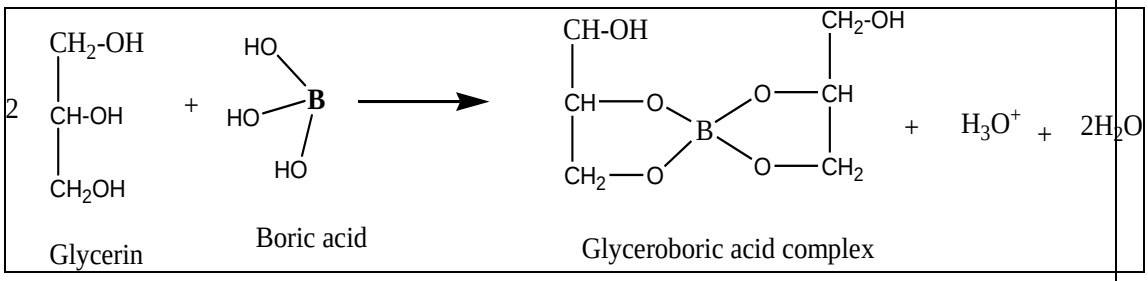
Important Instructions to examiners:

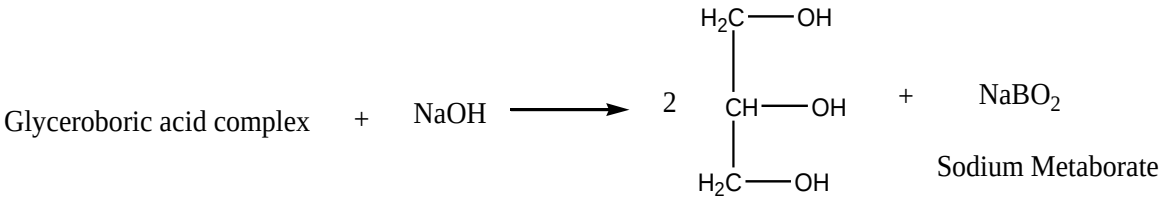
1) The answers should be examined by key words and not as word-to-word as given in the model answer scheme.
2) The model answer and the answer written by candidate may vary but the examiner may try to assess the understanding level of the candidate.
3) The language errors such as grammatical, spelling 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.

Q. No.	Sub Q.N.	Answer	Marking Scheme
1		**ATTEMPT ANY FIVE OF THE FOLLOWING.**	**20M (5x4)**
1	**a)**	**Define the terms with examples** **i) Lewis Acid and Lewis Base** **Definition of Lewis Acid:-** An acid is an electron pair acceptor or acid is electron seeking species or electrophilic species. Ex.H^+,Na^+,K^+,$M_g^{+,}Al^+$,BF_3,$FeCl_3$ **Definition of Lewis Base:-** A base is an electron pair donor and which have unshared electron pairs to share with proton or nucleophilic species. Ex.H_2O,OH^-,,F^-,$CH_3COOO^{-,}SO_4^{-2}$,NH_3 **ii) Respiratory stimulants-** Respiratory stimulants increases Pulmonary ventilation by their effect on depth and rate of respiration by stimulating respiratory centres in the medulla Examples- Gaseous ammonia, Dilute Ammonia solution, Ammonium carbonate etc. **Inhalants** Inhalants are gaseous substances directly administered by nasal or oral respiratory route for its local or systemic effect. **OR** Inhalants are drugs or chemicals which in vapour form are inhaled in the body. E.g. - Oxygen, Carbon dioxide, Nitrous oxide, Hydrogen, Nitrogen etc.	**2M Each**
1	**b)**	**Give synonyms and molecular formula for** **i) Sodium Hydroxide:** **Synony-**Caustic soda **Molecular formula-** NaOH **ii) Chlorinated lime** **Synonym -** Bleaching powder **Molecular formula -** Ca(OCl)Cl. H_2O or $CaOCl_2$	**2M EACH**

1	**c)**	**Explain why glycerine is used in the assay of Boric acid. Give reactions involved.** • The assay of boric acid is based upon acid-base type of titration in which Boric acid, a very weak acid is titrated against strong alkali like Sodium hydroxide. Boric acid is a weak acid having a pKa =9.19 for the ionization of its first proton. • Hence it must be combined with a polyhydroxy compound, in this case glycerin, for a titration assay to be performed. • This is because the glycerin esterifies the boric acid to produce a complex glyceroboric acid that behaves like a strong monoprotic acid, which in turn allows the titration to be carried out. • Once combined, it can be titrated against a strong base like sodium hydroxide, which causes the indicator(phenolphthalein) to change colour (from colourless to light pink).	**2M EACH**



Glycerin Boric acid Glyceroboric acid complex



Sodium Metaborate

Glycerol

Net reaction:

