MODEL ANSWER

WINTER– 18 EXAMINATION

Subject Title: PHARMACEUTICAL CHEMISTRY-I **Subject Code:** 0806

Important Instructions to examiners:

1) The answers should be examined by key words and not as word-to-word as given in the model answer scheme.
2) The model answer and the answer written by candidate may vary but the examiner may try to assess the understanding level of the candidate.
3) The language errors such as grammatical, spelling errors should not be given more Importance (Not applicable for subject English and Communication Skills.
4) While assessing figures, examiner may give credit for principal components indicated in the figure. The figures drawn by candidate and model answer may vary. The examiner may give credit for anyequivalent figure drawn.
5) Credits may be given step wise for numerical problems. In some cases, the assumed constant values may vary and there may be some difference in the candidate's answers and model answer.
6) In case of some questions credit may be given by judgement on part of examiner of relevant answer based on candidate's understanding.
7) For programming language papers, credit may be given to any other program based on equivalent concept.

1		**ANSWER ANY EIGHT OF THE FOLLOWING.**	**16M (8x2)**
1	**a)**	**State any four ideal properties of buffer solution.** • The pH of buffer solution remains constant. • The pH of solution does not change on dilution. • The pH does not change even after addition of small quantities of acids or bases. • The pH of solution remaining constant is useful in number of chemical reactions. • The pH of buffer solution does not change on keeping for long time.	**ANY FOUR 0.5M EACH**
1	**b)**	**Mention two different allotropic forms of sulphur.** • Rhombic (α sulphur) • Monoclinic (β sulphur) • Liquid (λ sulphur) • Plastic sulphur, • Amorphous sulphur • Sublime sulphur • Precipitate sulphur.	**1M EACH**
1	**c)**	**Explain Lewis acid acid-base theory.** **An acid** is an electron pair acceptor or acid is electron seeking species or electrophilic species. E.g. Some common examples of Lewis acids, other than the Bronsted acids are electron deficient compounds like boron chloride, aluminium chloride, ferric chloride & simple metal cations like Ag, Fe & Zn. These compounds & ions have the obvious feature of possessing at least one empty orbital capable of accepting a pair of electrons. Other compounds which can be classified as Lewis acids are those which possess a central species capable of expanding the valence shell to accept a pair of electrons. E.g. silicon fluoride, stannous chloride & sulphur tetra fluoride. **A base** is an electron pair donor and which have unshared electron pairs to share with proton or nucleophilic species.	

		E.g.• Water, ammonia & halide ions are Lewis bases.	
1	d)	**Define:** **i) Assay:-**It is defined as any procedure used to determine the purity of the given substance. **OR** It is a step by step description of a chemical analytical method for the determination of purity of active substance. **ii) Radio opaque Contrast Media:-**Radio-opaque substances are those compounds both inorganic and organic that have the property of casting a shadow on X-ray films, have the ability to stop the passage of X-rays and hence appear opaque on X-ray examination. Such compounds and their preparations are called as X-ray contrast media.	**1M EACH**
1	e)	**Name the inorganic compound used in following.-** i) **Schistosomiasis:**-Antimony potassium tartrate. ii) **Achlorhydria:**- Dilute Hydrochloric acid.	**1M EACH**
1	f)	**Write storage condition for:** **(i) Calcium hydroxide:-** It is kept in well closed container which is protected from moisture and carbon dioxide. **(ii) Bismuth sub carbonate:-** Keep container tightly closed. Keep container in a cool, well-ventilated area.	**1M EACH**
1	g)	**Write incompatibilities of the following.** (i) **Sulphur dioxide**:- Sulphur dioxide being a reducing agent, it is general incompatible with oxidising agents. Its bleaching action is able to remove colour from the preparation and other alkalis. (ii) **Silver nitrate**:- It is incompatible with halides like Cl^-, Br^-, I, and organic compound, tannis etc.	**1M EACH**

1	h)	**Explain:-** **i) Limit tests:-** Limit tests are quantitative or semi-quantitative tests designed to identify and control small quantities of impurity which are likely to be present in the substance. **ii) Significant figures:-** The number of significant figures is the number of digits which are necessary to express results which are consistent with the precision of the measurement.	**1M EACH**
1	i)	**Write importance of sodium ion in the body fluid.** • The main component of the extracellular fluid is sodium ion which is associated with chloride and bicarbonate in regulating the acid base balance. • It helps in the maintenance of osmotic pressure of various body fluids. • It is of vital importance in preserving normal irritability of muscle and permeability of cell. • It plays important role in the transmission of nerve impulses in the nerve fibres.	**2 M**
1	j)	**Define:-** i) **Radio activity:-** The phenomenon of spontaneous and continuous emission of radiations by radioactive isotopes is known as radioactivity. ii) **Half-life:-**It is the time taken for half of the radioactive nucleoid to disintegrate. **OR** It is defined as the time in which amount of radioactive nucleoid disintegrate to half of its initial value.	**1 M EACH**
1	k)	**Explain the role of lead acetate cotton plug and mercuric chloride paper in arsenic limit test.** **Role of lead acetate cotton plug:-** Lead acetate cotton plug is used to trap any hydrogen sulphide which may be evolved along with arsine gas. It prevents the interaction of hydrogen sulphide gas and mercuric chloride paper. **Role of Mercuric chloride paper:-**	**1M EACH**

