with the death of the proprietor because his heirs may not be as competent and qualified to run his business after his death.
- The sole proprietor usually run his business only on a small scale. So, he cannot enjoy the benefits of large-scale production or buying or selling. This may raise the cost of business operations.
- The liability for business debts is unlimited.
- There are no checks and controls on the sole proprietor.

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4. **What do you mean by pharmaceutical Management? What are the levels of management? (2+4)**

'Pharmaceutical Management':

Management is the art and science of organizing and directing human efforts applied to control the forces and utilize the materials of nature for the benefit of man.

When the principles and practices of management are applied to pharmaceutical industry and drug store, it is known as 'Pharmaceutical Management.

Levels of Management

There are three levels of management:

i. ***Top level management:*** Top level management of a company consists of the board of directors and managing director which frames the policies for the enterprise.

The top-level management generally performs the following functions:

- Laying down the overall objectives and broad policies of the enterprise.
- Organizing the business into various departments and divisions.
- Appointing department managers.
- Issuing guidelines for heads of the department. 5. Coordinating the work of different departments.
- Reviewing the work of departments and taking steps to ensure achievement of objectives.

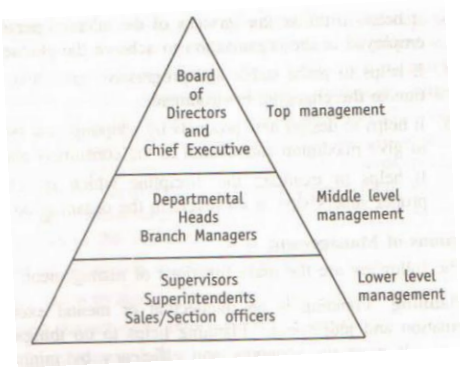
ii. Middle level management: It generally consists of head of departments. They are responsible to the top management for the efficient functioning of their departments.

iii. Lower-level management: It is also known as supervisory management because it is directly concerned with the control of the performance of the operative employees. The level includes supervisors, foremen, superintendents, sales officers, accounts

officers etc. They issue orders and instructions and guide day to day activities.

Lower-level management performs the following functions:

- Planning of day-to day work.
- Assignment of jobs and issuing orders and instructions.
- Supervising and guiding workers.
- Maintaining close personal contacts with workers to ensure discipline and team work.
- Evaluating operating performance.
- Communicating the grievances and suggestions of workers to higher authorities.



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Write a note on functions of management. **(9)**

Functions of Management The following are the main functions of management

- Planning
- Organizing
- Staffing
- Directing
- Controlling
- Coordinating

Planning:

- It is an intellectual or mental exercise requiring imagination and judgement.
- Planning helps to do things in an orderly manner.
- It increases economy and efficiency by minimizing random action.
- Planning helps in the proper utilization of resources.
- Planning aims at achieving the desired results.
- It involves forecasting of future problems and events and selecting an appropriate course of action to handle the anticipated problems and events.

Organizing:

- It is to organize the enterprise by grouping similar activities together with a view to attain the planned objectives, defining the responsibilities of the people in the organization, delegating appropriate authority to them to discharge their respective responsibilities and establishing relationship to enable coordination of the individual efforts to fulfil the objectives of the enterprise.
- Interrelate the activities like quality control, production, marketing, and finance department.

The process of organizing involves the following steps.

(1) Identify the activities necessary to achieve the objectives.

(2) Grouping the activities into manageable units.

(3) Assigning duties or task to appropriate individuals.

(4) Delegating necessary authority to individuals and fixing responsibilities for results.

(5) Defining authority-responsibility relationships among individuals.

Staffing:

- A right person should be selected for right type of job.
- The various activities, such as selection, communication, participation, counselling, training, compensation, dismissal etc. comes under it.

Staffing consists of following activities:

1. Manpower planning i.e., determining the number and quality of employees required in an organization.
2. Recruitment, selection, and replacement.
3. Training and development.
4. Appraisal, promotion, and transfer.
5. Employee remuneration etc.

Directing*:*

- Once the plans are formulated, the organization structure is created and competent persons are appointed at various posts, the enterprise is ready to start work.
- The work begins under the directing function involves issuing orders and instructions, motivating and leading subordinates, harmonizing organizational goals with interests of employees.
- The managers have the responsibility of guiding and supervising their subordinates in the following ways: -
    - (i) By issuing of orders and instructions.
    - (ii) By guiding and teaching the subordinates as regards the proper method of work.
    - (iii) Supervising the subordinates to ensure that their performance conforms to the laid down standards.

Controlling:

- Controlling means the steps taken to ensure that the performance of the organization conforms to the plans.
- Strict control on the activities of the subordinates may some- times leads to loss of all initiative and enthusiasm on the part of workers.

Coordinating:

- Coordination among its various departments,
- All activities are carried on by experts and different departments contribute to the achievement of the objectives of the business.
- It is essential that everybody in the organization understands the main objectives of the business and works towards their achievement in active cooperation with others.
- A well coordinated enterprise must satisfy the following conditions:
    - 1. Each department or division should be precisely informed of its share in the common task
    - 2. Each department should work in harmony with other departments
    - 3. The working schedules of various departments should be constantly attuned to circumstances.
- The basic features of coordination are as follows:
    - 1. It is a continuous process, orderly arrangement of group efforts
    - 3. Its purpose is to secure unity of action towards common objectives
    - 4. Coordination does not arise spontaneously. It has to be created through deliberate efforts
    - 5. It consists of three elements (i) timing, (ii) balancing, (u) integrating
    - 6. Coordination is the essence of management.

****

5. **a) Define the term Retailer. Describe the services performed by Retailer. (7.5)**

Retailer:

Retailer is a middleman between a wholesaler and actual consumers, who sells the goods to the consumers and maintains an intimate contact with the wholesalers, manufacturers, and consumers.

Services Performed by Retailers

Services to the Producer/Wholesaler

1. Retailer studies the tastes, likes and dislikes of the customers and through the wholesaler, communicates it to the manufacturer to enable him to improve his products accordingly.

2. They help the wholesaler and manufacturer by doing the job of advertisement by displaying goods in show windows or on counter or by any other means.

3. The retailer helps the manufacturers and wholesalers in meeting the various requirements of consumers living in every nook and corner of the country.

Services to the Consumers

1. They maintain a ready stock of goods to meet the demand of consumers.

2. They provide free home delivery service to the consumers.

3. A retailer displays the new products in show window and on counter for the information of the would-be consumers.

4. They provide credit facilities to consumers.

5. The retailers keep themselves well-stocked with different varieties of goods manufactured by different producers.

6. They maintain a regular contact with the customers to provide an opportunity to them to make a complaint regarding a substandard product, replacement of defective product etc.

7. The retailer offers free expert advice to his customers about the merits and uses of each product and about the availability of a better substitute.

****

b) Define the term Wholesaler, Describe the services performed by Wholesaler. (7.5)

Wholesaler:

- Wholesalers are the merchants who act as intermediaries between the manufacturer and the retailer.
- They buy goods and commodities in large quantities from the producer and sell them to the retailers.
- In pharmaceutical product selling, they require a drug license from the health department of the concern state government.

SERVICES PERFORMED BY WHOLESALERS

Services to Retailers

1. The wholesaler purchases goods from various producers and stores them at one place for retailers.

2. They help the retailers by supplying the goods to them promptly as compared to their getting the supply from the manufacturers.

3. The wholesaler buys goods in large quantities from the manufacturers and sells them in small quantities to the retailers.

4. The wholesalers help in stabilizing the prices by regulating the supply of goods and enable the retailers to earn a fair margin of profit.

5. The wholesaler usually obtains substantial discounts and rebates from the producers and are therefore able to give special discounts to the retailers on bulk purchases.

6. They inform the retailers regarding new products introduced into the market.

7. The wholesaler deals in a limited number of products and therefore gains expert

knowledge in his field of specialty. The retailer can also be benefited from the specialization achieved by the wholesaler.

8. They provide credit facilities to retailers. 9. They bear most of the risks connected with marketing and thus save the retailers from such risks (e.g., goods may be damaged, destroyed or stolen).

Services to Producers or Manufacturers

1. They buy goods in bulk from producers and relieve the producers of the botheration of collecting orders and supplying goods to widely scattered retailers.

2. The wholesaler trader helps in large scale production of goods by giving supply order for a bulk quantity.

3. They usually make cash payment for the goods purchased from producers. Thus, the capital invested by producers does not remain blocked for long which in turn results in quick turnover.

4. The wholesaler trader always maintains a sufficient stock of goods during the year.

5. They provide market information to the manufacturers so that they can regulate their production accordingly.

6. The wholesalers help the manufacturer in maintaining a uniform rate of production by placing advance supply orders.

S***ervices to the Society (Consumers)***

1. The wholesalers sell the goods to the retailers at uniform prices which helps in bringing uniformity in price of retailers.

2. Wholesalers purchase large quantity of goods from producers which helps to cut down the cost of production. Therefore, consumers can purchase the goods at reasonable price.

3. Wholesalers informed about the taste of consumers to the producers with the result consumers can purchase goods of their liking.

4. Wholesalers conduct market research from time to time. This help in the improvement in the existing product. Consumers get better quality products at reasonable price.

5. Wholesalers help in maintaining a balance in demand and supply and helps to stabilize the prices.

****

6. **Write short notes on following questions. (Any THREE) (5 x 3)**

a) Functions of Commercial Bank

Commercial Banks

A bank which accepts demand deposits and allows withdrawal of money by cheques or by any other means such as, providing finance for trade, industry and commerce, transferring money from one place to another.

Functions or Services of Commercial Banks

a. Services to depositors:

- Banks provide a means for saving money, i.e., by accepting money on deposits or saving accounts on which a reasonable interest is paid.
- They provide the following facilities to their customers: (i) Collect the amount of cheques, demand drafts, bills of exchange, hundis, local and foreign bills on behalf of their depositors. (ii) They offer discounting facilities in respect of local and foreign bills of their depositors. (iii) They also pay insurance premium, subscription and taxes on behalf of their depositors, if so desired.

b. Services by way of loans:

The commercial banks lend money to their customers in the following ways:

(i) Overdraft, (ii) Cash credit, (iii) Loans, (iv) Discounting of bills.

c. Miscellaneous services:

In addition to the above services, a bank provides several other services, such as,

(i) It buys and sells shares/bonds/debentures on behalf of its customers.

(ii) It accepts its customer's valuable articles, such as jewelry, securities, shares, other important documents for safe keeping in its strong room meant for this purpose. A strong room provides large number of cupboards of different sizes called lockers for safe keeping of belongings of customers.

(iii) Its interest/dividend on securities and shares belonging to its customers.

(iv) It makes regular payment of subscription, insurance premium, taxes etc. on behalf of its customers.

(v) A bank undertakes credit transfer from one branch to another.

(vi) It accepts and pays bills of exchange in respect of imported goods and purchases bills of exchange drawn by exporters on a foreign importer.

(vii) It helps people going or planning to go abroad by arranging for them foreign exchange or providing traveler's cheques and letters of credit.

(viii) It aids and advises the customers regarding investment and other financial matters.

****

b) Trial balance

- Trial balance is a statement prepared to check the arithmetical accuracy of the book-keeping entries up to the date stated at the head of the trial balance.
- Trial balance ensures that both the aspects of each transaction have been duly recorded.

Objectives of the Trial Balance

(a) To ascertain the arithmetical accuracy of the ledger accounts:

i. A wrong entry in the ledger

ii. Omission of an entry in the ledger

iii. Posting of a transaction in wrong columns.

iv. Posting of correct amount but to a wrong account.

(b) To help in locating errors:

i. A recheck of the tally of debits and credits of the trial balance.

ii. A recheck of the trial balance items with the ledger.

iii. Rechecking the totals of ledger and their balancing should be undertaken to see whether the difference in totals due to error in totaling/addition and balancing the ledger account.

iv. To check whether there are any in the books of original entry which do not have a ledger folio.

(c) To help in the preparation of final accounts:

The trial balance contains the list of all the ledger accounts with their debit and cred balances. So, while preparing the final accounts (financial statements there is no need to refer to the ledger. The financial statements can be easily prepared from a tallied trial balance.

****

c) Functions & Objectives of Inventory Control

An inventory shows major current assets of a business enterprise which described as the sum of the value of raw materials, fuels and lubricants, spare parts, maintenance consumables, semi-processed materials and finished goods stock of a business firm at any given point of time. Inventory management is essential to maintain a large size inventory for efficient and smooth production and for sales operation.

Functions of Inventory Control

i. To keep the inventories as low as possible consistent with the market conditions.

ii. To forecast market and economic conditions of supply as regards availability of materials.

iii. To maintain a sufficient stock of finished product to meet the reasonable expectations of customers for prompt delivery of goods.

iv. To maintain proper records so as to supply accurate and regular material reports to the management.

v. To minimize "out of stock" danger, which result in crash purchase at uneconomical rates.

Objectives of Inventory Control

The main purpose of having an inventory control is:-

1. Maximum customer service

2. Minimum inventory investment

3. Low-cost plant operation.

****

d) Difference between Journal & Ledger

Journal	**Ledger**
• It is the book of original entry. • It is the book for chronological record i.e., the transactions are recorded as and when they take place. • The unit of classification of data within the journal is the transaction. • From the books of original entry, the entries are transferred to the ledger. • The process of recording entries in the journal is called 'Journalizing. • In journal, there is one column for particulars and two columns for debit and another for credit. • Balancing is not done.	• It is the book of secondary entry. • It is the book for analytical record i.e., all the transactions relating to a particular account are recorded in order of their occurrence. • The unit of classification of data within the ledger is the account. • From the ledger, the Trial balance is drawn and then financial statements are prepared from it. • The process of recording entries in the ledger is called 'Posting. • In ledger, there are two equally for particulars and two columns for divided sides having identical amount one for debit and another column. The left side is known as debit side and the right side is known as credit. • All the accounts are balanced.