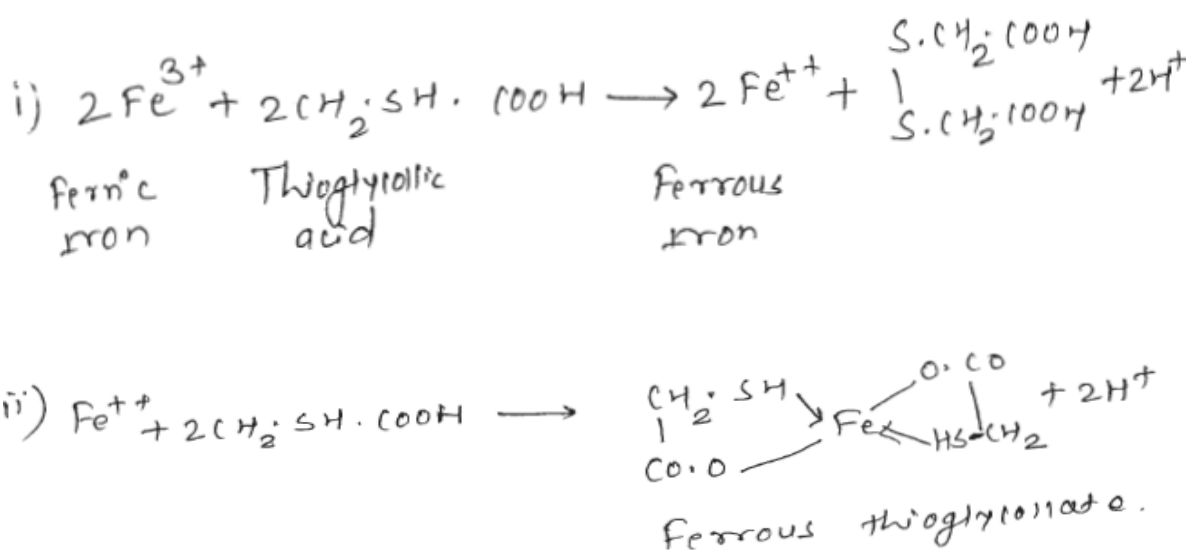
Glycerine

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

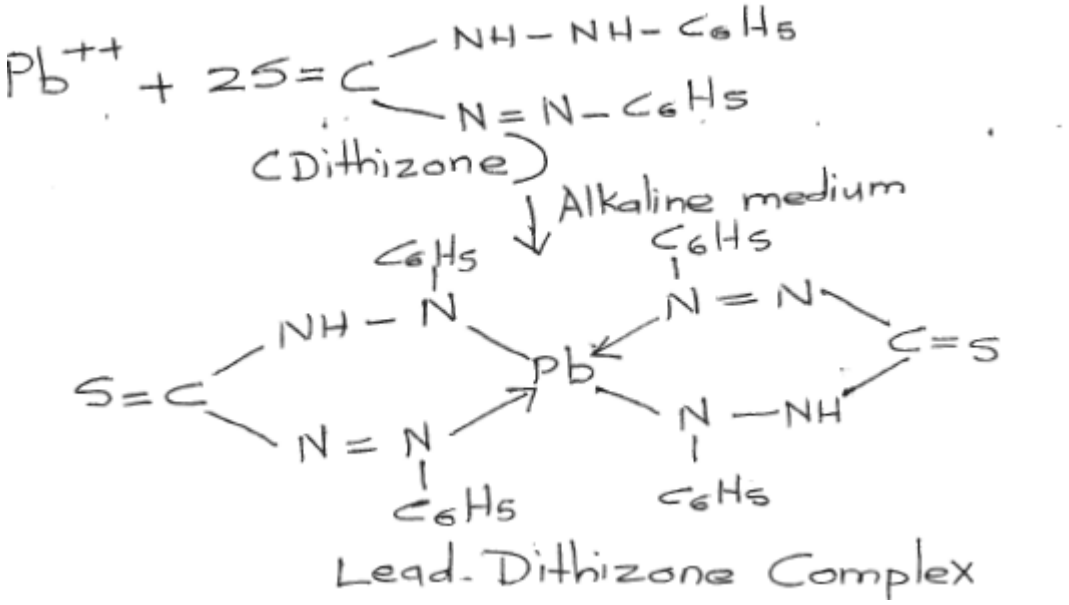
1	d)	**Define and classify "Topical Agents" with examples.** **Topical agents:** Topical agents are compounds or preparations applied locally on the surface of skin or mucous membranes. OR Topical agents are substance applied on body surface, including application within the body cavities that open to the outside. E.g. oral, vaginal, colonal, nose, ear, rectum etc. **Classification:** **1. Protectives & Adsorbents:** Talc, Zinc oxide, calamine, Zinc stearate, Titanium dioxide, Silicon polymers etc. **2. Antimicrobial agents:** a) Compounds acting by oxidation: Hydrogen peroxide, Potassium permanganate, Chlorinated lime b) Compounds acting by halogenation: Iodine preparations e.g. Iodine, povidone iodine, Chlorinated lime, Sodium Hypochlorite c) Compounds acting by Protein precipitation: Silver nitrate, Mild silver protein, Mercury & mercury compounds like yellow mercuric oxide, Ammoniated mercury, Boric acid, Borax **3. Sulfur & its compounds:** Sublimed sulfur, Precipitated sulfur, Selenium sulphide **4. Astringents:** Alum, Zinc sulphate, Aluminium chloride, etc.	**1M Def. 2M Class.**
1	e)	**Define "Astringents". Mention their uses.** Astringents are the agents which cause local or surface or mild protein precipitation when applied to damaged skin or mucus membrane. **Astringent uses:** 1. It causes constriction of small blood capillaries, and promote the coagulation of blood hence used as styptic (able to stop bleeding). 2. It decreases the volume of exudate from wounds & skin eruption. 3. Astringent causes constriction of skin pores & destroy body odor, hence used as an antiperspirant& deodorant.	**1M Def. 3M Uses**