		Conversion of arsenious acid to arsine gas which reacts with mercuric chloride paper gives yellow stain; depth of yellow stain on mercuric chloride paper will depend upon quantity of arsenic present in the sample.	
1	**l)**	**Give one important use of following compound.** **i) Magnesium Trisilicate** 1. It is used as an antacid in the treatment of peptic ulcers. 2. It also used gastrointestinal protective agent with colloidal silica, which can coat gastrointestinal mucosa conferring further protection. 3. It can also be used in oral pharmaceutical formulations and food products as a glidant. 4. It is used as a food additive. **ii) Stannous fluoride:-**It is used to prevent dental caries, single application of 8% solution of stannous fluoride to the tooth surface sufficient for 6 month.	**1M EACH**
2		**Attempt any FOUR of the following:**	**12M (4X3)**
2	**a)**	**Define and classify laxatives with examples.** Laxatives are substances that loosen stools and increase bowel movements. They are used to treat and prevent constipation. **Classification:** 1. Laxatives A) Bulk producing drugs- Isabgol, agar-agar, methyl cellulose, sodium carboxy methyl cellulose B) Stool softeners (Emollient) - liquid Paraffin 2. Strong purgatives A) Irritant/Stimulant purgatives- senna glycoside, phenolphthalein, aloe, castor oil, rhubarb B) Saline cathartics/ Osmotic laxatives (i) Sodium containing products- Sodium potassium tartrate, Sodium phosphate (ii) Magnesium containing products- Magnesium hydroxide, Magnesium sulphate, Magnesium Citrate. (iii) Sulfur as cathartic (iv) Non official Cathartics- Sodium sulphate, Potassium phosphate	**Define 1M** **Classify 2M**

2	b)	**Explain G.I.T. protective adsorbent. Give properties and uses of kaolin.** G.I. T. protectives and adsorbents- Protectives intended for use in the gastrointestinal tract are internal protectives. Adsorbent-protectives adsorb bacteria, toxins and viruses in addition to forming protective covering over the intestinal mucosa. Internal protectives and adsorbents are used in the treatment of diarrhea. **Properties of kaolin**. 1. It occurs as finely divided, white powder, free from grittiness 2. It is odorless, tasteless powder 3. It is insoluble in water, mineral acid and alkali **Uses of Kaolin:** 1. Adsorbent in enteritis 2. Treatment of Colitis, dysentery 3. Treatment of Diarrhea 4. External dusting powder 5. Drying agent for moist sores & infective ulcers 6. Clarifying agent	**1 M EACH**
2	c)	**Discuss Bronsted and Lowry concept of acids and bases. Explain its advantages over Arrhenius theory.** According to Bronsted Lowry concept, This theory is also called Protonic concept. An acid is any substance capable of donating a proton in a chemical reaction. An acid is a proton donor. According to this concept, Bronsted acid ionizes to produce a proton and the conjugate base of the acid. This can be shown in following half reaction: $HCl \rightarrow H^+ + Cl^-$ A base is any substance capable of accepting a proton in a chemical reaction. a base is a proton acceptor. Bronsted base accepts a proton & forms conjugate acid. This is shown by: $OH^- + H^+ \rightarrow H_2O$ Advantages over Arrhenius theory-	**1M EACH**

		i) It can explain the basic character of substances like Na_2CO_3, NH_3 i.e. which do not contain OH^- group and hence were not bases according to Arrhenius concept on the basis that they accept protons. ii) This concept is not limited to molecules but also covers even the ionic species to act as acids or bases. iii) It can also explain the acid-base reactions in the non-aqueous medium.	
2	**d)**	**Explain ORS powders recommended by UNICEF and WHO.** **Oral rehydration salt:** ORS is used to supply water and electrolytes in amounts needed for maintenance as soon as intake of usual foods and liquids is discontinued, and before serious fluid losses occur. They are also given to replace mild to moderate fluid loses due to excessive vomiting, diarrhoea, or prolonged fever. Large number of oral rehydration preparations are available in the market which contain anhydrous glucose, NaCl, KCl and either $NaHCO_3$ or sodium citrate. These dry powder preparations are dissolved in specified amount of water and are used for oral rehydration therapy. These preparations may contain a flavouring and suitable agent for free flow of the powder. The following three formulations are usually prepared when glucose is used, sodium bicarbonate is packed separately. The quantities given below are for preparing one litre solution- **Composition of ORS recommended by WHO and UNICEF.**	**1M EACH**

Ingradients	**Formula-II**	**Formula-II**
Sodium Chloride	**3.5 gm**	**3.5 gm**
Sodium bicarbonate	**2.5 gm**	**……..**
Sodium citrate	**…….**	**2.9 gm**
Potassium chloride	**1.5 gm**	**1.5 gm**
Anhydrous glucose	**20 gm**	**20 gm**
Or Glucose	**22.0 gm**	**…….**