****

7. **Journalize the following transactions and post them into concerned ledger** **(15)**

i) On July 01, Mr. X started his business with a capital Rs.50,000/-

ii) Purchase goods for cash Rs.10,000/-

iii) Bought furniture for cash Rs. 6,000/-

iv) Cash deposited in bank Rs. 5,000/-

v) Good sold for cash Rs.20,000/-

vi) Paid salaries expenses Rs.6,000/-

vii) Paid house rent Rs.1,000/-

viii) Purchased goods from Mr. Y on credit Rs.15,000/-

ix) Paid advertisement expenses Rs.500/-

Journal Entry

Date	**Particulars**	**L.F.**	**Debit Amount (Rs.)**	**Credit Amount (Rs.)**
YYYY Jul/ 01 (i)	Cash a/c ……Dr To Mr. X's Capital a/c (Business started with cash)		50,000/-	 50,000/-
(ii)	Purchase / Goods a/c ……Dr To Cash a/c (Goods purchased on cash)		10,000/-	 10,000/-
(iii)	Furniture a/c ……Dr To Cash a/c (Goods purchased on cash)		6,000/-	 6,000/-
(iv)	Bank a/c ……Dr To Cash a/c (Cash deposited with the bank)		5,000/-	 5,000/-

Date	Particulars	L.F.	Debit Amount (Rs.)	Credit Amount (Rs.)
(v)	Cash a/c ……Dr To Sales/Goods a/c (Goods sold in cash)		20,000/-	20,000/-
(vi)	Salary a/c ……Dr To Cash a/c (Salary paid in cash)		6,000/-	6,000/-
(vii)	House rent a/c ……Dr To Cash a/c (Rent paid in cash)		1,000/-	1,000/-
(viii)	Purchase / Goods a/c ……Dr To Mr. Y a/c (Goods purchased on credit from Mr. Y)		15,000/-	15,000/-
(ix)	Advertisement a/c ……Dr To Cash a/c (Cash paid for advt.)		500/-	500/-
Grand Total			1,13,500/-	1,13,500/-

Ledger posting from Journal entries:

Cash Account

'Dr' 'Cr'

Date YYYY	Particulars	J.F.	Amount (Rs.)	Date	Particulars	J.F.	Amount (Rs.)
Jul/ 01 (i)	To Mr. X's Capital a/c		50,000/-	(ii)	By Purchase / Goods a/c		10,000/-
(v)	To Sales/Goods a/c		20,000/-	(iii)	By Furniture a/c		6,000/-
				(iv)	By Bank a/c		5,000/-
				(vi)	By Salary a/c		6,000/-
				(vii)	By House rent a/c		1,000/-
				(ix)	By Advertisement a/c		500/-
					By Balance		41,500/-
			70,000/-				70,000/-

Mr. X Capital Account

'Dr' 'Cr'

Date YYYY	Particulars	J.F.	Amount (Rs.)	Date	Particulars	J.F.	Amount (Rs.)
	To Balance		50,000/-	(i)	By Cash a/c		50,000/-
			50,000/-				50,000/-

Purchase Account

'Dr' 'Cr'

Date YYYY	Particulars	J.F.	Amount (Rs.)	Date	Particulars	J.F.	Amount (Rs.)
(ii) (viii)	To Cash a/c To Mr. Y a/c		10,000/- 15,000/-		By Balance		25,000/-
			25,000/-				25,000/-

Furniture Account

'Dr' 'Cr'

Date YYYY	Particulars	J.F.	Amount (Rs.)	Date	Particulars	J.F.	Amount (Rs.)
(iii)	To Cash a/c		6,000/-		By Balance		6,000/-
			6,000/-				6,000/-

Bank Account

'Dr' 'Cr'

Date YYYY	Particulars	J.F.	Amount (Rs.)	Date	Particulars	J.F.	Amount (Rs.)
(iv)	To Cash a/c		5,000/-		By Balance		5,000/-
			5,000/-				5,000/-

Sales Account

'Dr' 'Cr'

Date YYYY	Particulars	J.F.	Amount (Rs.)	Date	Particulars	J.F.	Amount (Rs.)
	To Balance		20,000/-	(v)	By Cash a/c		20,000/-
			20,000/-				20,000/-

Salary Account

'Dr' 'Cr'

Date YYYY	Particulars	J.F.	Amount (Rs.)	Date	Particulars	J.F.	Amount (Rs.)
(vi)	To Cash a/c		6,000/-		By Balance		6,000/-
			6,000/-				6,000/-

House rent Account

'Dr' 'Cr'

Date YYYY	Particulars	J.F.	Amount (Rs.)	Date	Particulars	J.F.	Amount (Rs.)
(vii)	To Cash a/c		1,000/-		By Balance		1,000/-
			1,000/-				1,000/-

Mr. Y. Account

'Dr' 'Cr'

Date YYYY	Particulars	J.F.	Amount (Rs.)	Date	Particulars	J.F.	Amount (Rs.)
(vi)	To Balance		15,000/-		By Purchase a/c		15,000/-
			15,000/-				15,000/-

Advertisement Account

'Dr' 'Cr'

Date YYYY	Particulars	J.F.	Amount (Rs.)	Date	Particulars	J.F.	Amount (Rs.)
(ix)	To Cash a/c		500/-		By Balance		500/-
			500/-				500/-

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Pharmaceutical Jurisprudence
Model Answers

1.(A)

i) Schedule T?

- Schedule T is defined as the schedule of drugs and cosmetic act & rules which represents the good manufacturing practice of ASU (ayurvedic, siddha and unani) medicines along with area required for premises, specification required, qualification required, recommended machinery and equipment etc.
- i.e.Bhasma, Rasa, Kupi-pakva, Parpati, Sindura, Karpu/Uppu/Puram, Kushta, Asava-arishta etc.

ii) Loan Licence?

- A person(applicant) who does not have his own arrangements(factory) for manufacture but who wish to avail the manufacturing facilities owned by another licensee. Such licenses are called Loan licenses.

iii) Denatured Alcohol?

- Denatured alcohol or denatured spirit means alcohol of any strength which have been rendered unfit for human consumption by the addition of substances approved by the central government or by the state government with approval of the central government.

iv) CLAA?

- CLAA means central license approving authority.

v) Poppy straw?

- Poppy straw means all parts (except the seeds) of the opium poppy after harvesting whether in their original form or cuts crushed or powdered and whether or not juice has been extracted therefrom.

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 and loss account existing at the beginning of any financial period.

vii) Landed cost?

- Landed cost means the cost of import of formulation inclusive of customs duty & clearing charge.

viii) Coca derivative?

- Coca derivative means:
  i. Crude cocaine i.e. any extract of coca leaf which can be used directly or indirectly, for the manufacture of cocaine.
  ii. Ecgonine & all the derivatives of ecgonine form which it can be recovered.
  iii. Cocaine i.e. methyl ester of benzoyl ecgonine and its salts.
  iv. All preparation containing more than 0.1 percent of cocaine

ix) Narcotic drug?

- Narcotic drugs mean coca leaf, cannabis (hemp), opium, oppy straw & include all manufactured drugs.

x) Misbranded drug?

- A drug shall be deemed to be misbranded
  i. If it is coloured, coated, powdered or polished to conceal the damage or if it is made to appear of better or greater therapeutic value than it is really is; or
  ii. If it is not labelled in the prescribed manner; or
  iii. If its label or container or anything accompanying the drug bears any statement, design or device which makes any false claims for the drug or which is false or misleading in any particular.

1. (B)

i) Name & place of the Laboratory where oral polio vaccine is tested?

- Polio Vaccine Testing Laboratory, Central Research Institute, Kasauli, India.

ii) Write the penalties where no punishment is defined in breach of medicinal& Toilet (ED) Act.

- Breach of the any of the rules made under the medicinal and toilet preparations act (Where no penalty is separately provided) shall be punishable with fine upto Rs. 1000.

iii) Define R-W coefficient?

- The Rideal-Walker coefficient is a figure expressing the disinfecting power of any substance and is obtained by dividing the figure indicating the degree of dilution of the disinfectant that kills a microorganism in a given time by that indicating the degree of dilution of phenol that kills the organism in the same.
- R W coefficient =**Dilution of the test disinfectant/dilution of phenol**

iv) Write the penalties for obstructing a drug inspector while discharging his/her duties?

- Whoever willfully 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 thereunder, or conceals or prevents any worker in a factory from appearing before, or being examined by, an Inspector, shall be punishable with imprisonment for a term which may extend to[6 months] or with fine which may extend to[10,000] or with both.

v) Write the ex officio members of PCI?

- **Ex officio members:**
    - The Director General of Health Services
    - The Director of Central Drugs Laboratory
    - The Drugs Controller of India

vi) What is ceiling price?

- Ceiling price means a price fixed by the government for schedule formulations.

vii) Differentiate between the Advertisement of drugs & ordinary consumer goods?

- **Advertisement of drugs:**

➢ Advertisements are essential in day life. However if drugs are advertised to general public, it may lead to self- medication and other dangers related to it.

➢ It includes all notices, circulars, labels. wrappers or other documents and all announcements made orally or by means of producing or transmitting light, sound or smoke.

- **Ordinary consumer goods:**

➢ Consumer goods are products bought for consumption by the average consumer. Also called final goods, consumer goods are the end result of production and manufacturing. Clothing, food products, and dishwashers are examples of common consumer goods.

viii) Differentiate between the Bonded & Non bonded laboratory?

- **Bonded laboratory:**

  Bonded laboratory means the premises approval & licensed for the manufacture & storage of medicinal & toilet preparation containing alcohol, on which duty has not been paid.
- **Non bonded laboratory:**

  Non bonded laboratory means the premises approved & licensed for the manufacture & storage of medicinal & toilet preparation containing alcohol, on which duty has been paid.

ix) Differentiate between the Prohibited & Exempted Advertisement?

- **Prohibited Advertisement**
    - ➢ **Advertisements, relating to drugs, which are likely to lead to their use in the following ailments or conditions:**
        i. For the procurement of miscarriage or prevention of conception in women.
        ii. For the correction of menstrual disorders in women.

- **Exempted Advertisement**
- **The following classes of advertisements and displays are exempted from the purview of the Act and hence can be made without any prohibition:**

  i. Sign boards or notices displayed by Registered Medical Practitioner (RMP) indicating that treatment is undertaken for the disease or disorder, advertisements relating to which are otherwise prohibited.
  ii. Books or treatises relating to the diseases or ailments which are otherwise prohibited to be advertised, provided published from bonafide scientific or social standing.

x) Differentiate between the Wholesale & Retail sale?

- **Wholesale:**
- Sells to a business for reselling.
- May manufacture the goods they sell in bulk amounts.
- May purchase in bulk from other distributors.
- Typically require bulk purchases to earn profit.
- **Retail sale:**
- Sells directly to the consumer.
- May manufacture the goods they sell in smaller amounts.
- May purchase smaller quantities from wholesalers.
- Mark up the cost of goods higher to earn a profit.

2. a) Education Regulations?

The PCI after approval of the Central Government may make regulations prescribing the minimum standards of education required for Pharmacists which may include:

1. Minimum Educational qualification required for ad- mission to the course of Pharmacy.

2. Duration of Course of Study and training.

3. Nature and period of Practical training to be under- taken after the completion of regular course.

4. Subjects of examination and the standards to be attained therein for qualification.

5. Minimum facilities required to be provided by an institution for the conduct of course, examination and practical training.

6. Conditions to be fulfilled by the authorities holding approved examinations.

According to ER-91 a candidate shall be eligible to undergo practical training after 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 recognised by the PCI.

iii. Licensed Pharmacy, chemists and druggists shops.

iv. Licensed drug manufacturing units.

Practical Training shall be of not less than 500 hours spread over a period of not less than three months out of which not less than 250 hours must be devoted to actual dispensing of prescriptions. In the course of practical training the trainee shall have exposure to :

1. Working knowledge of records required by various Acts covering the profession of Pharmacy, and

2. Practical experience in:

i. The manipulation of pharmaceutical apparatus in common use.

ii. The reading, translation and copying of prescriptions including checking of doses.

iii. The dispensing of prescriptions illustrating the common methods of administering medicaments.

iv. The storage of drugs and medical preparations.

2. b) Formula for calculation of retail price of drug calculation?

Calculation of retail price of formulation: The retail price of a formulation is calculated by the Government using following formula.

R.P. = (M.C + C.C. + P.M. + P.C.) x (1 + MAPE/l00) + E.D.

Where,

R.P. = retail price

M.C. = Material cost and includes cost of drugs and other pharmaceutical aids used including, overages and process loss specified as a norm from time to time.

C.C. = Conversion cost worked out in accordance with established procedures of costing and fixed as a norm every year.

P.M. = Cost of packing material of formulation including, process loss and shall be fixed as a norm every year.

P.C. = Packing charges worked out in accordance with established procedures of costing and fixed as a norm every year.

MAPE = (Maximum Allowable Post-manufacturing Expenses) All costs incurred by manufacturer from ex-factory to retailing stage and includes, margin for manufacturer and trade margin and it shall not be more than one hundred per cent for indigenously manufactured Scheduled formulation.

E.D. = Excise duty to be paid.

In case of imported formulation the landed cost shall form the basis for fixing its price along with margin to cover selling and distribution expenses and importer's profit which shall not exceed fifty per cent of landed cost.

2. c) Customs collector?

Introduction: -

- Some drugs may be imported licence. The without any permit or licence. 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 and Cosmetics Act and Rules.
- The law relating to the customs and goods, import of which is prohibited, is time being applicable for the drugs and 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, and if required forwards sample of such drug or cosmetic to CDL.

Function: -

i. Import of Drugs and Cosmetics is checked controlled by the Customs Collectors. And
ii. It the Customs Collector suspects about the imported drugs, he may take samples and forward them to the Central Drugs Laboratory. Calcutta or Central Research Institute, Kasauli for analysis. He may also detain such consignment until the analytical report is received.
iii. If the sample does not comply with the prescribed standards, the Customs Collector may direct the importer to send back the consignment to the manufacturer. The importer must send back the consignment within 2 months of the receipt of information from the Custom Collector.

The Qualification of the Custom collector is similar to **licensing authority as Following: -**

i. He is a graduate in Pharmacy/Pharmaceutical Chemistry/Medicine with specialization in Clinical Pharmacology/Microbiology, from a recognized university.
ii. He has experience in the manufacture or testing of drugs or enforcement of the provisions of the Act for a minimum period of five years. Provided that the requirement as to the academic qualification shall not apply to Inspectors appointed under this Act and who are in position on the date of commencement of the Drugs and Cosmetics (Ninth Amendment) Rules, 1989.

2. d) What are the recommendations of Drug Enquiry Committee?

Drugs Enquiry Committee: The Government of India responded to a strong public opinion on the subject of drugs, and in pursuance thereof, and that of the Resolution of 1927; appointed the Drugs Enquiry Committee (also known as the Chopra Committee) under the chairmanship of Col. R. N. Chopra and Dr. B. Mukherjee as its Assistant Secretary.

The Committee finally recommended:

i. Central legislation to control drugs and pharmacy. The legislation may consist of either a combined Drugs and Pharmacy Act or separate Drugs Act and separate Pharmacy Act.

ii. Setting up of testing laboratories in all States to control the quality of production of drugs and pharmaceuticals and a control laboratory to control the quality of imported drugs and also to act as expert referee in case of disputed samples sent by local Government.

iii. Appointment of an Advisory Board to advise the Government in making rules to carry out the objects of the Act.

iv. Setting up of courses for training in pharmacy and prescribing minimum qualification for registration as a pharmacist.

v. Registration of every patent and proprietary medicine of undisclosed formula manufactured in India or imported from outside the country,

vi. The crude single drugs as well as compounded medicines used in the indigenous system of treatment should be brought under control.

3. a) Define Advertisement?

- Advertisements are essential in day life. However if drugs are advertised to general public, it may lead to self- medication and other dangers related to it.
- It includes all notices, circulars, labels. wrappers or other documents and all announcements made orally or by means of producing or transmitting light, sound or smoke.

3. b) What kind of advertisement are exempted under drugs & magic remedies Act?