		4. Higher concentration of astringent is used to remove warts (extra growth of cell on skin). 5. It promotes healing and toughens the skin. 6. It restricts blood flow to the surface of mucous membrane hence astringent decreases inflammation.	
1	**f)**	**Classify antacids with example. Write properties of ideal antacids.** **Classifications :** A) Systemic/ Absorbable antacids- Sodium Bicarbonate B) Non systemic/ Non absorbable antacids a) Aluminium containing antacids- Aluminium Hydroxide, Aluminium Phosphate, Basic aluminium carbonate b) Calcium containing antacids- Calcium carbonate, Calcium Phosphate c) Magnesium containing antacids- Magnesium carbonate, Magnesium oxide, Magnesium hydroxide, Magnesium trisilicate d) Combination antacids- Aluminium Hydroxide and Magnesium hydroxide, Aluminium Hydroxide gel and Magnesium trisilicate **Properties of ideal requirements of an antacids:-** • It should not be absorbable and cause systemic alkalosis. • It should not be laxative or cause constipation. • It should exert effect rapidly & over a long period of time. • It should buffer in pH 4-6. • It should not produce large volume of gas. • It should be palatable & inexpensive. • It should probably inhibit pepsin. • It should be insoluble in water & have fine particle size. • It should not have side effects.	**2M EACH**
1	**g)**	**Define expectorants. Write mechanism of action of expectorants with example.** **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	**1M Def. 3M MOA.**

		respiratory tract secretions. **Mechanism of action of expectorants:** **Mechanism of action of expectorants is categories in two ways that is sedative type and** **Sedative type :-**It acts by reflex action by irritating the gastric mucosa and thereby stimulating respiratory tract secretion. Ex.Ammoniumchloride, Potassium iodide. **Stimulant type**:- These drugs bring about a stimulation of the secretory cells of the respiratory tract directly or indirectly, since the drug stimulates secretion, more fluid is produced in respiratory tract and sputum gets diluted. Ex.Terpenoid oils like Eucalyptus, Lemon	
1	**h)**	**Discuss principle involved in limit test for iron with reactions.** **Principle:-** • Limit test for iron depends upon the interaction of thioglycolic acid with iron in the presence of citric acid and in the ammonical alkaline medium. • This results in the formation of purple colored ferrous salts of thioglycolic acid. • The limit test of iron is carried out in two Nessler Cylinders, one for the 'Test' and other for'standard'. • The intensity of purple color produced in the two is compared by viewing vertically downwards. • Role of Thioglycolic acid-Iron impurity may be present in trivalent ferric form or in the divalent ferrous form. If it is in ferric form, thioglycolic acid convert ferric form of impurity into ferrous form and then forms a ferrous thioglycolate complex. • Role of Citric acid: It prevents the precipitation of iron in presence of ammonia. • Role of Ammonia: It maintains alkaline PH for the formation of stable purple colored ferrous thioglycolate complex.	**2M EACH**

		Reaction:  	
2		**Attempt any <u>THREE</u> of the following.**	**12M (3x4)**
2	**a)**	**Define achlorhydria. Give properties, uses and molecular formula of agent used to treat achlorhydria.** **Achlorhydria :-** When due to some reasons, there is no secretion of hydrochloric acid in gastric secretion in stomach the condition is called as achlorhydria. **Properties of Hydrochloric acid :-** • It occurs as a colourless, fuming liquid with pungent odour. • It is miscible with water, alcohol & has a specific gravity of 1.18. • It is a strong acid & attacks metals forming their hydrochlorides with the evolution of hydrogen gas. • It is stored in glass-stoppered containers at a temperature not exceeding 30°C. **Uses of Hydrochloric acid :-** • Hydrochloric acid as such cannot be used as medicine. • The dilute hydrochloric acid is used as acidifying agent.	**1M EACH**