2	e)	**What are antacids? Give important properties of antacid.** **Antacid:** Antacids are the substances which are weak bases which on ingestion react with the gastric acid, neutralize the excess of HCl and lower the acidity of gastric contents. **Ideal properties of antacid:** 1. Antacid should not be absorbable or cause systemic alkalosis. 2. Antacid should not liberate carbon dioxide and cause rebound hyperacidity. 3. Antacid should not interfere with absorption of food. 4. Antacid should not be a laxative or cause constipation . 5. It should possibly inhibit enzyme pepsin. 6. Antacid should be quick acting and exert its effect over a long period of time. 7. Antacid should be inexpensive and palatable.	**1M** **2M**
2	f)	**Write Properties and uses of:-** **i) Titanium dioxide:-** **Properties:-** • It is an opaque, white fluffy powder. • It is odourless and tasteless. • It is practically insoluble in water and in dilute mineral acids. **Uses:-** • It protects skin from harmful UV radiation. • Commonly it is used in skin protective creams, pastes etc. • It used in cosmetic preparation. • It also used in preparation of paints. **ii) Calamine:-** **Properties :** • It is an amorphous pink or reddish brown color powder. • It is a tasteless, odorless powder. • It is insoluble in water, soluble in HCl with effervescence. • Ferric oxide imparts pink color to calamine; color depends on variety and amount of Ferric oxide.	**1.5 M EACH**

		Uses:- • It has a mild astringent action. • It is used in the form of dusting powder due to its soothing & protective property. • Used in cosmetic preparations like cream, lotion, ointment. E.g. calamine lotion.	
3		**Answer any <u>FOUR</u> of the following**	**12M (4X3)**
3	**a)**	**Explain the following terms:** **i) Desensitizing agent** **ii) Anticaries agent** **iii) Polishing agent** **i) Desensitizing agent:** Desensitising agents are the compounds used in treatment of sensitive tooth. Sometimes tooth become sensitive to heat &cold. During tooth decay or in tooth ache, the perception to heat & cold is felt strongly. Some desensitizing agents are incorporated in dental preparations to reduce the sensitivity of tooth to heat & cold. E.g.-Strontium chloride, Zinc chloride. **ii) Anticaries agent:** Caries or tooth decay is a disease of teeth caused by acids formed by the action of microorganisms on carbohydrates & is characterized by decalcification of tooth & bad mouth odour. An agent used in the treatment of caries is called as anticaries agent. E.g. Stannous fluoride, Sodium fluoride. **iii) Polishing agent:** The substances which give whiteness to teeth by their abrasive action are called polishing agent. E.g. Calcium carbonates Dibasic calcium phosphate and Sodium metaphosphate.	**1M EACH**
3	**b)**	**Define antidote. Discuss various actions of antidotes with examples.** **Definition:** Antidotes are the agents which are used to reverse, stop or counteract the action of poisons. **Various actions of antidotes with examples.** (1) Physiological antidote: It acts by producing the effect opposite to that of poison, or counteract the effect of poison physiologically.e.g. Sodium nitrite used in cyanide poisoning. It	**1M** **2 M**

		converts haemoglobin into methaemoglobin in order to bind cyanide poison. (2) Chemical antidote: It acts usually by combining with the poison and thus changes the chemical nature and detoxifies the poison. E.g. sodium thiosulphate used in cyanide poisoning. It converts the toxic cyanide ion to non-toxic thiocyanate ion. (3) Mechanical antidotes: These usually act by preventing the absorption of poison in the body or expelling out the poison by emesis or elimination through urine. E.g. Activated charcoal	
3	**c)**	**Explain the role of iron in human body.** **Role of Iron:** 1. Essential part of Hemoglobin in blood (Treatment of anemia) 2. In blood it transports Oxygen from lung to various organs. 3. It has significant part in Oxidation-reduction reaction constantly taking place in normal metabolism. 4. It is associated with myoglobin, catalase, ferredoxin, Cytochrome P450, electron transport, enzyme cofactor etc. 5. It is required during growth, Menstrual cycle, pregnancy, pathological bleeding 6. Involved in cellular respiration 7. Production of ATP 8. It is an essential element of several nucleoproteins.	**3M**
3	**d)**	**Define and classify topical agents with examples.** **Topical agents:** Topical agents are compounds or preparations applied locally on the surface of skin or mucous membranes. OR Topical agents are substance applied on body surface, including application within the body cavities that open to the outside. E.g. oral, vaginal, colonal, nose, ear, rectum etc. **Classification:** **1. Protectives & Adsorbents:** E.g. Talc, Zinc oxide, calamine, zinc stearate, titanium dioxide, silicon polymers etc. **2. Antimicrobial agents:** a) Compounds acting by oxidation: E.g. hydrogen peroxide, potassium permanganate, chlorinated	**1M** **2 M**