The following classes of advertisements and displays are exempted from the purview of the Act and hence can be made without any prohibition:

1. Sign boards or notices displayed by Registered Medical Practitioner (RMP) indicating that treatment is undertaken for the disease or disorder, advertisements relating to which are otherwise prohibited.

2. Books or treatises relating to the diseases or ailments which are otherwise prohibited to be advertised, provided published from bonafide scientific or social standing.

3. Advertisements sent confidentially, in the prescribed manner, to RMP's. However, such advertisements should bear the following words on top, in a conspicuous manner for the use of RMP or a Hospital or a Laboratory.

4. Any advertisement relating to a drug printed or published by the Government or by any person with the prior permission of the Government. 5.

Advertisements, labels or set of instructions which are permitted under the Drugs and Cosmetics Act or Rules made thereunder.
The Central Government may also permit the advertisement of any drug which it feels shall be in the interest of thepublic.

3. c) Discuss about exemption from duty on medicinal preparations supplied from Bonded laboratory?

- The preparations supplied to Government hospitals, dispensaries and charitable hospitals and 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, licenced or approved for this purpose and on which excise duty is not paid until the finished products are removed from the licenced 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 and observance of the rules.

3. d) Qualification & functions of drug inspector?

- The Drug Inspectors are appointed both by State Government and Central Government for specific areas or for specific category of activity.

  I. Qualification for Drug Inspector

  The person should not have direct or indirect financial interest in any of the activities concerned with import, manufacturing, sale or distribution of drugs. A graduate in pharmacy or pharmaceutical sciences or medicine with specialization in clinical pharmacology or microbiology from a University established in India, is eligible for the post of Inspector. For the purpose of Schedules C and C (1) drugs,

  (i) a drug inspector with at least 18 months of experience in manufacturing of at least one substance specified in Schedules C and C (1).

  (ii) a drug inspector with at least 3 years experience in inspecting the firms manufacturing Schedules C and C (1) drugs.

  (iii) a drug inspector with minimum of 18 months experience in testing of at least one of the substances in schedules C and C (1) in a laboratory approved for the purpose.

  The requirement of these qualifications shall not, however, apply to those persons appointed as Inspector on or before 18th October, 1993. Every Inspector shall be deemed to be a public servant under Section 21 of the Indian Penal code.

  II. Duties of Inspectors for Premises Licensed for Sale

  Subject to instructions of Controlling Authority, it shall be the duty of an Inspector authorized to inspect premises licenced for the sale of drugs.

  (i) to inspect, not less than once a year, all establishment for sale.

  (ii) to satisfy himself that conditions of licences are being observed.

(iii) to procure and send the drug for test or analysis if he has reason to suspect that drug is sold or stocked in contravention with provisions of the Act or Rules.
(iv) to investigate complaint in writing.
(v) to maintain a record of inspections.
(vi) to make necessary enquiries.
(vii) to institute prosecutions in respect of breaches of the Act and Rules.
(viii) when authorized by the State Government, to detain imported packages which he has reason to believe contain drugs, the import of which is prohibited.

III. Duties of Inspectors Specially Authorized to Inspect Manufacture of Drugs or Cosmetics

Subject to instructions of Controlling Authority, the following duties are performed:
(i) to inspect, not less than once a year, all premises licenced for manufacture of drugs or cosmetics
(ii) to satisfy himself that conditions of licence are fulfilled.
(iii) to inspect plant, process of manufacture and standardization, storage, technical qualifications and other details for Schedules C and C (1) drugs.
(iv) to send detailed inspection report to Controlling Authority.
(v) to take samples for test or analysis in accordance with Rules.

The Inspector, except for official business or when required by law, shall not disclose any information acquired by him. If he has sufficient reasons to believe that violation of provisions of DCA is taking place, he/she may and seize records or ask the manufacturer not to sell the drugs for a period of 20 days. Drug Inspector if required may take the xerox copies of the seized documents signed by the owner of the documents. Drug Inspector is supposed to carry a routine inspection at least once
in a year of a shop or a manufacturing unit within his area. The inspection should be generally carried out at reasonable time preferably during working hours. However if he/she has sufficient reasons to believe that contravention of the provision of DCA is taking place he/she accompanied by sufficient force may raid the premises and seize the documents, records or the medicines as the case may be.

4. a) Define the objective of the D & C Act? Discuss about the qualification of the licensing authority?

- **Objective:** The qualification of a licensing authority has been prescribed under "Rule 49A" by the Drugs and Cosmetics (Ninth amendment) Rules, 1989. Thus although the licencing authorities were performing an important executive function under the Act, their qualification was not prescribed until April 1989. The Drugs Controller, India has been notified as the Central Licence Approving Authority.
- **Qualification:** No person shall be qualified to be a licensing authority under the Act unless-

(i) He is a graduate in Pharmacy/Pharmaceutical Chemistry/Medicine with specialization in Clinical Pharmacology/Microbiology, from a recognized university. (ii) He has experience in the manufacture or testing of drugs or enforcement of the provisions of the Act for a minimum period of five years. Provided that the requirement as to the academic qualification shall not apply to Inspectors appointed under this Act and who are in position on the date of commencement of the Drugs and Cosmetics (Ninth Amendment) Rules, 1989.

4. b) Write the function of DTAB? Discuss the nominated members & elected members of DTAB?

- **Function:** It is a Statutory Board constituted by the Central Government under the provision of this Act to advise the Central Government and State Governments on all the technical matters related with the Act and also to set in the guidelines for types of formulations as and when asked for by the Central Government. It is a technical advisory body represented.
- **Nominated members:**
  i. Two persons nominated by the Central Government from amongst persons who are in charge of drugs control in States.
  ii. One person from the pharmaceutical industry, nominated by the Central Government.
  iii. Two Government analysts, nominated by the Central Government.
- **Elected members:**
  i. A teacher in pharmacy or pharmaceutical chemistry or pharmacognosy on the staff of an Indian University or 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 Council of the Central Medical Association.
  v.One person to be elected by the Council of the Indian Pharmaceutical Association.

5. a) Define ethics?

- The pharmaceutical Ethics Defined as the code of moral principles or the science of morals which is concerned with human character.

5. b) Describe briefly the essential features of code of ethics framed by PCI?

- **Essential features of pharmaceutical ethics:**

i. The pharmacist should be a good and law-abiding citizen conversant with Acts and Rules governing his/her profession.

ii. He/she should be a person with an attitude of service and sacrifice and concern for welfare of both patients and public.

iii. The pharmacist must be capable of upholding honor and dignity of the profession and not getting involved in any action which may bring disrepute the profession.

iv. The pharmacist should never disclose any information about patientor his family which he/she has acquired as part of professional activities, unless required to do so by law.

v. The pharmacist should not get involved in any unethical work under duress or pressure.

vi. Unethical and cut-throat publicity of professional services offeredby the pharmacist are against basic values of the profession. The pharmacist should not get involved in such unethical practices.

vii. The pharmacist should offer services directly to the public in his/her own premises which reflect the professional character of pharmacy.

viii. The pharmacist should receive the prescription of a doctor without any comment or discussion over it. He/She should not add, omit or substitute any content of the prescription without the consent of the prescriber. He/She should answer any questions on the prescriber to the customers with caution and core. In case of any error in the prescription, it should be referred back to the prescriber for correction.

ix. The pharmacist should keep himself/herself abreast with the progress of pharmaceutical knowledge in order to maintain high standard of professional competence. He/She should exchange such information with fellow pharmacist.

x. The pharmacist as an integral component of health care team should always endeavor to cooperate with doctors, nurses and other members of health care system. xi. The pharmacist should possess good communication skills to be able to work closely with other health care providers.

xii. The pharmacist should help the client with personal consultation and about proper use of medicines and other health care products. The information provided must be clear, understandable, correct, up-to-date and explicit.

xiii. The pharmacist should be alert to occurrence of adverse effects of medicine and same should be recorded in the individual patient medication record.

xiv. The pharmacist should be an active member of all professional associations or organizations which are established with an objective of sincerely serving the cause of the profession.

- The chariot of health care system is driven by four giant wheels represented by doctors, pharmacists, nurses and other paramedical personnel. So long as the four wheels of the chariot are co-axial, the chariot of health care shall march steadily on the path of prosperity and good health. The moment there is imbalance in mobility of the chariot due to defect in one of the wheels, the chariot is bound to collapse mid-way, and the dream of attaining excellence in health remains unfulfilled.

5. c) What is the purpose of this code?

- The pharmacist is a vital link between the doctor and the patient. He is charged with the responsibility of providing professional services of high order to the community at large by ensuring production of Quality Medicine and their sale and distribution to the consumers. The techno-professional background of the pharmacist gives him/her the confidence of providing services with ethical approach to the satisfaction of patients. The sacred values are required to be cherished and professed by the pharmacist. Government restricts the practice of pharmacy to those who qualify under regulatory requirement and expects the pharmacist to fulfill his/her professional obligations honorable and with due regard for the well being of society.

6. a) Government analyst?

Government Analysts are appointed by the Central Government or a State Government u/s 33-F in relation to Ayurvedic, Siddha or Unani drugs and u/s 20 in relation to any other drug or cosmetic. The State Government may, by notification in the Official Gazette, appoint such persons as it thinks fit, having the prescribed qualifications, to be Government Analysts for such areas in the State and in respect of such drugs or classes of drugs as it may notify. The Central Government may also similarly appoint Government Analysts, in respect of such drugs, classes of drugs, cosmetic and classes of cosmetics, as specified.

Qualifications: For the appointment as a Government Analyst, a person should be:

i. A graduate in medicine/science/pharmacy/pharmaceutical chemistry of a recognised university and have five years post graduate experience in the testing of drugs in a laboratory under the control of (i) a Government Analyst or (ii) head of an approved institution or testing laboratory or has completed two years' training on testing of drugs, including items stated in Schedule C, in Central Drugs Laboratory, or

ii. A post graduate in medicine/science/pharmacy/pharmaceutical chemistry of a recognised university or Associateship Diploma of the Institution of Chemists (India) obtained by passing the said examination with Analysis of Drugs and Pharmaceuticals as one of the subjects with at least three years experience in the testing of drugs in a laboratory under the control of (a) a Government Analyst; or (b) head of an approved institution or testing laboratory or has completed two years' training on testing of drugs, including items stated in Schedule C, in Central Drugs Laboratory.

Duties of government analysts:

i. To cause to be analysed or tested samples of drugs or cosmetics sent to him under the Act and to furnish reports of the results of test or analysis.

ii. Forward to the Government from time to time, reports giving the results of analysis work and research with a view to their publication at the discretion of Government.

6. b) Scope of pharmaceutical legislation in India?

Scope and Objectives of Pharmaceutical Legislation in India:-

i. A Central law to control drugs and pharmacy profession.

ii. Setting up of testing laboratories in all States to control the quality of production of drugs and pharmaceuticals and a central laboratory to control the quality of imported drugs and also to act as expert referee in case of samples sent by local/state Government.

iii. Appointment of an Advisory Board to advise the Government in making rules to carry out the objectives of the Act.

iv. Setting up of courses for training of pharmacist and prescribing minimum qualifications for registration as pharmacist.

v. Registration of every patent and proprietary medicines of undisclosed formula manufactured in India or imported from outside the country.

vi. The crude single drugs as well as compounded medicines used in the indigenous systems of treatment should be brought under control.

vii. The drug industry in India should be developed.

viii. The manufacturing in Medical Stores/Depots should be gradually reduced.

ix. An Indian Pharmacopoeia be compiled.

The following pharmaceutical legislation and actions of the Central Government can be traced to the above recommendations:

i. Passage of Drugs Act in 1940 to regulate the import, manufacture, distribution and sale of drugs. The Drugs Rules were framed in 1945 to give effect to the provisions of the Act.

ii. The Pharmacy Act, 1948 provided the regulations for the profession and practice of Pharmacy. The educational regulations prescribed the minimum qualifications for registration as pharmacist.

iii. Drug testing laboratories have been set up at State and Central Government level.

iv. Suitable Advisory Boards such as Drugs Technical Advisory Board (DTAB) and Drugs Consultative Committee (DCC) have been set up.

v. Drugs manufactured according to the indigenous systems of medicine (Ayurveda, Siddha, Unani Tibb) and Homeopathic medicines have been brought within the purview of Drugs and Cosmetics Act, 1940.

vi. Registration of all drugs and formulations sold in India.

vii. A rapid and phenomenal growth by the Indian Pharmaceutical industry which now manufactures most bulk drugs and formulations needed in the Juan country as well as exports them to various countries. Many Indian pharmaceutical companies have become multinational.

viii. Pharmacopoeias for drugs used in indigenous sys- terms of medicine are being developed.

ix. As more formulations of standard quality are available commercially, manufacturing in Medical Stores and Hospital pharmacies has been minimized.

6. c) Function of PCI under Pharmacy Act?

- **Pharmacy Council of India**
- The Pharmacy Council of India is constituted by the Central Government every five years. The first Pharmacy Council of India (PCI) was constituted in the year, 1949.

Functions of Pharmacy Council of India:

i. To prescribe the minimum standards of education re- quired for qualification as a Pharmacist (also known as Education Regulations).

ii. To regulate the minimum educational standards by inspecting the institutions.

iii. To recognise qualification granted outside the territory to which the Pharmacy Act, 1948 extends, for the purpose of qualifying for registration.

iv. To compile and maintain a Central Register for Pharmacists containing names of all registered persons. 5. Any other function required for the furtherance of objectives of Pharmacy Act, 1948.

6. d) State Pharmacy Council?

- The Pharmacy Act, 1948 also provides for the constitution of a State Pharmacy Council in each State. Two or more States can also enter into an agreement to form a Joint State Pharmacy Council or otherwise the State Pharmacy Council of one State may serve the needs of the other participating States. The State Pharmacy Council and the Joint State Pharmacy Council has the following constitution:

State Pharmacy Council	Joint State Pharmacy Council
Elected Members:	
1. Six members elected amongst themselves by Registered Pharmacists of the State.	Six Members elected amongst themselves by Registered Pharmacists of each participating State.
2. One member elected by the Medical Council of the State from amongst its members.	One member elected by the Medical Council of each State from amongst its members.
Nominated Members:	
1. Five members nominated by the State Government of whom at least three should possess a degree or diploma in pharmacy or pharmaceutical chemistry or be Registered Pharmacists.	Two to four members nominated by each participating State of whom more than half should possess a degree or diploma in pharmacy or pharmaceutical chemistry or be Registered Pharmacists.
Ex-officio Members:	
1. Chief administrative medical officer of the State.	Chief administrative medical officer of each of the participating State.
2. Officer-in-charge of Drugs Control Administration of the State.	Officer-in-charge of Drugs Control Administration of each participating State.
3. Government Analyst of the State or where there is more than one Analyst, such one as may be appointed by the State Government.	Government Analyst of each participating State or where there is more than such one as may be appointed by the

	State Government

7. a) Discuss on provision for import, possession & sales of poison according to poison Act?

Introduction: The Poisons Act was passed on 3rd September, 1919 with a view to control the import, possession and sale of poisons. The act extends to the whole of India except the state of Jammu and Kashmir where only certain provisions related to the importation of specified poisons into India are applicable.