		• It is also used as a solvent in numerous industries. • Also used as laboratory reagent. **Molecular formula : HCl**	
2	**b)**	**Define the following terms** **i) Antioxidants:** Antioxidant is an agent which is added to any preparation to prevent oxidation of ingredients and subsequent deterioration of the product. Chemically they act as reducing agents. **ii) Anticaries Agent:** These are the agents used to treat Dental caries or tooth decay which has been defined as a disease of the teeth caused by acids formed by the action of microorganisms on carbohydrates. **iii) Emetics:** A drug or substance given to induce vomiting is known as Emetic. OR The drugs or compounds which expel contents from the GIT are known as emetics. **iv) Dental fluorosis:** More quantity of fluoride if ingested, it is carried to bones and teeth and produces mottled enamel known as dental fluorosis.	**1M EACH**
2	**c)**	**Explain the principle involved in the limit test for lead IP with reaction.** • The limit test for lead as per I. P. and U. S.P is based upon the reaction between lead and diphenylthiocarbazone (dithizone). • Dithizone in chloroform extracts leads from alkaline aqueous solutions as a lead dithizone complex (red in colour). • The original dithizone has a green colour in chloroform, thus the lead-dithizone shows a violet-red colour. • The intensity of the colour of complex depends upon the amount of lead in the solution. • The colour of the lead-dithizone complex in chloroform is compared with a standard volume of lead solution, treated in the same manner. • In this method, the lead present as an impurity in the substances, is separated by	**2M EACH**

		extracting an alkaline solution with a dithizone extraction solution. • The interference and influence of other metal ions etc., is eliminated by adjusting the optimum pH for the extraction, by using ammonium citrate, potassium cyanide, hydroxylamine hydrochloride reagents, etc. **Reaction:-**  	
2	**d)**	**Give properties and uses of calcium carbonate and hydrogen peroxide.** **i) Calcium carbonate** **Properties:** • It is a fine, white, microcrystalline powder. • It is odourless and tasteless. • It is insoluble in water and alcohol and water solubility is increased by the presence of CO_2 and also by ammonium salt. **Uses:** • It is used as an antacid and adsorbent • It reduces gastric hyperacidity and pain in gastric and duodenal ulcers. • It is used as emulsifying agent.	**2M EACH**

		ii) Hydrogen peroxide: **Properties**: • Colourless and odourless liquid with slight acidic taste. • Soluble in water, alcohol and ether. • Decomposes in contact with oxidisable matter, reducing agents, on making alkaline, or on standing. $2\ H_2O_2 \rightarrow 2\ H_2O + O_2$ • It acts as an oxidizing or reducing agent depending upon the chemical environment. **Uses:** • Antiseptic and Disinfectant- For cleaning of wounds. • 1.6% solution is used as Deodorant, gargle and mouth wash. • Used for bleaching the hair. • As an antidote in phosphorous and cyanide poisoning.	
2	**e)**	**Define Antimicrobial agents and explain their mechanism of action. Give properties of Potassium Permanganate.** Antimicrobial is a broad terminology describing activity against microbes. Specific terminology describes exact mode or mechanism of action. e.g. Antiseptics, Disinfectant, Germicide (bactericide against bacteria), fungicide (against fungi), virucide (against virus) etc. denotes exact action.), Bacteriostatic. Inorganic compounds generally exhibit antimicrobial action by, either of the three mechanisms viz. **(i) Oxidation** **(ii) Halogenation** **(iii) Protein binding or precipitation.** **i) Oxidation Mechanism :** Compounds acting by this mechanism belong to class of peroxide, peroxyacids, oxygen liberating compounds like permanganate and certain oxo-halogen anions. They act on proteins containing sulphadryl group and oxidize free sulfhydryl to disulphide bridge and inactivate its function. **ii) Halogenation Mechanism:**	**1M Def. 2M MOA 1M Prop.**