		lime b) Compounds acting by halogenation: E.g. Iodine preparations e.g. Iodine, povidone iodine, Chlorinated lime, Sodium Hypochlorite c) Compounds acting by Protein precipitation: E.g. silver nitrate, mild silver protein, mercury & mercury compounds like yellow mercuric oxide, ammoniated mercury, Boric acid, borax **3. Sulfur & its compounds:** E.g. Sublimed sulfur, precipitated sulfur, selenium sulphide **4. Astringents:** E.g. Alum, zinc sulphate, Aluminium chloride, etc.	
3	**e)**	**What are Metabolic acidosis and alkalosis? How they are treated?** **Metabolic acidosis:** Metabolic acidosis occurs due to disturbance in acid-base balance in which acid concentration is increased in blood & body fluid. It occurs due to excess loss of base or bicarbonate (HCO_3^-) or increase in acid load. Reasons are 1. Excessive diarrhea, vomiting. 2. Excess acid production occurs due to diabetic acidosis, lactic acidosis, inadequate food intake, lack of oxygen etc. 3. Excess acid retention occurs due to renal failure or excess administration of acidifying salts like ammonium chloride. **Treatment-** This can be overcome by respiratory & renal mechanism. E.g. lungs increase CO_2elimination and also treated by using drugs like Sodium bicarbonate, Sodium acetate, Potassium acetate, Sodium citrate, Potassium citrate, Sodium lactate etc. **Metabolic alkalosis:** Metabolic alkalosis occurs due to disturbance in acid-base balance in which alkali (HCO_3^-) concentration is increased in blood & body fluid. It occurs due to retention of base or bicarbonate (HCO_3^-)or decrease in acid load. Reasons are: 1. Excess use of bicarbonates, loss of H^+, vomiting, use of diuretics etc. 2. Excess alkali retention occurs due to renal failure or excess administration of alkaline drugs like Sodium acetate, Potassium acetate. **Treatment**: This can be overcome by respiratory & renal mechanism. E.g. lungs decrease CO_2	**1.5M EACH**

		elimination and is also treated by using acidifying drugs like ammonium chloride.	
3	f)	**Enlist six different sources of impurities in Pharmaceuticals.** **Sources of Impurities:** **1.** Raw material 2. Reagents used in manufacturing process 3. Intermediate products in manufacturing process 4. Defects in manufacturing process/ manufacturing hazards 5. Solvents 6. Action of solvent and reagents on reaction vessel 7. Atmospheric contamination during manufacturing process 8. Defective storage of final products 9. Adulteration	**0.5M EACH**
4		**Answer any <u>FOUR</u> of the following**	**12M (4X3)**
4	**a)**	**Discuss the role of Oxygen in biological system** **Role of oxygen in the biological system:** 1. Oxygen is important to the living cell. 2. It is necessary for normal oxidative metabolic process in body for production of energy. The energy is used by cells to synthesize ATP. 3. Transport of oxygen is carried by hemoglobin, a constituent of blood. 4. Oxygen combines with hemoglobin to form oxyhaemoglobin. $Hb + O_2 = HbO_2$ This complex rapidly dissociates to release oxygen in the cell. Numbers of factors are responsible for association & dissociation of Oxyhaemoglobin. Example-temperature, pH, electrolyte, carbon dioxide. 5. By inhalation during respiration oxygenation of blood takes place in alveoli in the Lungs. Thus more oxygen is needed in anoxic condition.	**3M**

4	b)	**State the precautions to be taken while handling and storage of Radiopharmaceuticals.** **Handling and Storage of Radiopharmaceuticals** 1. Precautions should be taken while handling & storing radioactive material to protect the people from harmful radiations & to protect radiopharmaceuticals. 2.Radiopharmaceuticals should never be touched with hand but handled by means of forceps or suitable instrument 3.Smoking, drinking, eating should not be carried out in laboratory where radiopharmaceuticals are being handled 4. Sufficient protective clothing & shielding must be used. 5.Radiopharmaceuticals should be kept in suitable labeled container shielded by lead bricks, in a remote area 6. Disposal of radiopharmaceuticals should be done with great care. 7. The shielding effect can be achieved by thick (1meter thickness) concrete blocks or with pure distilled water layer. Water layer stops radioactive radiations allows visible light to pass while thick concrete block stops all radiations.	**3M**
4	c)	**Write the principle and reaction involved in the limit test for chloride**. **Principle: -** • Limit test for chlorides depends upon the interaction of chlorides with silver nitrate in the presence of nitric acid. • This results in the precipitation of silver chloride. When only very small quantity of chloride ions are present, silver chloride appears as turbidity and not as precipitate. • Silver chloride appears as opalescence which is compared with standard in Nessler cylinder. • The standard turbidity is produced by the action of silver nitrate solution with 1 ml of 0.05845 % w/w of Sodium chloride (Chloride Standard Solution- 25 ppm Cl). • Nitric acid is added to prevent precipitation of other acid radicals such as phosphate, sulphate etc. with silver nitrate solution.	**2M**

		Reaction: $Cl^- + AgNO_3 \rightarrow AgCl \downarrow + NO_3^-$ $NaCl + AgNO_3 \rightarrow AgCl \downarrow + NaNO_3$	**1M**
4	**d)**	**Define respiratory stimulant and expectorant. State properties of potassium iodide.** **Respiratory stimulant:** The substances which increase the rate & depth of respiration are called as Respiratory stimulant. **Expectorant**: The drugs that remove sputum from the respiratory tract. These drugs either increase the fluidity of sputum or increase the volume of fluids that are to be expelled from the respiratory tract by coughing. Expectorants are used orally to stimulate the flow of respiratory tract secretions. **Properties of potassium iodide** 1. It is a hexahedral crystals either transparent & colourless or somewhat opaque & white, or as a white granular powder. 2. It is odorless & has a saline bitter taste. 3. The salt is deliquescent in moist air. 4. It is soluble in water, alcohol & glycerine.	**1 M Each**
4	**e)**	**Give the molecular formula for:** i) Sodium metabisulfite: $Na_2S_2O_5$ ii) Sodium Bicarbonate : $NaHCO_3$ iii) Ammonium hydroxide: NH_4OH	**1M EACH**
4	**f)**	**Write reactions involved in:** **i) Effect of heat on Boric acid** **ii) Effect of Glycerin on Boric acid** **i)Effect of Heat on Boric acid**	**1.5 M EACH**