Import of Poisons: The import of poisons is permitted only by persons who have been granted licence for the purpose by the Central Government. Such persons may import poisons across one of the defined customs frontiers and in accordance with the conditions of the licence. The Central government may prohibit the import of any specified poison across any defined custom frontiers into India.

Possession & sales of poison:

1. The grant of licences for the possession and sale of any specified class of poisons and fixing of the fees to be paid for grant of such licences.

2. The classes of persons to whom the licences for the possession and sale of poisons are to be granted.

3. The categories of persons to whom the poisons may be sold.

4. The maximum quantity of poison that may be sold to a person.

5. Maintenance of a sales register by the persons who have been granted licence.

6. The safe custody of poisons and labelling of the vessels. packages or coverings, etc., in which poisons are sold or stored for sale.

7. b) Discuss the offences & punishment laid down on contravention of NDPS Act, 1985?

Objective: It is the Act to consolidate and amend the law relating to narcotic drugs; to make stringent provisions for the control and regulation of operations relating to narcotic drugs and psychotropic substances; to provide for the forfeiture (seizure) of property derived from or used in illicit traffic in narcotic drugs and psychotropic substances; to implement the recommendations of the

International Conventions on narcotic drugs and psychotropic substances; and for matters connected therewith. The Act extends to whole of India.

Offences and Penalties:

i. For offence in relation to poppy straw, coca plant and leaves, prepared opium poppy or cannabis plant, there is punishment of rigorous imprisonment of 10-20 years and fine of not less than Rupees one lakh in case of first conviction. However, the subsequent conviction is punishable with rigorous imprisonment of 15-30 years and fine of RS 1.5 to 3 lakhs.

ii. For contravention or offence relating to ganja, punishment is up to 5 years and fine up to Rs.50.000 or both.

iii. In relation to manufactured drugs and preparations, psychotropic substances, external dealings of NDPS etc., for first conviction, the punishment is rigorous imprisonment of 10-20 years and fine of Rs.1-2 lakh. The subsequent conviction is punishable with rigorous imprisonment of 15-30 years and fine ofRs.l.5-3 lakhs.

iv. For allowing premises to be used for offence, first conviction is punishable with rigorous imprisonment of 1 0-20 years and fine of Rs 1-2lakhs while, for subsequent conviction, the punishment is rigorous imprisonment of 15-30 years and fine of Rs. l.5-3 lakhs.

v. The offence for illegal possession of NDPS by an individual in small quantity for personal consumption is punishable with 6 months to 1 year imprisonment or fine or both.

vi. For illegal traffic of NDPS and also for harboring offenders or helping offenders, the punishment is imprisonment of 10-20 years and fine of Rs 1-2 lakhs. For subsequent conviction, rigorous imprisonment is for 15-30 years and fine of Rs. 1.5-3 lakhs.

vii. Death penalty: There is a provision of death penalty for certain serious offences that are committed after previous conviction. If any individual or firm is found to possess more than following quantities of NDPS without permission, licence, etc., and if the offence is repeated, the death penalty may be awarded. Death penalty may also be awarded for a serious offence of financing directly or indirectly such a big crime as indicated. Special Courts may be constituted with single judge appointed by the Chief Justice of the High Court to dispose of the cases of NDPS.

D.PHARM PART (II) -2022(I) MODEL ANSWERS E.R 1991

SUB: PHARMACOLOGY & TOXICOLOGY (T)

1.A) a. Haematinics- These are substances required in the formation of blood, and are used for treatment of anaemias.

b. Myasthenia gravis- It is a disease characterised by weakness of rapid fatigability of skeletal muscle. It is an autoimmune disorder of neurotransmission at neuromuscular junction.

c. Neuroleptics- They are also called antipsychotic or major tranquilizer. It is useful in all types of functional psychosis, especially schizophrenia, mania.

d. Glaucoma-It is a disorder characterised by increase in intraocular tension / pressure occurs due to excessive production of aqueous humour or due to decreased drainage. It produces pain in eye and can damage optic nerve and can lead to blindness.

e. Uricosuric agent -These are the agents used in the treatment of gout ; a painful arthritic condition caused by excessive uric acid in the blood that gets deposited as monosodium urate crystals in joints. It inhibits reabsorption of urate in the kidneys there by increasing its excretion in the urine. (i.e., Allopurinol, Probenecid)

f. Hypertensive Crisis-Food products like cheese contain tyramine. In the presence of MAOI, tyramine is not metabolised. This leads to accumulation of tyramine. Tyramine produces rise in blood pressure by releasing noradrenaline.

g. Teratogenic effect -Drugs when given to pregnant women are likely to produce foetal abnormalities. eg.- Thalidomide

h. Anaemia- It is a condition where there is a decrease in the number of RBCs or haemoglobin.

i. Broad spectrum Antibiotics- Antibiotics used against both gram positive and gram negative bacteria and also against rickettsia and chlamydia.

j. Zollinger Ellison Syndrome-I t is a rare condition in which one or more tumours are grown in pancreas or in upper part of the small intestine.

B) i. Receptor- It is defined as a macromolecule or binding site located on the surface or inside the effector cell that serves to recognize the signal molecule/ drug initiate the response to it ,but itself has no other function. It may be a protein or enzyme.

ii. Antagonist- an agent/drug which prevents the action of an agonist on a receptor, but it does not have any effect of its own. It has affinity but no intrinsic activity.

iii. Tolerance- It is an unusual resistance to normal therapeutic dose of a drug, happens due to repeated administration

iv. Therapeutic Index-It is defined as the ratio of median lethal dose to median effective dose.

Therapeutic index= LD_{50}/ED_{50}

v. Potentiation(Supra additive)-The effect of combination is greater than individual effect of the component: effect of drug A+B $\geq$ effect of drug A+ effect of drug B.

vi. Bioavailability- It is the quantity of drug that is absorbed and reaches into the systemic circulation after administration by any route. It is 100% in case of I.V. route.

vii. Enzyme Induction- It is the increase of metabolic activity of enzyme either by binding the enzyme and activating it.

viii. Tachyphylaxis- It is an acute tolerance that develops due to repeated administration of a drug at short intervals. In this case drug response decreases.eg Tyramine

ix. Sequential pill- Sequential pills contain only oestrogen during the first part of the cycle and an oestrogen and progestogen thereafter. Oestrogen alone is given from the 5^{th} to 20^{th} day. From the 21^{st} day oestrogen progestin combination is given.

x. Biological lag- It is the interval between administration of a drug and development / commencement of response.

2. Diuretics are drugs which increase the flow of urine. These drugs are mainly used for relief of oedema. Also they are useful for the elimination of toxic product through urine.

Classification of diuretics:

A) Based on mechanism of action-

1.Promoter of glomerular blood flow - Xanthine

2.Inhibitor of tubular reabsorption - Thiazide, Acetazolamide

3.Antagonist of aldosterone - Spironlactone

4.Osmotic diuretics - Mannitol, Glycerol, Isosorbide

5.Potassium retaining diuretics - Triamterene, Amiloride

6.Loop of Henle diuretics - Furosemide, Ethacrynic acid

B) Based on Potency-

1.Weak diuretics - Osmotic diuretics, Xanthine derivative, Carbonic anhydrase inhibitors

2. Moderately potent diuretics - Thiazides

3.Very potent diuretics(High ceiling diuretics) - Furosemide, Ethacrynic acid

4.Potassium retaining diuretics - Triamterene, Amiloride , Spironlactone

Mechanism of action-

These compounds have highest efficacy (high ceiling) and they mainly act on the thick ascending limb of the loop of Henle (loop diuretics), exert inhibitory effect on Na^+,K^+,$2Cl^-$ carrier system and inhibit the reabsorption of both Na^+ and Cl^-.This makes the tubular fluid hypertonic drawing more water into it, and as a consequence there is excretion of more K^+ and H^+ in to the distal tubule. Excretion of Ca^{+2} and Mg^{+2} are also enhanced and excretion of Cl^- is greater than that of Na^+.

Pharmacological action-

- Kidney-Excretion of Na^+,K^+,Cl^-,PO_4^{-2},Excessive chloride loss- Hypochloremic alkalosis
  K^+ loss hypokalaemia (less marked with furosemide than thiazide)
  Little change in urine PH
- Furosemide dilates peripheral vasculature.
- Lowers the arterial BP, rapid venous pooling of blood reducing cardiac preload and afterload.
- Metabolic action- Increased blood uric acid and disturbances of glucose tolerance increased blood urea.Ca^{++} and Mg^{++} excretion also increases.

Adverse Effect-

- Muscle weakness and cramps due to electrolyte loss
- Cardiac arrest on intravenous administration
- Skin rashes , nausea and diarrhoea
- Liver and bone marrow changes

Uses-

- In acute pulmonary oedema.
- Acute renal failure
- In hypercalcaemia
- In Poisoning due to barbiturate and halides
- In raised intracranial pressure , they reduce intracranial tension by reducing blood volume.

3. Local anaesthetics are agents which block the peripheral nerve conduction of impulses . When applied locally they produce loss of sensation in that particular area.

Classification of drugs:-

A. Injectable

1. Low potency - Procaine, Chloroprocaine

2.Intermediate potency - Lignocaine, Prilocaine

3.High potency - Tetracaine, Bupivacaine, Ropivacaine

B. Surface anaesthesia - Cocaine, Lignocaine, Benzocaine

Mechanism of action-

It prevents the generation and conduction of impulses. This is produced by blocking voltage dependent sodium channels. So they decrease the permeability of cell membrane to sodium (membrane stabilizing effect).This prevents depolarisation. As a result i) rise of action potential declines ii) impulse conduction slows iii) nerve conduction fails.

Pharmacological actions-

- Effect on sensation :- Initially the local anaesthetics block the sensation of pain and temperature. Later they produce loss of sensation for touch and pressure. They produce blockade of smaller nerve fibres initially followed by large nerve fibres. Recovery occurs in the reverse order.
- Central nervous system :- Local anaesthetics produce stimulation of CNS. This manifests as euphoria, restlessness and tremors. Addiction to cocaine occurs mainly due to its euphoric effects.
- Cardiovascular system :- All local anaesthetics except cocaine produce vasodilation and so hypotension. But cocaine produces vasoconstriction and so a hypertensive effect. All local anaesthetics produce a depressant effect on the myocardium.
- Other actions :- They produce relaxant effect on smooth muscles and neuromuscular blockade.

Adverse effect-

- Intolerance like dermatitis, asthmatic attack and anaphylactic reactions.
- CVS like hypotension and cardiac arrest, CNS like euphoria, excitation, restlessness, tremors, and convulsion.

Uses -

- Surface anaesthetics for pain due to burns, fissures and ulcers.
- Infiltration anaesthesia to anaesthetise nerve endings by subcutaneous infiltration.
- Nerve block anaesthesia where it is injected close to a specific nerve.
- Spinal anaesthesia where it is injected into the subarachnoid space.
- Systemic use for antiarrhythmic effect .

4. a) Angina Pectoris- It is a Coronary artery disease where 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 dilate 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 vasodilators in human body. It is produced by endothelial cells and is responsible mainly for dilation of veins. To some extents it also dilate 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 like Captopril , Lisinopril, Enalapril

Adverse effect-

Flushing, Throbbing headache 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.

5.a) Calcium Channel Blockers

Mechanism Of Action-

Contraction of cardiac and smooth muscles depend on calcium concentration. CCBs interfere with the entry of calcium in to myocardium.so that cardiac muscle relaxes.

a) Voltage dependent channel-It opens and closes in response to a voltage gradient. Calcium channel blockers close this gate. This inhibits the entry of extracellular calcium.

b) receptor operated channel- is activated by alpha adrenergic agonists or angiotensin. This channel is also blocked by calcium channel blockers.

c) sodium channel exchange- it is important only for the action of cardiac glycosides.

Important actions of CCBs are-

- Negative ionotropic effect which decreases cardiac contractility
- Dilatation of coronary arteries
- Relaxation of peripheral blood vessels
- Antiarrhythmic effect
- Antianginal effect

b) MAO inhibitors: (Monoamine oxidase inhibitors)

Mechanism of action-

Biogenic amines like 5- hydroxyl tryptamine, noradrenaline and dopamine are inactivated by the enzyme monoamine oxidase(MAO). MAOI inhibits the enzyme MAO. This leads to accumulation of these amine in brain. This produces antidepressant effect.

Pharmacological actions-

- Behaviour- In case of mental depression these compounds elevate the mood. The patient feels more energetics and fresh.

- Reserpine reversal: in animals pre-treated with MAOI, reserpine does not produce drowsiness. Instead, it produces agitation and excitement. This is called as" reserpine reversal".
- CVS: No effect on heart or circulation at normal dose.
- Potentiation of sympathomimetic amines: These compounds potentiates the action of sympathomimetic amines , amphetamine and tyramine.

Adverse reaction-

- Behavioural effects: Headache ,excitement and disturbed sleep
- CNS effects: Twitching, ataxia and tremors
- ANS effects: Dry mouth constipation and blurred vision
- Hypertensive crisis

Uses -

Antidepressant effects.

c) Oral hypolipemic agents-

Hypolipemic agents are those which lower the levels of lipids and lipoprotein in blood. Lipoproteins are necessary for the transport of cholesterol and triglyceride in blood. The plasma lipoproteins are chylomicrons, very low density lipoprotein (VLDL), intermediate density lipoprotein (IDL), low density lipoprotein (LDL) and high density lipoprotein (HDL).

Classification-

1. HMG-CoA reductase inhibitor (Statins)- atorvastatin, pravastatin, lovastatin
2. Bile acid binding agents- cholesteramine, cholestipol, cholesevelam
3. Fibric acid derivatives- gemfibrozil, fenofibrate, clofibrate
4. Lipolysis and triglyceride synthesis inhibitor- nicotinic acid
5. Dietary cholesterol absorption inhibitor- ezetimibe

HMG-CoA reductase inhibitor (Statins)-

Statins are most effective agents for treating hyperlipidaemias. They include rosuvastatin, atorvastatin and pravastatin.

Mechanism of Action –

Statins competitively inhibit HMG-CoA reductase, the rate limiting step in cholesterol biosynthesis (I.e., the conversion of HMG-CoA to mevalonate). This results in decrease in blood LDL and VLDL levels. Decrease in cholesterol synthesis increases LDL receptor in the liver which increases LDL uptake and degradation. Thus statins are very effective in reducing plasma LDL levels. They also reduce triglycerides (TGs) and increase HDL cholesterol levels in plasma. Statins are usually given once daily in the evening because cholesterol biosynthesis occurs mainly at night. Atorvastatin and rosuvastatin have long half life.

d) 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 pholcodine

2.Non opioid antitussive: Noscapine, dextromethorphan

3.Antihistamine: Chlorpheniramine, 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

e) Stages of general anasthesia:

Anaesthetic agents cause dose dependant depression of the central nervous system. They depress the CNS in the descending order I.e., higher cortical centres first and the medullary centres are depressed the last. The depth of anaesthesia is assessed by respiratory movements and conjunctival reflexes. Accordingly, the anaesthesia can be divided into 4 stages as given below.