		Compounds which liberate chlorine or hypochlorite or iodine act by this mechanism. This category of agents acts on peptide linkage and alter its potential and property. The destruction of specific function of protein results in death of microorganisms. **iii) Protein Precipitation Mechanism :** Many metals in their cation form exhibit protein binding or protein precipitation. The nature of interaction with protein occurs through polar group of protein which acts as ligand and metal ion acts as Lewis acid. The complex formed may be a strong chelate leading to inactivation of protein. This action in general is non-specific. Protein precipitants do not distinguish between the protein of microbes and that of host. Germicidal action results when the concentration of ion is such that reaction is restricted largely to the parasite cell. **Potassium permanganate:** **Properties**: • Dark purple coloured, crystalline powder. • It is Strong oxidizing agent. • Odourless but has sweet, astringent taste • Soluble in water.	
3		**Attempt any THREE of the following:**	**12M (3X4)**
3	**a)**	**Define and explain mechanism of antioxidants. Give properties and uses of Sodium thiosulphate.** **Definition:** Antioxidants are defined as the agents which have the capability of functioning chemically as reducing agents and are commonly used to prevent rancidity of oils and fats or deterioration of other pharmaceutical materials through oxidative processes. **Mechanism of action-** • When a substance acts as antioxidant (it being a reducing agent) it gets oxidised itself and prevents the oxidation of the active pharmaceutical species. • If the active pharmaceutical species is already oxidized, then the antioxidant will reduce it back to its original reduced form. • Inert gas like nitrogen displaces the oxygen in container & prevents oxidation.	**1M EACH**

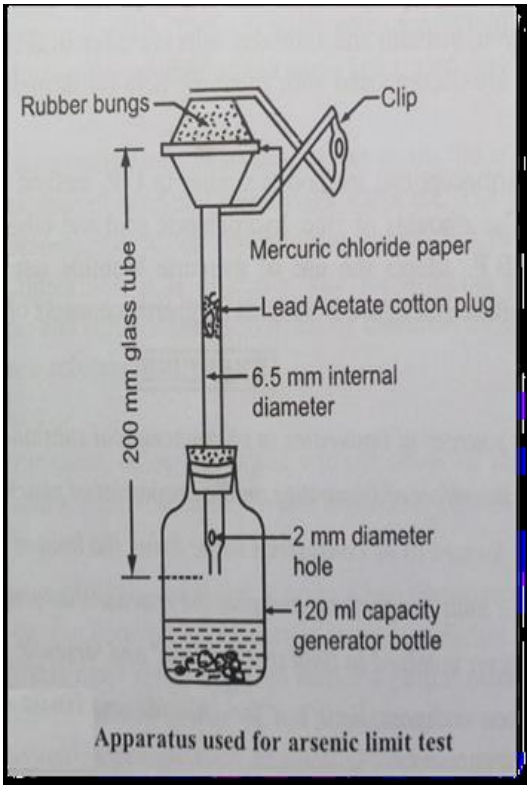
		Properties- • It occurs as transparent, colourless monoclinic prisms or as a crystalline powder. • It has cool and bitter taste. • It effloresces in dry air and deliquesces in moist air. • It is soluble in water but insoluble in alcohol. **Uses-** • It is useful as Antioxidant. • It is used as antidote in cyanide poisoning. • It is an effective Antifungal and used in skin infections such as dermatophytosis. • When used in large doses it causes cathartic action.	
3	**b)**	**Define with example** **i) Radio Isotopes** **ii) Protectives and Adsorbents** **iii) Buffers** **iv) Radio opaque contrast media** **i) Radioisotopes-** The elements having same atomic number but different atomic mass number or atomic weight are called as radioisotopes. e.g.- ^{60}CO,^{131}I, ^{32}P, ^{14}C,^{24}Na,^{90}Y etc **ii) Protective and adsorbents-** Are the chemical agents used internally in treatment of disturbances of gastrointestinal tract like diarrhoea & dysentery because they are water insoluble substances and they form a protective coat on the mucosal membrane and offer mechanical protection, furthermore, they adsorb bacterial toxins which are believed to stimulate flow of electrolytes into intestine resulting in watery stools. e.g. - Bismuth Sub carbonate, Kaolin etc. **iii) Buffers-**Buffers are solutions or systems that resist a sudden change in pH	**1M EACH**

		upon addition of small quantities of acids & bases.e.g.- Ammonium acetate. Acetic acid and sodium acetate. Ammonia and Ammonium chloride **iv) Radio-opaque contrast media-** Are the chemical compounds which have the ability to absorb X-rays & block the passages of X-rays. Thus, they are opaque to x-ray examination, such compounds & their preparations are called as radio opaque contrast media. X-rays are electromagnetic radiation of short wavelength & thus have high penetrating power. The electrons of high atomic number element can interact with x-rays. The interaction causes interference in their passage through the medium. e.g.- Barium sulphate	
3	**c)**	**Give two identification tests for-** **i) Chloride ion** **ii) Calcium ion** **i) Chloride ion:-** 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. $NaCl + 2H_2SO_4 + MnO_2 \longrightarrow MnSO_4 + Na_2SO_4 + 2H_2O + Cl_2\uparrow$ **ii) Calcium ion:-** 1) When solution of calcium salt is prepared with minimum amount of HCl, neutralized with ammonium carbonate solution gives a white ppt. of calcium carbonate. On boiling & cooling the amorphous ppt. of calcium carbonate becomes crystalline. The ppt. is sparingly soluble in ammonium chloride solution.	**2M EACH**