1] When heated above 100°C, it dehydrates, forming *metaboric acid* (HBO_2):

$H_3BO_3 \rightarrow HBO_2 + H_2O$

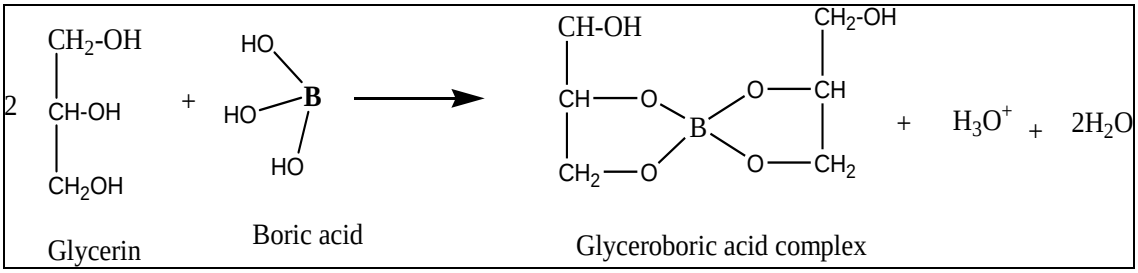
2] Boric acid melts at about 160°C, forming *tetraboric acid* or *pyroboric acid* ($H_2B_4O_7$):

$4HBO_2 \rightarrow H_2B_4O_7 + H_2O$

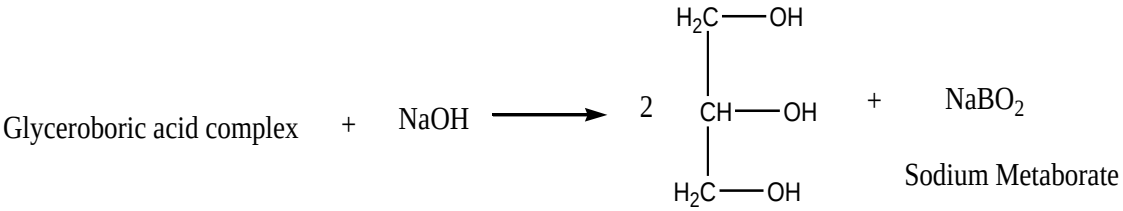
3] When heated above 160°C further dehydrates, forming boron trioxide.

$H_2B_4O_7 \rightarrow 2\ B_2O_3 + H_2O$

ii) Effect of Glycerin on Boric acid



Glycerin Boric acid Glyceroboric acid complex



Sodium Metaborate

Glycerol

Net reaction:

Glycerine

H_3BO_3 + NaOH ----------→ $NaBO_2$ + $2H_2O$

5		**Answer any <u>FOUR</u> of the following**	**12M (4x3)**
5	**a)**	**Mention properties, uses and storage of Borax.** **Properties-** • It occurs as colourless, odourless crystals or as white crystalline powder that has sweetish alkaline taste. • It effloresces in dry air. • It is soluble in water, more soluble in boiling water and glycerine and insoluble in alcohol. • An aqueous solution is alkaline to litmus. **Uses-** • Used in External application preparations. • Used as germicidal. • Used as bacteriostatic agent. • Used in preparations of eye wash, mouth washes & gargles. • Used as food preservative. • Used in cosmetic preparations as emulsifier. • Used in preparations of lotions. **Storage** – It should be stored in well closed container.	**1M EACH**
5	**b)**	**Explain electrolyte replacement therapy. Give official preparations of sodium chloride.** **Electrolyte replacement therapy**: Under normal physiological conditions body mechanism adjust the electrolyte balance and no replacement is necessary. But under some pathological and disease and other conditions there is deficiency of particular electrolyte. So administration of that electrolyte in appropriate concentration of tonicity becomes necessary. Electrolytes as sodium, potassium, calcium singly or in combination with other constituents like dextrose, invert sugar, and mannitol is given by oral route and by intravenous (parenteral)route to maintain the electrolyte balance in our body. **Official preparations of Sodium chloride:** 1. Sodium chloride eye lotion (B.P)	**1.5M EACH**

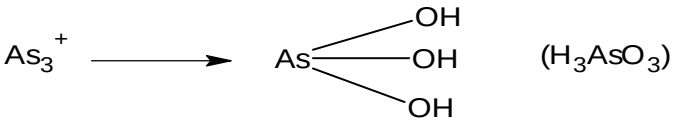
		2. Sodium chloride solution (B.P) 3. Sodium chloride injection (I.P , B.P) 4. Sodium chloride Hypertonic Injection (I.P) 5. Sodium chloride Tablet (B.P) 6. Sodium chloride and Dextrose injection (I.P) 7. Mannitol and Sodium chloride Injection (U.S.P)	
5	**c)**	**Define astringents. Give properties and uses of Alum.** **Definition-** Astringents are the agents which cause local or surface or mild protein precipitation when applied to damaged skin or mucus membrane. **Properties-** • It occurs as colourless, transparent powder or granular crystals with sweet astringent taste. • It is odourless. • Aqueous solution is acidic to litmus. • It is freely soluble in water, soluble in glycerine and insoluble in alcohol. **Uses-** • Used as Powerful astringent. • Dilute solution (1.4 %) used as astringent in mouth washes and gargles. • 2% solution of alum is used as antiperspirant. • Used as styptic in minor cuts. • Used in lotion & deodorant preparations. • Is used in preparation of diphtheria & tetanus toxoids.	**1M EACH**