- Stage 1 – this is the period from the beginning of anaesthetic administration to the loss of consciousness. the patient progressively losses pain, but motor activity and reflexes remain normal. There is relief of pain from cutaneous receptors. This stage is also called stage of analgesia.
- Stage 2 – this period extent from the loss of consciousness, through a stage of irregular and spastic breathing to the re-establishment of regular breathing. The eyes move in a roving motion and the pupils are dilated. The patient may laugh, vomit or struggle and for this reason it is called the stage of excitement.
- Stage 3- this is the stage of surgical anaesthesia as most surgical operation are performed in this stage. It is sub-divided into 4 planes of increasing anaesthetic depth. The movement of the eyes gradually stop, the pupils constrict and then dilate progressively, the eyelid and then the corneal and pupillary reflexes disappear. Respiration which at first is deep and regular becomes more shallow and diaphragmatic.
- Stage 4 – this stage is called medullary paralysis indicating imminent death, the pupils are completely dilated and finally respiratory arrest followed by circulatory failure occurs.

6. Opioid analgesics- They are also known as narcotic analgesics produce their action of relieving pain by acting on the 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 produces a biphasic action and mediates its action through opioid receptors like mu , kappa & delta . It relieves severe pain like visceral pain and pain of trauma , cancer etc
- 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 on respiration
- Pupil-Constriction of pupil (miosis). Morphine addicts have constricted pupil (pin point pupil).
- Emetic action- Small doses produces vomiting by stimulating CTZ
- Antitussive effect- it suppresses cough by depressing cough centre.
- G.I.T- It is used in diarrhoea and produces constipation
- Other smooth muscle- constrict of bronchi is produced at large doses.

  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. Anti-depressant drugs-

These are drugs used for the treatment of mental depression. They are also called as psycho analeptics or mood elevators.

Classification-

1. Reversible inhibitors of MAO- A (RIMAs) – moclobemide, clorgyline
2. Tricyclic antidepressants (TCAs) –
   i) NA+ 5-HT reuptake inhibitors – imipramine, amitriptyline, trimipramine
   ii) Predominantly NA reuptake inhibitors – desipramine, nortryptiline, reboxetine
3. Selective serotonin reuptake inhibitors (SSRIs) – Fluoxetine, fluvoxamine, sertralinine
4. Serotonin and nor adrenaline reuptake inhibitors (SNRIs) – venlafaxine, duloxetine
5. Atypical antidepressant- trazodone, mianserine, mirtazapine

Mechanism of Action –

The TCAs and related drugs inhibits NET (norepinephrine transporter) and SERT(Serotonin transporter) which mediate active reuptake of biogenic amines NA and 5-HT into their respective neurones and thus potentiate them by increasing their availability in the synaptic cleft.

Pharmacological Action –

- Behaviour – in case of mental depression these compounds elevate the mood. The patient feels more energetic and fresh.
- CVS – no effect at normal dose but toxic doses may produce cardiac arrhythmia.
- ANS – TCA produces anti cholinergic effects like dry mouth, constipation, palpitation and blurred vision.

Adverse Effect-

- CNS- lethargy, headache and drowsiness
- ANS- dry mouth, constipation and tachycardia
- CVS- cardiac arrhythmia and hypotension
- Allergic Reaction- skin rashes and photo sensitivity

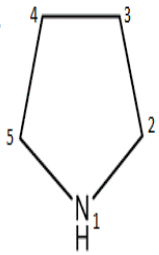
Model answers

PHARMACEUTICAL CHEMISTRY-II

D. Pharm Part – II Examination - 2022(II)

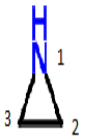
Q1. A) Write the structure of the heterocyclic ring with numbering & give suitable example

a.

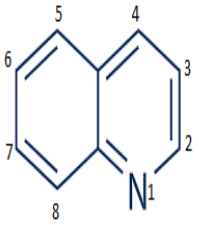


e.g- Ethosuccimide

b.

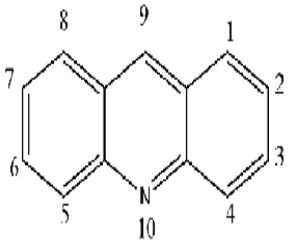


e.g- Mitomycin



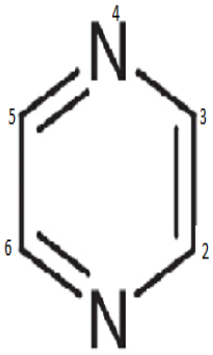
e.g-Chloroquine

d.



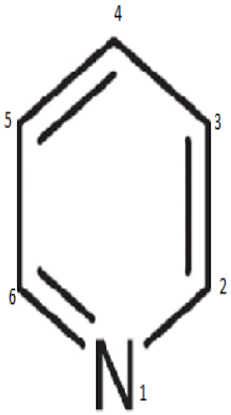
e.g-Proflavin

e.



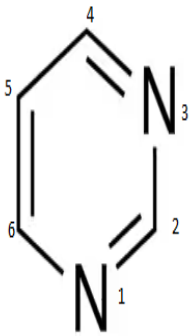
e.g- Pyrazinamide

f.



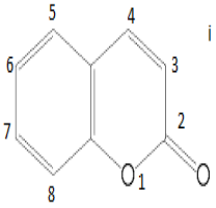
e.g-Nicotinamide

g.



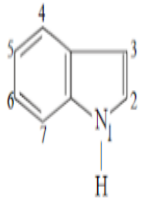
e.g-Thiamine

h.



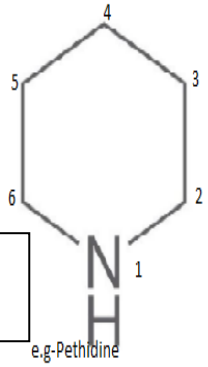
e.g.Warfarin

i



Indomethacin

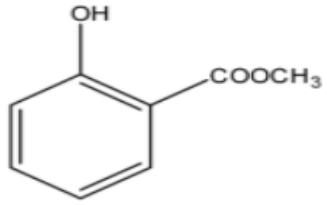
j



e.g-Pethidine

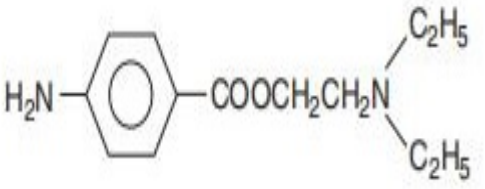
B) Write the chemical structure & use of the following medicinal agents

a.



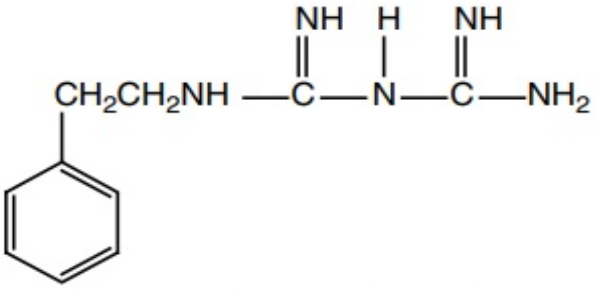
Reduce fever and to relieve mild to moderate pain

b.



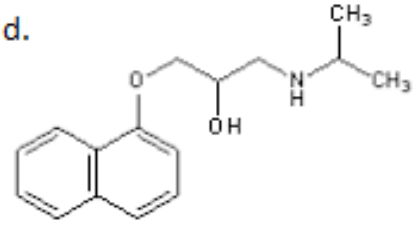
Local anaesthetic

c.



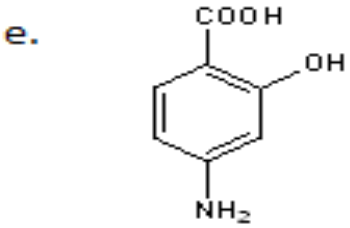
Anti-diabetic drug

d.



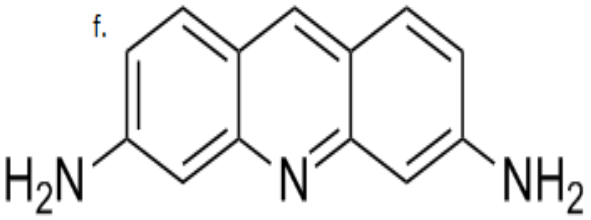
Hypertension

e.



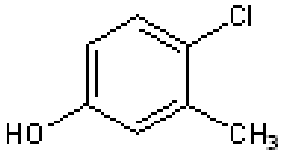
Tuberculosis

f.



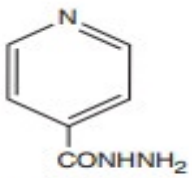
Disinfectant agent

g.



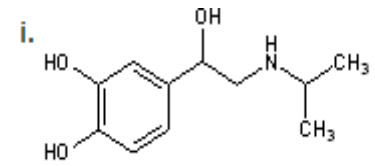
Antiseptic and preservative.

h.



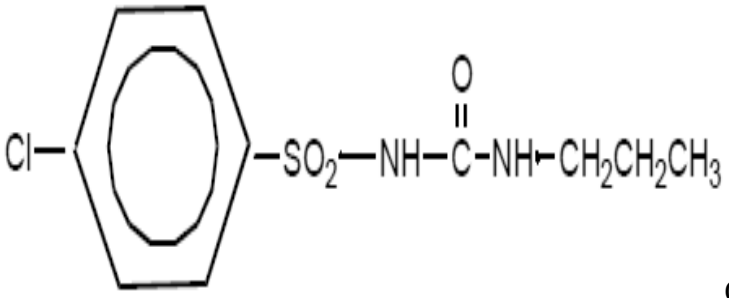
Tuberculosis

i.



Adrenergic drug

j



Chlorpropamide

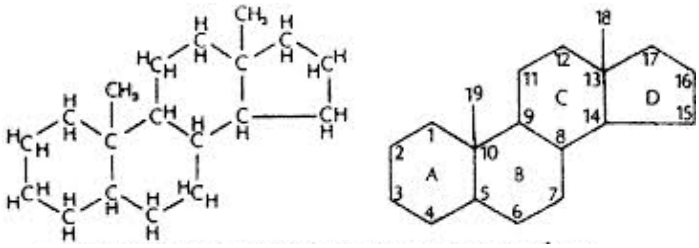
Q2. Write short notes on any three.

(i) Steroidal drugs

A steroid is a type of organic compound that contains characteristic arrangements of four cyclo alkane rings, that are joint to each other. The three cyclohexane rings (designated as ring A, B, C) and one cyclopentane ring (designated as D). Themethyl group present at position number 13 and 10 is numbered as 18 and 19 respectively. 100 of different steroid are found in the plants, animals and fungi such as

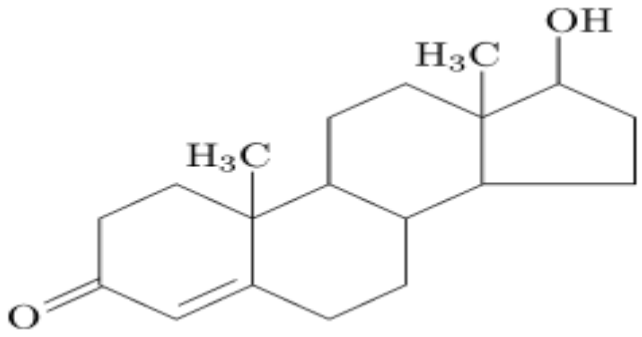
- Dietary fat: cholesterol
- Sex hormones: Estradiol, Testosterone
- Anti-inflammatory: Dexamethasone

Basic Steroidal structure



TESTOSTERONE

Testosterone is the primary sex hormone and anabolic steroid in males. Testosterone is a steroid from the androstane class containing a ketone and a hydroxyl group at positions three and seventeen respectively. It is biosynthesized in several steps from cholesterol and is converted in the liver to inactive metabolites.



USES-

To correct penile size in childhood.

To stimulate erythropoiesis.

To treat male infertility.

(ii) Local Anaesthetics

These are drugs which produces reversible loss of sensation in limited area when applied, without loss of consciousness. They act by blocking the conduction of sensory nerve impulse near to the site of their application or injuries. Local anesthetics are used for temporary relief of pain in surgical procedure dental manipulation and injuries.

CLASSIFICATION

1) Ester
   a) Ester of benzoic acid.
      Ex: cocaine
   b) Ester of Para ammonia benzoic acid
      Ex: procaine, benzocaine.
2) Amides
   a) Anilide amides

Ex: xylocaine (Lidocaine or Lignocaine)

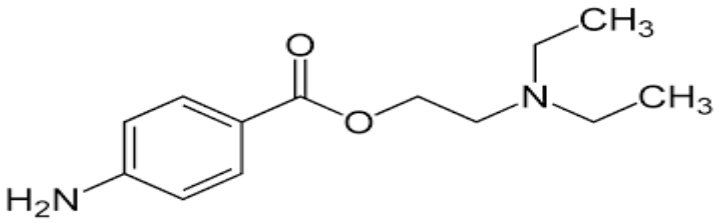
b) Non – anilide amides

Ex: chinchocaine

3) Miscellaneous

Ex: phenol, eugenol, benzyl alcohol

Procaine :



Chemical name: 2-diethylamino ethyl,4-amino benzoate

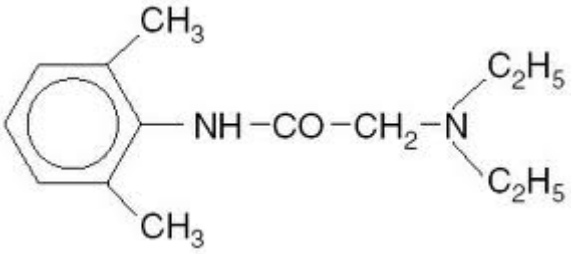
Physical properties: White crystalline powdered, odourless and bitter in taste. It is freely soluble in alcohol and H_2O.

Stability and storage: Aqueous solution is most stable at pH 3.5. Hence it is stored in well - closed light - resistant containers.

Uses:

- Used as a local anaesthetics.
- Its salt with benzyl penicillin is given to increases duration of action of benzyl penicillin.

Lignocaine :



Chemical name: N-diethylamino acetyl 2,6-xylidine

Physical properties : White crystalline powder bitter in taste solublein H2O and alcohol.

Stability and storage: It is very stable compound. Hence stored in awell closed container.

Uses:

- Used as a local anaesthetics.
- It is also used for prevention andtreatment of cardiac arrhythmias

(iii) Antiseptics and Disinfectants

Antiseptics: Antiseptics are the agents that destroy or kill or prevent the growth of the microorganism when applied to living tissues. They are applied in the form of mouthwashes, gargles, soaps, preparations for minor wound and burns.