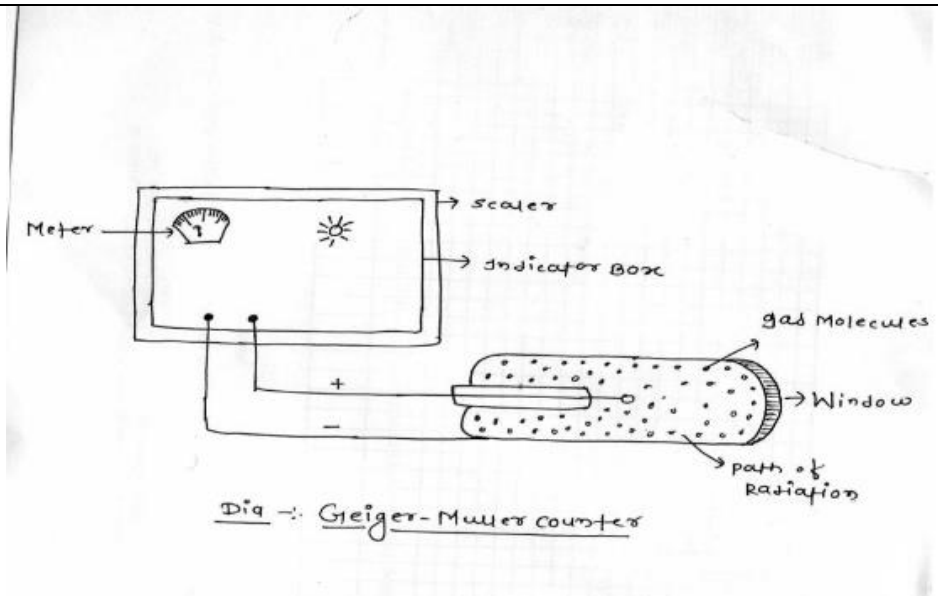
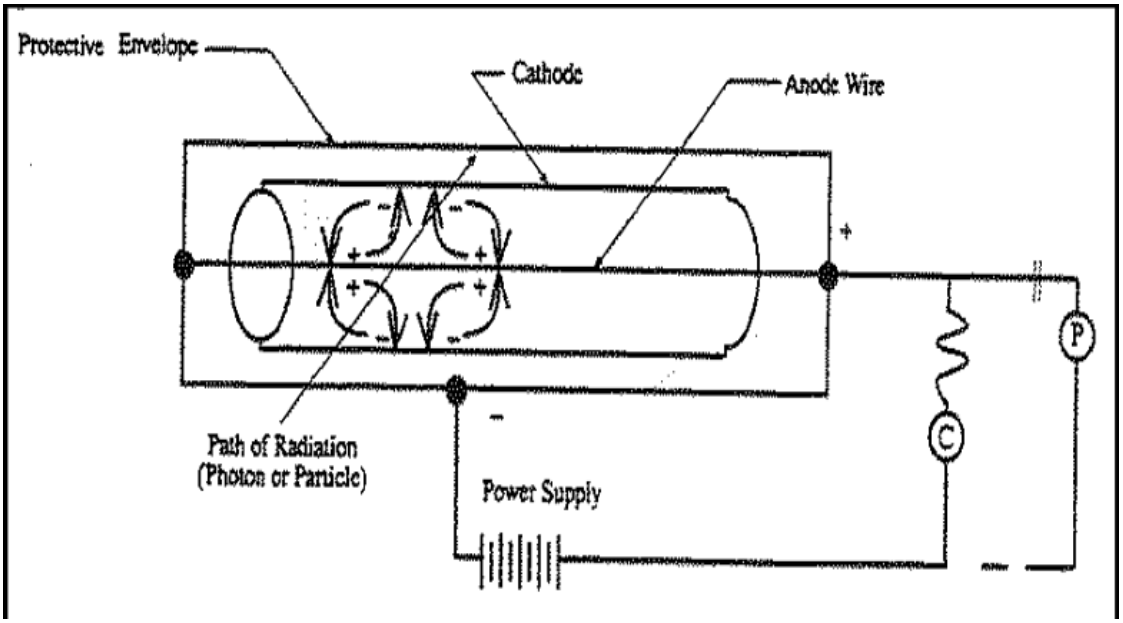
		$Ca^{++} + Co_3^{--} \longrightarrow CaCO_3$ 2) When ammonium oxalate solution is added to a solution of calcium salt, a white ppt. of calcium oxalate is obtained. This ppt. is sparingly soluble in dilute acetic acid but dissolves in HCl. $Ca^{++} + C_2O_4 \longrightarrow CaC_2O_4 \longrightarrow CaCl_2 + H_2C_2O_4$ 3) Concentrated solutions of calcium salts on treatment with potassium chromate solution give a yellow crystalline ppt. of calcium chromate on shaking. On dilution with water the ppt. dissolve $Ca + 2CrO_4^- \longrightarrow 2CaCrO_4$ 4) When a solution of calcium salt is acidified with glacial acetic acid and treated with few drops of potassium ferrocyanide solution, the salt solution remains clear; on addition of ammonium chloride it gives a white ppt which is less soluble. The exact composition of second ppt is depend upon amount of ammonium ions. $Ca^{++} + 2K^+ + Fe(CN)_6^{----} \longrightarrow CaK_2(Fe(CN)_6) \longrightarrow CaNH_4KFe(CN)_6$	
3	**d)**	**Discuss the biological effects of radiations on human body.** **Biological effects of Radiation** The effect of radiation upon biological tissue depends upon a number of factors such as: -Ability of the radiation to penetrate tissue. -The energy of Radiation -The kind of Tissue -Surface area of the tissue exposed -Dose rate of the Radiation The radiation interacts with the molecules present in the tissue & forms abnormal chemical species like ions &/or free radicals. These ions or free radicals can alter the local PH in the tissue & initiate the undesirable free radical chain reactions, producing peroxides & other compounds toxic to the tissue .this may lead to necrosis &ultimately destroy the tissue or organ. Water molecules in the tissue are the most probable reactive species in the path of ionizing radiation. Other Free Radicals & Hydrogen peroxidases also formed.	**4M EACH**