5	d)	**Explain the principle involved in limit test for arsenic.**	**3M**

Step-1

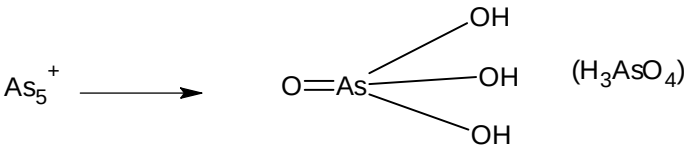
Limit test for arsenic is based on semi quantitative determination of arsenic impurities in the test sample of drug. The sample is dissolved in stannated acid which converts the arsenic impurities to arsenious acid or arsenic acid depending upon valency state of arsenic impurity present in the test sample.

STEP:-1



Trivalent arsenic — Arsenious acid

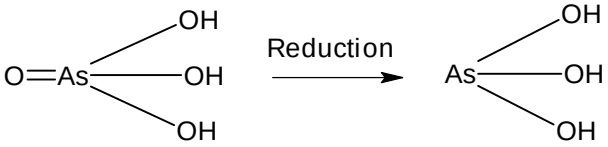
STEP:-2



Pentavalent arsenic — Arsenic acid

Step- 2

When acidic solution of sample treated with reducing agent (Stannous chloride) converts pentavalent arsenic acid into trivalent arsenious acid.



Arsenic acid — Arsenious acid

Step- 3

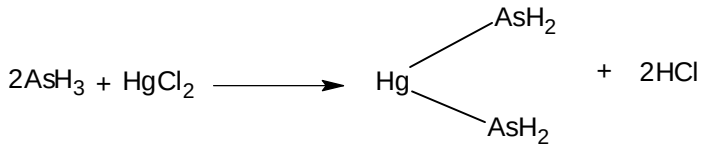
$Zn^{+}2 + 2SnHCl_3 \longrightarrow ZnCl_2 + 2SnCl_2 + 2(H)$

Step-4

The arsenious acid is then converted into gaseous hydride (Arsine gas) with the help of nascent hydrogen which is produced by Zinc and hydrochloric acid.

Step -5

Arsine gas is carried through the tube by the steam of hydrogen and out through the mercuric chloride paper. A reaction occurs between arsine and mercuric chloride, which produce yellow colour stain.



(Yellow in colour)

Step-6

The stain produced by test sample compared with that of standard arsenic solution. The limit of arsenic is expressed as part per million.

5	e)	**Give procedure involved in the limit test in iron.**	**3 M**

Procedure:

Standard Solution	Test Solution
1) Pipette out 2.0ml of iron standard solution in a labeled Nessler's Cylinder & add 20ml of distilled water.	1) Weigh 2gm of given sample & dissolve In 20ml of distilled water in a labeled Nessler's Cylinder.

2) Add 2ml of a 20% w/v Citric Acid iron free solution to both.

3) Add 0.1ml of thioglycollic acid to both mix well & make alkaline with iron free ammonia solution.

4) Dilute to 50ml with distilled water & allow to stand for 5 minutes.

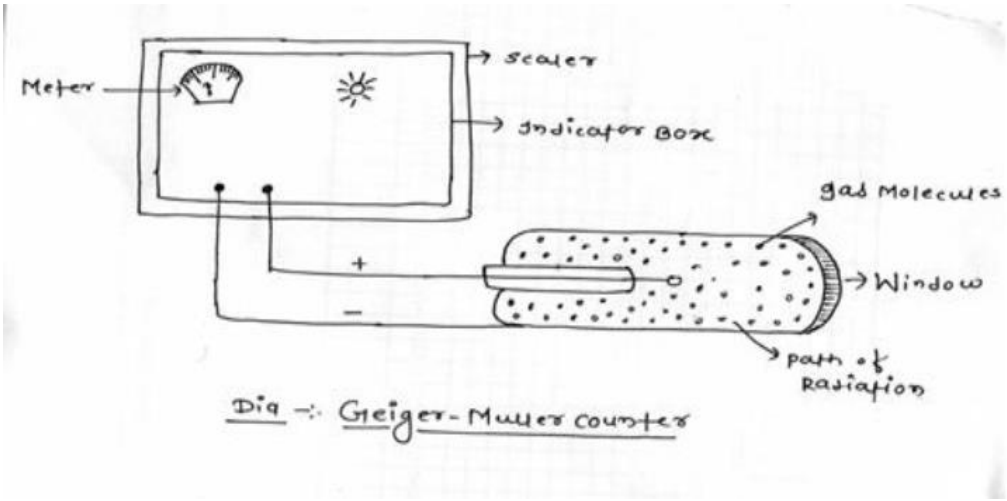
5) Compare the intensity of colour produced in the test solution with the standard.

6) Report accordingly.