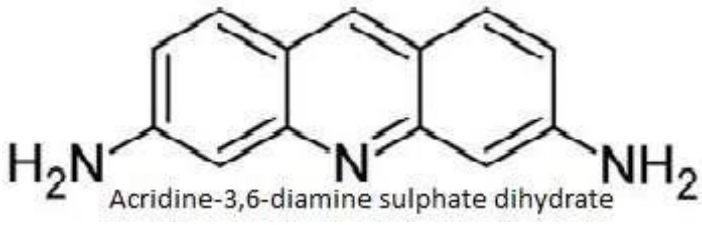
Disinfectants: - These are the agents that kill vegetative bacteria when use on an inanimate (non-living) objects.

CLASSIFICATION

1) Phenols and related compounds
Ex: Phenol, Chlorocresol, Chloroxylenol.
2) Alcohol and Related compounds
Ex: Ethanol, Isopropyl alcohol.
3) Aldehyde
Ex: Formaldehyde
4) Carboxylic acid derivatives
Ex: Benzoic acid, Methyl P-hydroxy-benzoate.
5) Halophors
Ex: Povidone-iodine, chloramine-T.
6) Heavy metals
Ex: Silver sulphadaizine, Thiomersal
7) Quaternary ammonium compound
Ex: Benzalkonium chloride, Cetrimide.
8) Dyes
Ex: Proflavin, Brilliant green.
9) Miscellaneous

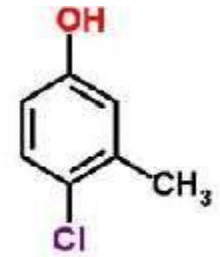
Ex: Nitrofurazone, Nitrofurantoin.

Proflavine



Acridine-3,6-diamine sulphate dihydrate

Chlorocresol



4 chloro, 3methyl phenol

Properties	Proflavin	Chlorocre sol
Physical Properties	Orange to red crystalline powder, odourless,soluble in water.	Colourless crystal characterstic odour soluble in hot water.
Stability &Storage	Affected by light & hygroscopic. Hence it is storedin tightly - closed light - resistant containers.	Oxidized by air or oxygen hence it is store in a tightly closed container.
Different Formulation	Proflavin creams	Chlorocresol solution.

Uses	It is used a) In treatment of infected wound. b) For dressing of wounds and burns c) For treatment of local infections of ear,mouth, throat and skin.	a) It is a powerful bactericide and fungicide. b) It is used as preservative in creams & pharmaceutical preparations for external use.

(iv) Anthelmintic Drugs

Helminths or intenstinal worms are parasitic worms and include round worms, hook worms, thread worms, tape worms, filarial worms, etc. Helminthiasis are parasitic disease produced by infection with parasitic worms living in the alimentary canal of the host. The disease generally spreads through handling of contaminated food or soil. Severe infection of worms may lead to abdominal pain, skin rashes, even obstruction of the intestine.

Anthelmintics are the drugs used to kill or remove the parasitic worms. The drugs which kill the worms are called vermicidal and drug used in expelling them are called vermifuges.

Classification of anthelmintic drugs

1. Natural drugs: Male fern, chenopodium, Ivermectin

2. Synthetic drugs

a. Benzimidazoles: Albendazole, mebendazole, thiabendazole

b. Quinoline and isoquinoline: Praziquantel, oxamniquine

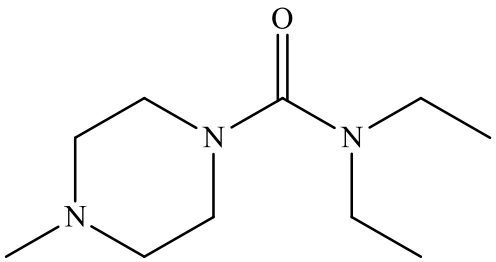
c. Piperazine derivatives: Piperazine citrate, Diethylcarbamazine(DEC)

d. Vinyl pyrimidines: Pyrantelpamoate, oxantel

e. Amides: Niclosamide

f. Miscellaneous: Levimasole, Niridazole, Metrifonate

Diethyl carbamazine(DEC)



Diethyl carbamazine

Chemical name: N,N-diethyl-4-methylpiperazine-1-carboxamide

Brand names: Carbamazine, DEC, Notezine

Uses: 1. Anthelmintic agent

2. Antifilarial agent

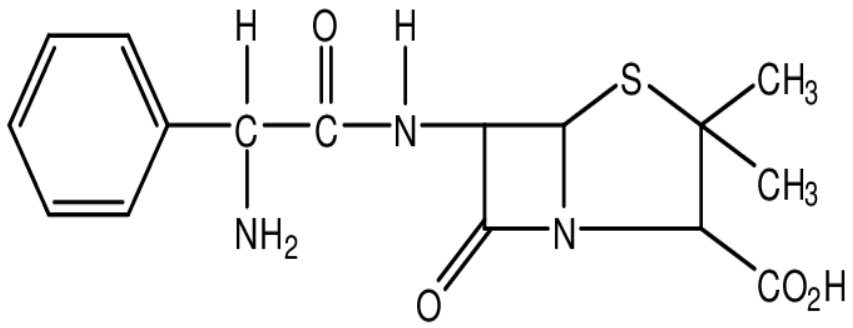
Q3. A) Antibiotics are defined as substances produced by microorganisms which have the capacity of inhibit the growth or destroying other microorganisms. Some antibiotics having high degree of specificity, such that they are selectively effective either gram positive bacteria or gram negative bacteria or certain fungi or yeast are called as narrow spectrum antibiotics. Some antibiotics are effective on large number of pathogens and are called as broad spectrum antibiotics.

CLASSIFICATION

1) Natural penicillin
   Ex: Penicillin - G, Procaine Penicillin
2) Semi synthetic penicillin
   a) Acid resistance penicillin.
      Ex: Phenoxymethyl penicillin
   b) Penicillinase resistance penicillinEx: Cloxacillin
3) Broad spectrum penicillin
   Ex: Ampicillin, Carbencillin.

B)

a) Ampicillin



Chemical name: 6-(2- amino -2-phenyl acetamido) penicillanic acid

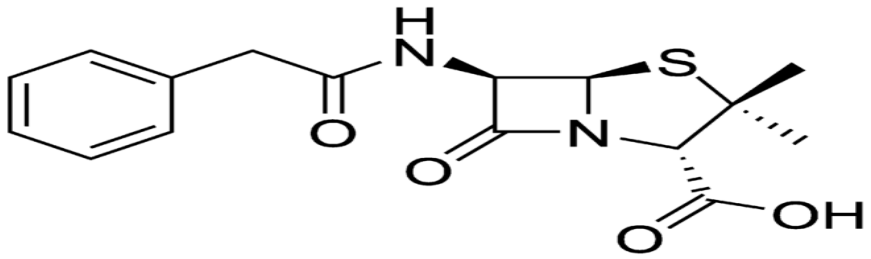
USES:

It is used to treat

a) Respiratory tract infection
b) Urinary tract infection
c) Bone and joints infections
d) Meningitis
e) Syphilis
f) Gonorrhea
g) Pneumonia

BRAND NAME: Roscillin, Ampillin, Ampipin

b) Benzyl Penicillin



Chemical name: 3,3-Dimethyl-7-oxo-6-(2-phenylacetamido)-4-thia-1-azabicyclo[3.2.0]heptane-2-carboxylic acid

or

6(2- phenyl acetamido) penicillanic acid

USES :

It is used to treat

a) Syphilis

b) Gonorrhea
c) Pneumonia
d) Pharyngitis
e) Tetanus
f) Diptheria
g) Anthrax

BRAND NAME: Pentids, Crystapen, PAM

4 A)

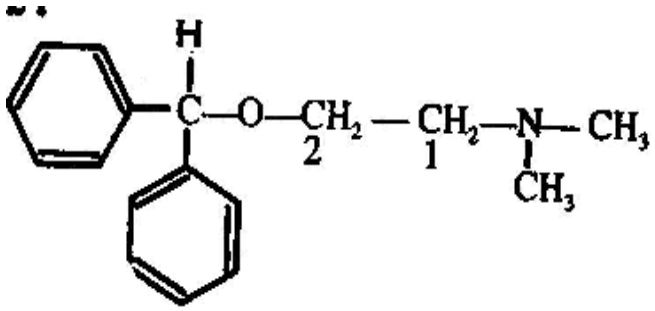
Histamine is biological amines. It is formed by decarboxylation of histidine. It is mainly formed in biological fluids, platelets,leucocytes, basophils, mast cell of lungs, GI mucosa. Histamine after release act on two types of histamine receptor (H1 and H2) in our body. As such histamine has no diagnostic and therapeutic uses, it has only experimental uses.

Antihistamines are the drug which blocks the action of histamine, which liberate in the body. Antihistamine mainly blocksthe action of histamine on H1 receptor.

Classification of Antihistamine

1 Amino alkyl ether
Ex: Diphenhydramine
2 Ethylene diamine
Ex: Mepyramine, Antazoline
3 Alkyl amines
Ex: Pheniramine, Chlorphenerimine
4 Phenothiazine derivatives
Ex: Promethazine
5 Piperazine derivatives
Ex: Meclazine, Buclizine
6 Miscellaneous
Ex: Cyproheptadine

B. (i) Diphenhydramine



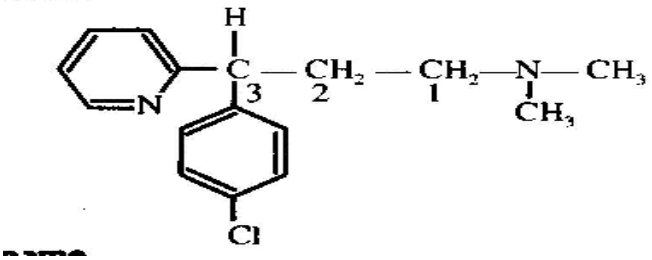
Chemical name: 1-dimethylamino-2-diphenylmethoxy ethane

USES:
Used to treat:

- Allergic skin reaction
- Motion sickness and post operativevomiting.
- Cardiac arrhythmia in combinationwith antazoline

BRAND NAME: Benadryl, Caladryl

ii) Chlorpheniramine



Chemical name: 3-(P-chlorophenyl),3-(pyrid-2-yl),N,N-dimethyl propamine

USES:

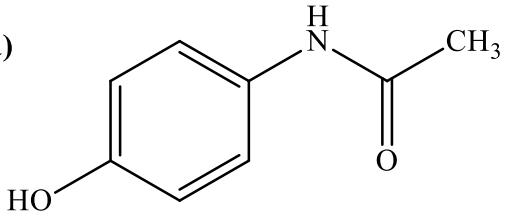
Used to treat:

- Allergic skin reaction
- Motion sickness and post operativevomiting.
- Cardiac arrhythmia in combinationwith antazoline

BRAND NAME: Corex, Alergin

5. (a) A non-opioid analgesic

a)

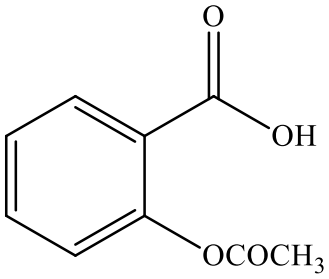


Paracetamol

Chem. Name: *N*-(4-hydroxyphenyl)acetamide

Use: Painkiller

b)

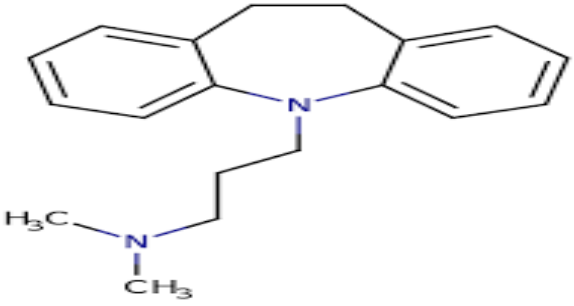


Aspirine

Chem. Name: 2-Acetoxybenzoic acid

Use: Analgesic and antipyretic

(b) A tricyclic antidepressant



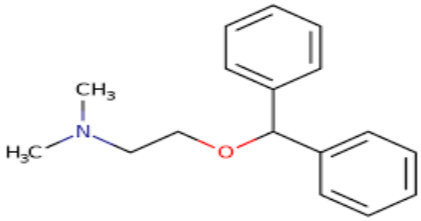
Imipramine

Chemical name: 10,11-dihydro-5-(3-dimethyl amino propyl) 5H dibenzo[b,f]azepine

USES: Uses: It is used to treat:

a) Depressive illness
b) Anxiety disorders
c) Nocturnal enuresis in children
d) hyperactivity and attention deficit
e) Catalepsy
f) Allergic conjunctivitis

(c) A non-heterocyclic antihistamine



Diphenhydramine

Chemical name: 1-dimethylamino-2-diphenylmethoxy ethane

USES:

Used to treat:

- Allergic skin reaction
- Motion sickness and post operativevomiting.
- Cardiac arrhythmia in combinationwith antazoline

(d) A pyrimidine containing sedative and hypnotic

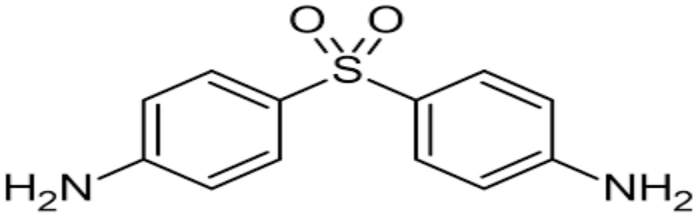
Phenobarbitone

Chemical name: 5-ethyl-5-phenyl barbituric acid

USES:

- Used as sedatives and hypnotics.
- Used to treat grandmal andpsychomotor epilepsy.
- Used to treat Neonatal jaundice

d) A sulfone containing anti-leprotic drug.



Dapsone

Chemical name: 4,4'-Diaminodiphenyl sulfone

USES:

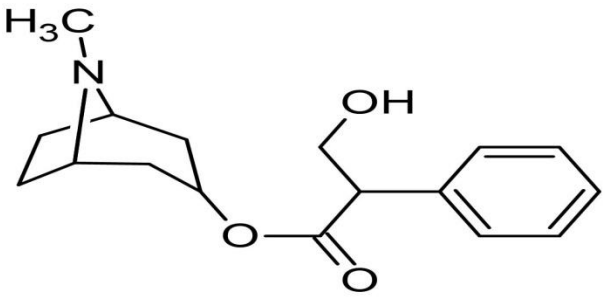
- It is a drug of choice for leprosy
- It is used in the treatment of dermatitis
- In combination with trimethoprim or pyrimethamine, it is used to treat pneumonia

6. A) The drugs which inhibit pharmacological actions of acetylcholine are known as anticholinergic or parasympatholytics or cholinolytics. The anticholinergic drugs which inhibit muscranic actions of acetylcholine are called as antimuscranic drugs.