		×H2O →×H+×HO ↓ ↓ yH2 yH2O2 Free radicals formed from water can also abstract radicals from other molecules &produce various toxic species which can alter the DNA in cells & cause cross linking between certain amino acids in proteins. Thus the particular tissue gets destroyed. Alpha particles also have a potential to produce a tremendous amount of ionization or free radicals but the range & penetration of these particles are very slight. Therefore, the isotopes emitting alpha particles must be close enough to the individual for the radiation to reach the skin, in order to get observable effects. Gamma rays have relatively low ionizing power, even though the range & penetrating power of this type of radiation are high enough to produce significant damage in the particular tissue at distances of several meters from the source.	
3	**e)**	**Define cathartics. Classify with examples. Give synonym and molecular formula of Sodium Potassium tartarate.** **Cathartics**: Cathartics are the agents used to promote defecation or to relieve constipation. Laxatives are mild cathartic and Purgatives are strong cathartics. **Cathartics Classification:** **1. Laxatives** **A) Bulk producing drugs**- Isapgol, agar-agar, methyl cellulose, sodium car boxy methyl cellulose. **B) Stool softners (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	**1M EACH**

		(iii) Sulfur as cathartic (iv) Non official Cathartics- Sodium Sulphate, Potassium Phosphate. **Synonym-** Rochelle salt, seignette salt, Potassium sodium tartarate. **Molecular formula-** $C_4H_4O_6NaK.4H_2O$	
4		**Attempt any THREE of the following:**	**12M (3X4)**
4	**a)**	**Give storage and labelling for-** **i) Oxygen** **ii) Carbon dioxide** **i) Oxygen**: It should be stored under compression in metal cylinder. It should be stored in a special storage room which should be cool and free from inflammable materials. The shoulder of the metal cylinder is painted WHITE and remainder is painted BLACK. The cylinder carries a label stating the name of the gas and in addition, the symbol "O_2" is stencilled in paint on the shoulder. **ii) Carbon dioxide:-** It should be stored under compression in metal cylinder.The shoulder of cylinder is painted grey and has the name and symbol of "CO_2" stencilled in paint on the shoulder.	**2M EACH**

4	**b)**	**Draw a well labeled, neat diagram of Gutzeit-Apparatus**  Apparatus used for arsenic limit test	**4M**
4	**c)**	**Classify Gastrointestinal Agents with examples.** **Classification :** **1) Gastric acidifiers/Acidifying agent:** Dilute Hydrochloric Acid **2) Antacid**: **i) Systemic Antacid**- Sodium Bicarbonate **ii) Non systemic Antacid**- Aluminium Hydroxide, Aluminium Phosphate, Basic aluminium carbonate , Magnesium carbonate, Magnesium oxide, Magnesium hydroxide, Magnesium trisilicate, Calcium carbonate, Calcium Phosphate, Sodium bi-carbonate etc. **3) Protective and Adsorbent**: Bismuth Sub carbonate , Bismuth sub nitrate , kaolin , Milk of bismuth etc **4) Cathartics** –it is also classified as i) Stimulant ii) Bulk purgative iii) Lubricants iv) saline cathartics E.g. – Castor oil, Methyl cellulose, liquid paraffin, Mineral oil, Senna, Magnesium sulphate, Isapgol, etc.	**4M**