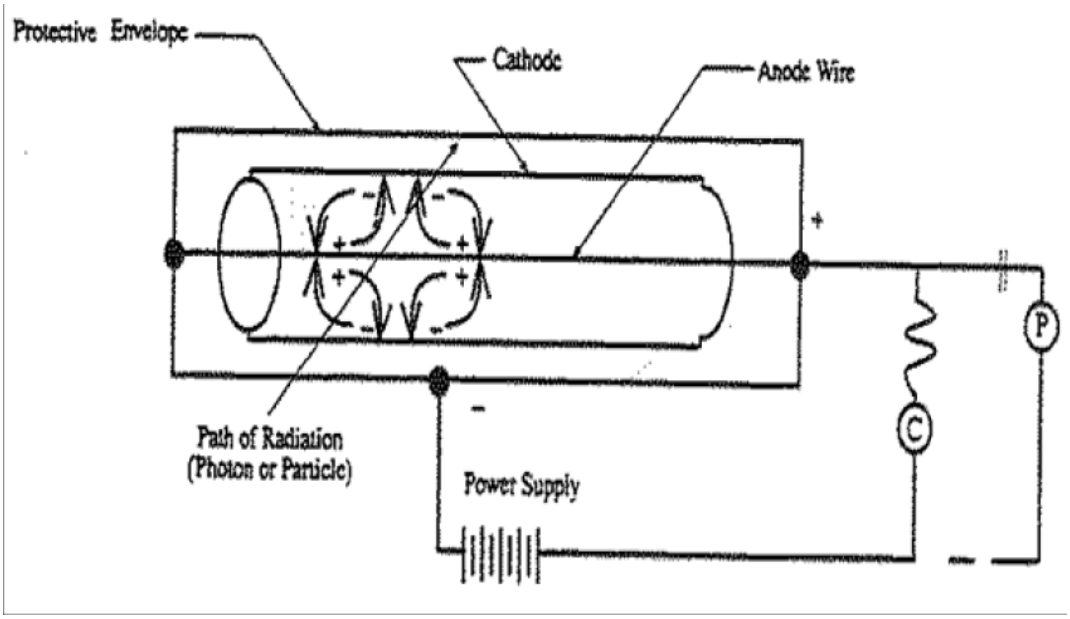
5	**f)**	**Write Synonym of :** i) Sodium Metaphosphate ii) Sublimed Sulphur ii)Ferrous sulphate **Compound** / **Synonym** Sodium Metaphosphate – Graham's Salt Sublimed Sulphur – Flower Of Sulphur Ferrous sulphate – Green Vitriol	**1 M EACH**
6		**Answer any <u>FOUR</u> of the following**	**16M (4X4M)**
6	**a)**	**Define: -** i) Antiseptic ii) Disinfectant iii) Germicide iv) Bacteriostatic **Antiseptic:** They are antimicrobial substances that are applied to living tissue/skin to reduce the possibility of infection, sepsis. **Disinfectant:** Disinfectants are substances that are applied to non-living/inanimate objects to destroy microorganisms that are living on the objects. **Germicide:** These are the agents which kill the microorganisms like bacteria, fungi and virus etc.	**1 M each**

		Bacteriostatic: These are the agents which functions by inhibiting the growth of bacteria. Thus these agents do not kill but arrest the growth of bacteria.	
6	**b)**	**Give any four properties of α and β rays.** **Alpha radiation:** 1. It emits alpha particles (Helium nucleus) having two positive charges. 2. They are helium ions with a relative +2 charge, containing two protons and two neutrons and have 4 mass number and atomic number 2. 3. It is heaviest and slowest of all radioactive emissions. 4. The velocity is about 1/10th that of light. 5. Penetrating power is less as compared to other emitted species. 6. It has no biological applications. 7. It is affected by strong magnetic field. 8. As these particles have 4 positive charge their ionization power is very high. **Beta radiation:** 1. They have a mass of 1/1836 i.e. the mass of hydrogen atom and a relative charge of -1. 2.As these radiations are lighter, they travel with the velocity little less than that of light 3. It has high penetrating power. 4. Particles affected by strong magnetic field. 5. Particles are useful in biological applications. 6. As these particles have negative charge they cause ionization of molecules, when they pass through various medias.	**2M EACH (Any 4diff.)**

6	c)	**Draw a neat labelled diagram and explain working of G.M counter.**	**2M EACH**



Dia :- Geiger-Muller counter



Working-

		Working of G.M. Counter:- It consists of stainless steel or glass cylinder with silver on the inner side which acts as a cathode. A fine metal wire is mounted coaxially inside the cylinder which acts as an anode. The cylinder is fitted with argon gas Radiation enters through the window. Due to radiations, argon gas is ionized. A high voltage (800-1300 V) is maintained between the electrodes. Due to ionization of argon gas, positively charged ions are attracted towards cathode & negatively charged ions are attracted towards anode. The passage of these ions through the tube constitutes flow of current. Each particle of radiation causes a brief flow or pulse of current which is recorded by a device known as scaler. Scaler shows total number of pulses & results are analysed.	
6	**d)**	**Define antioxidants.Give molecular formula,properties and uses of sodium thiosulphate.** **Definition-** Antioxidants are the agents which inhibit oxidation and are commonly used to prevent rancidity of oil and fats or deterioration of other material through oxidative process. **Molecular formula-** $Na_2S_2O_3.5H_2O$ **Properties-** • It occurs as transperant,colourless,monoclinic prisms or as a crystalline powder. • It has cool and bitter taste. • It effloresces in dry air and deliquesces in moist air. • It is soluble in water but insoluble in alcohol. **Uses-** • It is used in parasitic skin diseases. • It is used in controlling infection to athlete's foot. • It is effective in cyanide poisoning. • It is used extensively in photographic industry.	**1 M Each**