CLASSIFICATION

1 Amino alcohol esters
Ex: Atropine, Hyoscine, Propantheline
2 Amino alcohol ethers
Ex: Benzotropine
3 Amino alcohols
Ex: Biperiden
4 Amino amides
Ex: Tropicamide
5 Miscellaneous
Ex: Pirenzipine, Ethopropazine

(i) Atropine



Tropan-3-yl tropate

USES

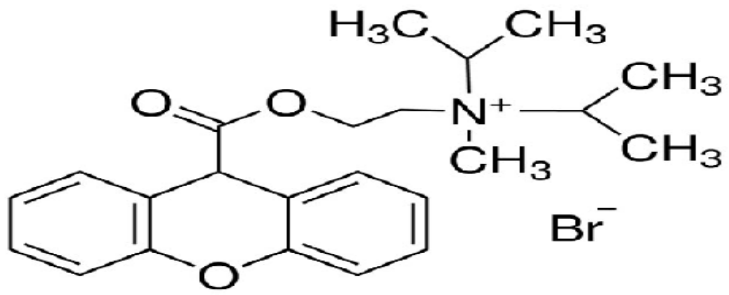
It is used:

- To treat parkinsonism
- CNS stimulant in small dose

- As a mydriatic
- As an antispasmodic
- As apre-anaesthetic medication
- To treat organ phosphorouspoisoning

BRAND NAME: Eumydrin

ii) Propantheline



Chemical name: N,N-diisopropyl-N-methyl-N-2-(xanthen-9-yl carbonyloxy)ethyl ammonium bromide.

USES: It is used:

1 To treat gastric and duodenalulcers
2 To treat intestinal hyper motility
3 To reduce gastric secretions.
4 To control excessive sweatingand salivation
5 To prevent nocturnal enuresisin children
6 To reduce biliary and ureteric spasm

BRAND NAME: Profanthine

7.

a) Diagnostic agents

Diagnostic agents are the chemicals or substances that are used to detect abnormalities in tissues or organ or to test onorgans. These agents do not usually have any medical values or pharmacological effects; they are useful for the clinical diagnosis of diseases. The diagnostic agent can be discussed under following heads:

A) Radiopaques (X-ray contrast media)
Ex: Iopanic acid, Propyliodone

B) Agents used to treat organ functions:
   a. To test kidney function
   Ex: Indigotindisulphonate (Indigo caramine)
   b. To test liver function
   Ex: Sulphobromophthalein sodium
   c. Miscellaneous

Ex: Fluorescein sodium, Evans blue, Congo red

Iopanic acid

Properties: White or cream colouredpowder, odour less, tasteless.

Stability and storage: Affected by light. Hence stored in well closed light resistant containers
Formulations: Iopanic acid tablet Uses: It is used as a contrast medium inradiography of gall bladder.

Indigo caramine

Properties: Purpulish blue powder orblue granules. It is sparingly soluble in water.
Stability and storage: Affected by light. Hence stored in well closed lightresistant containers
Formulations: Indigo caramineinjection
Uses: to test kidney functions

b) Anticoagulants

Anticoagulants are the drugs used to reduce the coagulation of blood. Anticoagulant agents are usually administered patientwith acute myocardial infarction and the one undergoing treatment of pulmonary and venous thrombosis.

CLASSIFICATION

A) Parentral anticoagulant
Ex: Heparin
B) Oral anticoagulant
Ex: warfarin sodium, phenindione

HEPARIN is a mixture of muco polysaccharides of molecular weight ranging from 3000 to 40000.
Source: Lung of intestinal mucosa of ox, pig or sheep.
Stability & storage: The aqueous solutions are stable for at least 7yrs at pH 7 to 8. It is stored in sealed container toprotect from microorganisms and moisture
Formulations: Heparin injection.

Brand name: Beparine.

Uses: To prevent post operative deep venous thrombosis.
To prevent clotting during open heart surgery.

c) Stages of anaesthesia

Stage I. stage of analgesia: This sage starts from the beginning of induction of general anesthesia to loss of consciousness.

Stage II. Stage of excitement or delirium: Starts from loss of consciousness to onset of automatic breathing but depression of higher motor centres involving the brain stem and the cerebellum leads to excitement and delirium.

Stage III. Stage of surgical anesthesia: Starts from onset of automatic respiration to respiratory paralysis. This stage was the desired plane for surgery when muscle relaxants were not used. This stage is characterized by,

- Cessation of eyeball movements.
- Loss of spinal reflexes.
- Skeletal muscle relaxation
- Pupils dilated and light reflex is abolished

Stage IV. Stage of respiratory paralysis: Startsfrom stoppage of respiration till death. This stage may arise due to anesthetic overdose which causes medullary paralysis with respiratory arrest and vasomotor collapse. Pupils are widely dilated and muscles are relaxed.

d) Analeptics

An analeptic is a drug which stimulates the central nervous system. The term analeptic specially refers to a respiratoryanaleptic a drug that acts on central nervous system to stimulate the breathing muscles, improving respiration.

CLASSIFICATION

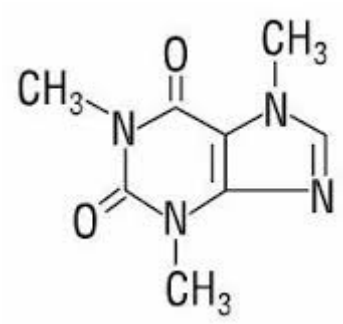
1) Naturally occurring drugs

a) Alkaloids
i) Xanthine derivatives
Ex: Caffeine, theophylline
ii) Other alkaloids
Ex: Strychine

2) Synthetic derivatives
Ex: Nikethamide (coramaine)

3) Miscellaneous
Ex: Dexamphetamine, Cocaine,Atropine

CAFFEINE



Chemical name: 1,3,7- tri methyl xanthine

USES: It is C.N.S stimulant and it is used:

a) To enhance mental activity.
b) To get relief from fatigue and milddepression.
c) To cause insomnia in moderate dose.
d) It has mild diuretic activity.
e) It is generally given in combination withaspirin or codeine for analgesic activity.
e) It also stimulates respiratory centre

Model answer of Pharmaceutics-II

D.Pharm Part-ii 2022(i)

Q1. (A) Definition:-

i. **Tachyphylaxis:**

When certain drugs are administered repeatedly at short intervals, the cell receptors get blocked up and pharmacological response to that particular drug is decreased. The decreased response cannot be reversed by increasing the dose. The phenomenon is known as Tachyphylaxis or acute tolerance.

Eg: - Ephedrine when in repeated doses at short intervals in the treatment of bronchial asthma may produce very less response due to Tachyphylaxis

ii. **Posology :**

i. The word posology is derived from the Greek words

'Posos' meaning how much & 'logo's meaning science.

ii.. posology is a branch of medical science which deals with dose or quantity of drugs which can be administered to a patient to get the desired pharmacological action.

iii. **Displacement value:** The quantity of the drug which displace one part of base.

Eg: - Aminophylline displacement value is 1.5 & Boric acid- 1.5

iv. **Subscription:** The comprises direction to the pharmacist for preparing the prescription and the no. of doses to be dispensed. These days, the prescribers are omitting the specific instructions to the pharmacist because the majority of the prescriptions are not compounded and dispensed.

v. **Tablet triturates:**

i. These are powders moulded into tablets.

ii. Moulded tablets are flat circular disc and usually contain potent substances which are mixed with lactose, dextrose or some other suitable diluents.

(B) Latin term to English term

I) Signa: - Label

II) Unguentum: - An ointment

III) Capiendus: - To be taken

IV) Post cibos: - After meals

V) Cochlear minimum: - One teaspoonful

VI) Omni mane: - Every morning

C) i. Differentiate between suppositories and pessaries

Suppositories	Pessaries
i) These are solid dosage form of medicament for insertion into the body cavities other than mouth. E.g Rectal suppository	i. These are meant for introduction into vagina.
ii) These are usually available in weight about 1-2g.	ii. These are usually available in weight about 4-8g.
iii) They are either cone or torpedo shaped.	iii. They are conical, rod shaped.

ii. Dose for the child : Child's dose = 9/150 X 150

= 9 mg.

Q2. A) Therapeutic incompatibility: therapeutic incompatibility may be as a result of prescribing certain drugs to a patient with the intention to produce a specific degree of pharmacological action but the nature or intensity of the action produced is different from that intended by the prescriber

ii.. This occurs due to the following reasons: -

1. Error in dosage
2. Wrong dose or dosage form
3. Contra-indicated drugs
4. Synergistic and antagonistic drugs
5. Drug interactions

1. **Error in dosage form:** Many therapeutic incompatibilities result from errors in writing or interpreting the prescription order. The most serious type of dosage error in the dispensing is overdose of a medication.

   Eg:-

   Rx

Atropine sulphate	0.006g (more than max. recommended dose)
Phenobarbitone	0.015g
Aspirin	0.300g

2. **Wrong drug or dosage form:** These are certain drugs which have quite similar names and there is always danger of dispensing the wrong drug.

   Eg: - prednisone and prednisolone, digoxin and digitoxin.

3. **Contra-indicated drug:** These are certain drugs which may be contra-indicated in a particular patient who is allergic to it.

   Eg**:** corticosteroids are contra-indicated in patient having an active peptic ulcer.The penicillin and sulpha drugs are contra-indicated to the patients who are allergic to it.

4. **Synergistic & antagonistic drugs:** Many drugs exhibit synergism and antagonism when administered in combination. When two drug prescribed together, they tend to increase the activity of each other is known as synergism.

   Eg: - A combination of aspirin and paracetamol increase the analgesic effect of the drug. Similarly, a combination of penicillin and streptomycin increases the antibacterial activity.

   Rx

Amphetamine sulphate	20 mg.
Ephedrine sulphate	100 mg.
Syrup upto	100 ml.

   There is a combination of two sympathomimetic drugs with additive effect, so need to reduce the dose by the prescriber.

   When two drugs having the opposing pharmacological effects are prescribed together antagonism occurs.

   Eg : Rx

Acetyl salicylic acid	0.6 g.

Probenecid 0.5 g.

Both drugs are used in the treatment of gout but combination of these leads to neutralisation, so need necessary correction by the prescriber.

5. **Drug interaction: -** The effect of one drug is altered by the prior or simultaneous administration of another drug. The drug interaction can usually be corrected by the proper adjustment of dosage if the suspected interaction is detected.

Eg: - R_x

Acetophenetidin 150 mg
Acetyl salicylic acid 200 mg
Caffeine 30 mg

Both acetophenetidin and acetyl salicylic acid are analgesics. Acetophenetidin depresses the CNS and this side effect is undesirable but caffeine is a CNS stmulant to neutralise the side effect of acetophenetidine. So the incompatibility is intentional.

Rx

Tetracycline hydrochloride 250 mg

Direction : Take one capsule every six hours with milk.

Tetracycline is inactivated by calcium which is present in the milk. So tetracycline should not be taken with milk and the incompatibility is un intentional and change by the physician.

Q2. (b) Sources of errors in prescription

1. **Abbreviation**:

i. Abbreviation presents a problem in understanding parts of the prescription order.

ii. Extreme care should be taken by a pharmacist in interpreting the abbreviation. Pharmacist should not guess at the meaning of an ambiguous abbreviation
Eg: - Achromycin for " Achro " but the intention of the prescriber is to dispense Achrostatin.
Abbreviation "SSKI " stands saturated solution of potassium iodide (KI)

2. **Name of the drug:-**

   These are certain drugs whose name look or sound like those of other drugs.

   Eg: - Digitoxin – Digoxin

   Prednisone – Prednisolone

   Indocin - Lincocin

3. **Strength of the prescription:**

   The strength of the preparation should be started by the prescriber. It is essential when various strengths of a product are available in the market.

   Eg:- it will be a wrong decision on the part of a pharmacist to dispense paracetamol tablet 500mg when a prescription for paracetamol tablet is received with no specific strength.

4. **Dosage form of the drug prescribed:**

   Many medicines are available in more than one dosage form.

   Eg: - liquid, tablet, capsule and suppository

   The dosage form should be written to avoid ambiguity.

5. **Dose:**

   Unusually high or low doses should be discussed with the prescriber. Pediatric dosage may present a problem. So, pharmacist should consult pediatric posology to avoid any errors e.g. sustained release formulation to be administered after every four hours should be checked because such formulation should be taken two or three times a day.

6. **Instruction for the patient:**

   i. The instructions for the patient which are given in the prescription are incomplete or omitted.

   ii. The quantity of the drug to be taken, the frequency and timing of administration and route of administration should be clearly given in the prescription so as to avoid any confusion.

7. **Incompatibilities:**

   It is essential to check that there are no pharmaceutical or therapeutic incompatibilities in a prescribed preparation and that different medicines prescribed for the same patient do not interact with each other to produce any harm to the patient. Certain antibiotics should not given with meals because it may decrease the absorption of the drug.

Q3. Mixture: a mixture is a liquid preparation meant for oral administration in which medicament or medicaments are dissolved or suspended in a suitable vehicle.

Classification of mixture:

i. Simple mixture containing soluble substance
ii. Mixture containing diffusible solids
iii. Mixture containing indiffusible solids
iv. Mixture containing precipitates forming liquids
v. Mixture containing slightly soluble liquids

1. Indiffusible solids:

i. Indiffusible solids are those solids which are not soluble in water and do not remain uniformly distributed in the vehicle for sufficiently long time.
ii. To suspend the drug, suspending agents are added.
iii. The commonly used indiffusible drugs in mixture form are acetyl salicylic acid, quinine salicylate, calomel, phenacetin, benzoic acid, phenobarbotone, chalk etc.
iv. The common suspending agents are compound tragacanth powder (2g/100ml) and tragacanth mucilage (proportion of 1/4th of the volume of the mixture)

Method of dispensing (using compound tragacanth powder)

1. Finely powder indiffusible solids. Add any soluble or diffusible solids and compound tragacanth powder. Mix them thoroughly.
2. Measure ¾ volume of the vehicle, triturate with a portion to form a smooth cream. Then add the remaining part of the vehicle.
3. Examine, if any foreign particle is visible pass through muslin cloth.
4. Ass any liquid ingredients if present.
5. Add more of the vehicle to produce the required volume.
6. Transfer the mixture into the bottle and label with a direction " shake the bottle well before use "

Method of dispensing (using tragacanth mucilage)

1. Finely powder indiffusible solids. Add any soluble or diffusible solids, mix and triturate with tragacanth mucilage (¼ th of the volume)to form a smooth cream.
2. Then gradually dilute with ½ of the vehicle.

3. Then repeat 3, 4, 5, and 6 steps.

Eg: - R_x

Acetyl salicylic acid	1.5g
Oxyphenbutazone	0.25g
Simple syrup	15.0ml
Water up to	90.0ml

Method of dispensing :

1. Finely powder acetyl salicylic acid and oxyphenbutazone, mix and add 20 ml of mucilage of tragacanth to form a smooth cream
2. Dilute 45 ml of water.
3. Add 15 ml of simple syrup in the above mixture and triturate.
4. Add more water to make up the final volume.
5. Transfer to a bottle, cork, label and dispense.

2. Precipitate forming liquid

i. These liquid preparations contain resinous matter, when mixed with water, the resin is precipitate which may adhere to the sides of the bottle or form a clotted precipitate which will not re-diffuse upon shaking. To prevent this compound tragacanth powder or tragacanth mucilage is used.