6	e)	**Mention four official preparations of:** **i) Iodine** **ii) Calcium** **i) Official preparations of Iodine-** a) Aqueous Iodine Solution b) Weak Iodine Solution c) Strong Iodine Solution d) Iodine tincture (U.S.P) e) Iodine ointment f) Phenolated iodine solution g) Povidone-iodine solution **ii) Official preparations of Calcium-** a) Calcium gluconateInjection. b) Calcium gluconate tablets c) Calcium hydroxide solution (B.P)(Lime water) d) Calcium lactate tablets e) Calcium Levulinate Injection (I.P) f) Sodium calcium edentate intravenous infusion (B.P)	**2M each**
6	f)	**Give two identification tests for (any two)** **i) Acetate ion** **ii) Potassium ion** **iii) Chloride ion** **iv) Sodium ion** **i) Acetate ion-** 1) When acetates are heated with equal quantity of oxalic acid, forms acetic acid which is recognized by its odour.	**2 M EACH**

$2CH_3COONa+(COOH)_2 \longrightarrow 2CH_3COOH+COONa$

2) Acetates when mixed with sulphuric acid followed by ethyl alcohol and warmed forms ethyl acetate.

$CH_3COONa+C_2H_5OH \longrightarrow CH_3COOC_2H_5+H_2O+NaOH$

3) Acetates when heated with calcium oxide forms acetone. Acetone is detected when a filter paper moistened with 2% O-nitrobenzaldehyde solution and dried and again moistened with NaOH,is placed on the mouth of the test tube and it turns blue.

4) Aqueous solution of acetates when treated with lanthanium nitrate solution followed by 2 drops of 0.1N iodine and a drop of dilute ammonia and boiled, gives blue precipitate or dark blue colour.

ii) Potassium Ions-

1) Potassium salt moistened with HCl and taken on platinium wire, when held in Bunsen flame gives a violet colour to flame.

2) Concentrated solution of salt when treated with perchloric acid gives a white crystalline precipitate of potassium perchlorate.

$3K^{+}+ClO_4^{--} \longrightarrow KClO_4$

3) Aq. Solution of salt acidified with acetic acid when treated with sodium cobalt nitrite gives a orange yellow precipitate of potassium cobalt nitrite.

$3K^{+}+[(Na_3CO(NO_2)_6]^{--} \longrightarrow K_3[CO(NO_2)_6]$

4) Aq. Solution of potassium salt when treated with sodiumtetraphenyl boron solution gives a white precipitate of potassium tetraphenyl boron.

$K^{+}+Na[B(C_6H_5)_4] \longrightarrow K[B(C_6H_5)_4]+ Na$

5) Potassium salts when ignited, cooled and dissolved in minimum quantity of water and treated with platinic chloride solution, yellow crystalline precipitate of potassium

chloroplatinate, which on ignition gives KCl and platinum.

$2K^{+}+H_2PtCl_6 \longrightarrow K_2PtCl6\,KCl + Pt$

iii) Chloride ions

1) Dissolve in 2ml of water a quantity of the substance being examined equivalent to about 2mg of chloride ion. Acidify with dilute nitric acid & add 0.5ml of silver nitrate solution. Shake & allow to stand, a curdy white ppt. is formed, which is insoluble in nitric acid but soluble after being well washed with water, in dil. ammonia solution, which is reprecipitated by addition of dil. nitric acid.

$NaCl + AgNO_3 \longrightarrow AgCl + NaNO_3$

2) Take 2mg of substance in test tube add 0.2gm of potassium dichromate & 1ml of Sulphuric acid. Place filter paper strip moistened with 0.1ml of diphenylcarbazide solution over the opening of the test tube, the paper turns violet red.

3) Chloride when heated with manganese dioxide & sulphuric acid, chlorine gas liberated

$NaCl + 2H_2SO_4 + MnO_2 \longrightarrow MnSO_4 + Na_2SO_4 + 2H_2O + Cl_2\uparrow$

iv) Sodium ions-

1) Sodium salt when moistened with HCl when taken on platinum wire and held on Bunsen flame, imparts yellow colour to the flame.

2) When sodium salt solution is boiled with potassium carbonate no precipitate is obtained, but if potassium antimonate solution is added to above, boiled solution and sides of the test tube rubbed with glass rod forms dense white precipitate of disodium antimonate.

$4Na^{+}+2KH_2SbO_4 \longrightarrow 2Na_2H_2SbO_4+2K$

3) Aq. Solution of Sodium salt when acidified with acetic acid and treated with magnesium uranyl acetate solution gives a yellow crystalline precipitate of triple

		acetate. $Na^{+}+3UO_2(C_2H_3O_2)_2.Mg(C_2H_3O_{22} \longrightarrow NaMg(UO_2)_3(C_2H_3O_2)_9.6H_2O$	