Method of dispensing (using compound tragacanth powder)

1. Finely powder the indiffusible solid and diffusible solid, mix with compound tragacanth powder in a mortar.
2. Measure ¾ th of the vehicle and add a portion of it, triturate to form a smooth cream. Add remaining part of the vehicle.
3. Measure precipitated forming liquid and add slowly in the centre of the cream with papid stirring.
4. Dissolve the soluble ingredient if present in vehicle and add slowly into the cream.
5. Then repeat 3, 4, 5 and 6 steps.

Method of dispensing (using tragacanth mucilage)

1. Mix tragacanth mucilage with an equal volume of the vehicle.
2. Measure precipitated forming liquid, add slowly into the centre of the mucilage with constant stirring.

3. Dissolve any solid substance in about ¼ volume of the vehicle and mix it in the mixture.
4. Then repeat 3, 4, 5 and 6 steps.

Eg:- R_x

Potassium iodide	2.0g
Tincture lobelia ether	4.0ml
Tincture stramonium	16.0ml
Chloroform	90.0ml

Method of dispensing :

1. Mix 20 ml of mucilage of tragacanth with equal volume of water.
2. Measure tincture lobelia ether and tincture stramonium separately and pour slowly into the centre of the mucilage with stirring.
3. Dissolve potassium iodide in water and mix with above mixture.
4. If foreign particles are seen, pass through muslin cloth.
5. Add more of chloroform to produce the required volume.
6. Transfer into the bottle, cork, label and dispense.

Q4. Eye drops:-

i. Eye drops are sterile aq. or oily or suspension of drugs that are instilled into the eye with a dropper.

ii. Eye drops contain drugs having antiseptic, anesthetic, anti-inflammatory, mydriatic or meiotic.

Formulation of eye drops

1. Preparation of bactericidal and fungicidal vehicle:

i. The aqueous or oily vehicle is used in the preparation of eye drops. Though aqueous vehicle may support bacterial or fungal growth so preservative must be added.

ii. Eg:- phenyl mercuric nitrate – 0.002%

Benzalkonium chloride – 0.01%

Chlorohexidine acetate- 0.01%

2. Preparation of solution of medicament and adjuvant

   The medicaments are dissolved in the aq. Vehicle containing anti microbial agent. The adjuvants are also dissolved in the vehicle at this stage to form stable preparation.

3. Clarification
   i. The eye drops are clarified by passing the solution through membrane filter having a pore size of 0.8mm.
   ii. The clarified solution is immediately transferred into final containers and sealed to exclude micro organisms.

4. Sterilization

   The eye drop are sterilized by autoclaving or heating with bactericide at 98^0 – 100^0 C for 30 min. or filtration through bacteria proof filters.

5. Container
   i. The eye drop should be packed in neutral glass container or in a suitable plastic container.
   ii. Now -a-days neutral glass small bottles having capacity 4ml- 8ml are used. It has two polypropylene screw caps.

Adjuvants used in the preparation of eye drops

1. Thickening agent: These are methyl cellulose, carboxy methyl cellulose, polyvinyl alcohol, polyethylene glycol are used to increase the viscosity of the eye drop and help to prolong the contact time of the drug in the eye.
2. Buffers:
   i. Buffers are added to adjust and maintain the pH of the eye drops. The pH of the eye drop is adjusted to maintain chemical stability to reduce discomfort and to improve clinical response.
   ii. Eg: - boric acid, sodium acid phosphate, sodium citrate are used as buffers.

3. Antioxidants:
   i. They are added in eye drop provide protection from oxidation.

ii. Eg: - sodium metabisulphite (0.05-0.5%) & sodium thiosulphate (0.1-0.2%) are used as antioxidants.

4. Wetting agents :
   i. These are used for proper penetration of eye drops into the cornea of the eye.
   ii. Eg:- polysorbate 20 & polysorbate 80
5. Isotonicity adjustment substance:

   Eye drops are made isotonic with lachrymal secretion with the help of various buffers and other solution.

Q5. Prescription

Def:- It is a written order form a registered medical practitioner or other properly licensed practitioner, such as dentist, veterinarian etc. to a pharmacist to compound and dispense a specific medication for the patient.

Part of a prescription

1. Date
2. Name, age, sex and address of the patient
3. Superscription
4. Inscription
5. Subscription
6. Signatura
7. Renewal instruction
8. Signature, address and registration no. of the prescriber

1. Date :

I. It helps a pharmacist to find out the date of prescribing and date of presentation for filling the prescription.

II. The prescription which prescribes narcotic or other habit forming drugs must bear the date. So as to avoid the misuse of prescription if it is presented by the patient, a no. Of times for dispensing.

2. Name, age, sex and address of the patient:

i. Name, age, sex and address of the patient must be written in prescription because it serves to identify the prescription.

ii. If any case of this information is missing in the prescription, the same may be included by the pharmacist after proper enquiry from the patient.

iii. Age and sex of the patient, especially in case of children, help the pharmacist to check the prescribed dose of medication.

3. Superscription:

i. It is represented by a symbol R_x which is written before the prescription.

ii. R_x is a Latin word, meaning 'you take'.

4. Inscription:

i. This is the main part of the prescription order. It contains the name & quantities of the prescribed ingredient.

ii. The names of ingredients are generally written in English language but common abbreviation used.

iii. It divided into following parts

a) Base: the active medicaments which are intended to produce the therapeutic effect.

b) Adjuvant: it is included either to enhance the action of medicament or to improve the palatability of the preparation.

c) Vehicle: it is included in the prescription either to dissolve the solid ingredient or to increase the volume of the preparation.

5. Subscription:

This comprises direction to the pharmacist for the preparing the prescription and no. of doses to be dispensed.

6. Signatura:

i. This consists of the direction to be given to the patient regarding the administration of the drug.

ii. It is usually written as 'sig' on the prescription. The instructions given in the prescription are required to be transferred to the label of the container in which the medicament is to be dispensed.

iii. The instruction may include following

(a) The quantity to be taken

(b) The frequency of administration or application

(c) The model of administration

(d) The special instruction such as dilution direction.

7. Renewal instruction :

i. The prescriber indicate on every prescription order, whether it may be renewed and if so, how many times.

ii. It is very important particularly in the prescription containing the narcotic and other habit forming drugs to prevent the misuse.

8. Signature, address & registration no. of the prescriber:

The prescription must bear the signature of the prescriber along with its registration no. & address.

GURUDEV CLINIC

Brahma nagar,, Berhampur, Odisha

Date:

Name: Badri narayana suar Age: 23yrs Sex: male

Address: Rampa street, gate bazaar

R_x(superscription)

Light kaolin	12.0ml	
Light magnesium carbonate	3.0ml	
Sodium bicarbonate	3.0g	(inscription)
Water	90ml	

Fiat mistura (subscription)

Sig cochleare magnum ter in die postcibos sumenda (Signatura)

Refill: ……..

Sd/-

Name of the prescriber

M.B.B.S., M.D.

REGD. NO: ……..

Q6. Parenteral product

i. Parenteral products are pharmaceutical products that are given by other than oral route.

ii. Transfusion fluids and injections are parenteral products.

Evaluation of Parenteral preparation:

The finished parenteral products are subjected to following evaluation tests.

a) Sterility test
b) Clarity test
c) Leakage test
d) Pyrogen test
e) Assay

a) Sterility test:

i. The sterility test is done for detecting the presence of viable forms of bacteria, fungi and yeast in parenteral preparation.

ii. The sterility test must be carried out under strict aseptic condition in order to avoid accidental contamination of the product during test.

iii. All glasswares required for the test must be sterile.

iv. Culture media required for the growth of aerobic, anaerobic and fungi are prepared as described in pharmacopeia.

v. The test for sterility test may carried out either by

1. Membrane filtration method
2. Direct inoculation method

The test samples of parenteral preparation are transferred into a test tube containing sterile culture media which provide nutritive material and water for growth of aerobic, anaerobic bacteria and fungi. The test tubes are incubated for a stated period of time in a favourable condition of temperature and pressure for the growth of organisms. After the incubation period examine, the presence of turbidity in the culture media indicates the growth of microorganisms

and the sample fails to comply with tests for sterility. This can be confirmed by repeating the test.

b) Clarity test:
   i. Clarity test is performed to ensure that the parenteral products are free from foreign particles.
   ii. Parenteral preparation in its final container is subjected individually to a visual inspection to exclude the possibility of foreign particles.
   iii. The unlabelled containers are held by the neck against a strongly illuminated black & white screen.
   iv. White screen is used for dark coloured particles and black screen for detection of light coloured particles.
   v. The contents of the containers are slowly inverted and rotated. The solution is examined for the presence of foreign particles.
   vi. Nowadays Coulter counter instrumental methods are developed and used in industry.

c) Leakage test:
   i. The testes perform only for ampoules which have been sealed by fusion to ensure that there should not be any leakage in them.
   ii. Leakage test is performed in a vacuum chamber. The ampoules are dipped in 1% solution of methylene blue in vacuum chamber and vacuum is applied.
   iii. Vacuum is released; the coloured solution will enter the ampoules with defective sealing.
   iv. The presence of dye in the ampoule confirms the leakage and hence is rejected.
   v. Vials and bottles are not subjected to this test due to flexibility of rubber.

d) Pyrogen test:
   i. The test is done as per I.P. 2007 to check the presence or absence of Pyrogen in all aq. parenteral preparation.
   ii. The test involves the measurement of the rise in body temperature of rabbits following IV injection of sterile solution of parenteral preparation being examined.

iii. Rabbits are used to perform this test, because their body temperature increases when pyrogens are introduced into their bodies by parenteral route.

e) Assay:

i. Assay is performed according to the method given in the monograph of that parenteral preparation in the pharmacopeia.

ii. Assay is done to check the quantity of medicament present in the parenteral preparation.

Q7. A) Stability of suspension

i. A stable suspension can be redispersing homogeneously with moderate shaking and can be easily poured through its shelf life.

ii. The most stable pharmaceutical suspensions are flocculated.

Evaluation of the stability of suspension

1. Sedimentation method:-
   i. The measurement of the sedimentation volume is the most important parameter in the evaluation of the stability of suspension.
   ii. It is determined by keeping a measured volume of suspension is graduated cylinder in a UN disturbed position for a definite period of time and noted the ultimate height of the sediment and initial height and ultimate height.
   iii. The sedimentation volume can be plotted against time.
   iv. The graph indicates the sedimentation pattern of suspension on storage.
   v. A stable suspension shows a horizontal or less steep curve.
   vi. The evaluation of redispersibility can also be determined by shaking the suspension and again find out the sedimentation volume.

2. Micromeritic method: -
   i. The stability of a suspension depends on the particle size of the dispense phase.
   ii. The size of the particle in a suspension may grow and may ultimately lead to the formation of lumps or caking.

iii. Any change in particle size with reference to time will provide information regarding stability of suspension.

iv. It can be studied by a microscope and coulter counter method.

3. Rheological method:
   i. The viscosity of the suspension is studied at different time intervals by using a good quality of viscometer. It provides useful information about the stability of suspension.
4. Electrokinetic method:
   i. The determination of surface electric charge or zeta potential of suspension is helpful to find out the stability of suspension.
   ii. Certain zeta potential produces more stable suspension because of controlled flocculation.
   iii. Zeta potential can be calculated from the migration velocities of the particles measured by the electrophoretic method.

Q7. B) Facial cosmetics:

i. These are used for cleansing, refreshing & nourishing effects.

ii. They are available in the form of solid, liquid & semi solid

iii. They prevent premature ageing of skin and improve the overall looks and personality

Ex:-Facial cosmetics are

1. Face powder
2. Compact face powder
3. Rouges
4. Cold cream
5. Cleansing cream
6. Vanishing cream
7. Foundation cream
8. Moisturizing cream
9. Preparation of eye make up

a) Eye shadow
b) Eye brow pencil
c) Mascara

10. Lipstick
11. Bleaches
12. Shaving media
    a) Lather shaving cream
    b) Brushless shaving cream
    c) Shaving soap
    d) Shaving sticks

Q7. C) Alkaloidal in compatibility

a) Alkaloidal salts with alkaline substance
    i. Alkaloids are weak bases. They are almost insoluble in water but alkaloidal salts are soluble in water.
    ii. If these salts are dispensed with alkaline preparation free alkaloid may be precipitated.

Eg. Rx

Strychnine hydrochloride solution	6 ml
Aromatic sprit of ammonia	4 ml
Water upto	120 ml

Strychnine hydrochloride is an alkaloidal salt whereas the aromatic spirit of ammonia is an alkaline substance. When they react together, the strychnine gets precipitated as diffusible precipitates.

b) Alkaloidal salts with soluble iodides
    i. Alkaloid with soluble iodides it forms a very insoluble hydroiodide, the precipitates of which are diffusible
c) Alkaloidal salts with tannins
    i. Alkaloidal salts when combined with a drug containing tannins, alkaloids form tannates which are separated as diffusible ppt.

ii. The tannates of most alkaloids are insoluble in water. Hence strong tea or tannic acid solution is commonly used in alkaloidal poisoning.

d) Alkaloidal salts with salicylates

i. When quinine compounds are combined with salicylate, they form indiffusible ppt. of quinine salicylate.

Eg. Rx

Quinine hydrochloride	0.12 g
Sodium salicylate	4.0 g
Water upto	100 ml

Quinine hydrochloride reacts with sodium salicylate form quinine salicylate which gets precipitated as indiffusible precipitates.

e) Alkaloidal salts with soluble iodides and bromides

i. Alkaloids like strychnine, morphine, codeine etc. form insoluble hydroiodides and hydrobromide with soluble iodides and bromides.

Eg. Rx

Potassium iodide	1.5 g
Tincture of stramonium	8.5 ml
Chloroform water to make	100 ml

Tincture of stramonium contains solanaceous alkaloid reacts with potassium iodide to form diffusible precipitates of hydroiodides.

Q7. D) Formulation of shampoo: The various additives are used in formulation of shampoo. These are

a) Conditioning agent:
   i. These are used in lubricating the hair and improve the texture of hair.
   ii. It reduces the fluffiness and smoothen the hair shafts.
   iii. It makes the hair soft and shiny.
   iv. Eg:- lanolin, glycerin & propylene glycol
b) Thickening agents:

i. These are used to increase the viscosity of the shampoo.
ii. It provides the desire consistency to the preparation.
iii. Eg:- polyvinyl alcohol, methyl cellulose, sodium alginate & sodium stearate

c) Solubilizing agents:
   i. These are used to solubilize poorly soluble substance so as to get a clear shampoo.
   ii. Eg:- ethyl alcohol, glycerol, propylene glycol & diethylene glycol, mono ethyl ether
d) Opacifying agents:
   i. These are used to make the shampoo opaque.
   ii. Eg: - glycol, glyceryl stearate, cetyl alcohol & stearyl alcohol, stearic amide.
e) Preservatives:
   i. These are required to preserve the shampoos against bacteria or mould contamination by adding preservative.
   ii. Eg:- methyl paraben and propyl paraben

Formulae of shampoo

Cream type shampoo

Sodium lauryl sulphate	10.0g
Sodium citrate	1.0g
Calcium alginate	2.0g
Glycerin	5.0g
Methyl paraben	0.15g
Perfume	q.s
Water	100ml

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