4	**d)**	**Name four devices used for measurement of radiations. Explain GM counter.** **Devices-** 1. Ionization chamber 2. Proportional counters 3. GM counters 4. Scintillation counter 5. Semiconductor detectors 6. Photographic plate method **GM counter-** **Construction & working of GM counter** 1. It consists of stainless steel or glass cylinder with silver on the inner side which acts as a cathode. 2. A fine metal wire is mounted coaxially inside the cylinder which acts as an anode. 3. The cylinder is fitted with argon gas & radiation enters through the window. 4. Due to radiations, argon gas is ionized. A high voltage (800-1300 V) is maintained between the electrodes. 5. Due to ionization of argon gas, positively charged ions are attracted towards cathode & negatively charged ions are attracted towards anode. 6. The passage of these ions through the tube constitutes flow of current. 7. 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.	**1M** **Names** **3M** **Expl.**

		 Dia :- Geiger-Muller counter 	
4	**e)**	**Define and classify antidote with examples. Name two antidotes used in cyanide poisoning.** **Definition:** Antidotes are the agents which are used to reverse, stop or counteract the action of poisons. **Classification of Antidotes-** (1) Physiological antidote:	**1M Def. 2M Classify**

		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 (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. (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,$MgSo_4$,$NaHPO_4$,$Cuso_4$ **Antidotes used in cyanide poisoning-** • Sodium Nitrite • Sodium thiosulphate.	**1M names of ant.**
5		**ATTEMPT ANY <u>THREE</u> OF THE FOLLOWING**.	**12M (3X4)**
5	**a)**	**Explain "Physiological acid-base balance".** • The acid-base balance in the body is well regulated by intricate mechanisms. • Number of chemical reactions takes place inside the cells and the activity of cell and the reactions occurring inside the cell is greatly influenced by pH or hydrogen ion concentration. • The hydrogen ion concentration in the extra-cellular fluid is regulated at a value of approximately 4 x 10^{-8}Eq/Iit. • The pH of blood of healthy person remains constant around 7.38-7.42. • When the pH of the blood falls below 7.38, the condition is known as metabolic acidosis**,** while when the pH of blood is higher than 7.42, it is known as metabolic alkalosis. The control of hydrogen ion concentration (pH). (Physiological Acid- Base Balance) is mainly carried by three mechanisms viz. **<u>(1) Buffering system :-</u>** Three major systems of buffers occurring in the body are:-	**4M**

(i) Carbonic acid/bicarbonate **[H_2C0_3/HCO_3^-]** which mainly occurs in plasma and kidney,

(ii) Monohydrogen phosphate/dihydrogen phosphate **[$HPO_4^{-2}/H_2PO_4^-$]** found in cells and kidney and

(iii) Protein buffer system.

- Proteins are composed of amino acids which are bound together by peptide linkage.
- It is the most abundant buffer in body cells & plasma. Proteins are composed of amino acids that contain at least one carboxyl group (COOH) & at least one amino (NH_2) group.
- When there is an excess of hydrogen ions, the amino group acts as a base & accepts the proton.
- Thus, protein serves both the functions of acid & base components of a buffer system because of its amphoteric nature.
- At physiological pH, histidine & cysteine are the most important amino acid buffers.
- Since haemoglobin is a protein composed of histidine residues, it is also an effective buffer.

(2) Respiratory centre:-

- The other important pH control is through the control of "respiratory centre".
- When this is stimulated, it alters the rate of breathing.
- Through the rate, the removal of $CO_2$from body fluids leads to the changes in pH of blood.
- Retention of CO_2in the body due to decrease in ventilation as a result of mechanical/muscular impairment, lung disease, pneumonia, CNS depression due to narcotic drugs, etc. induces respiratory acidosis.
- This can be overcome by renal mechanismby
  i) Increase in acid excretion by Na^+- H^+ exchange
  ii) Increase in reabsorption of HCO^{3-} (bicarbonate)
- In respiratory alkalosis there is excess loss of CO_2 from body due to over breathing or hyperventilation as a result of emotional factor, fever, hypoxia, loss of appetite, salicylate poisoning etc. This can be overcome by renal mechanism by :

		• Increase in bicarbonate (HCO_3^-) excretion • Decrease in ammonia (NH_3) formation • Decrease in reabsorption of HCO_3^- (bicarbonate) **(3) Kidneys:-** • The third mechanism is via elimination of some ions through urine by kidney. • Absorption of certain ions and elimination of others control the acid-base balance of blood and thus of body fluids.	
5	**b)**	**Define impurity and explain its effect on pharmaceutical preparations.** **Impurity-**Any foreign matter present in a given sample is termed as an impurity. **Effect of impurity on pharmaceutical preparations-** • Toxic impurities- These impurities have toxic effect on body if present beyond prescribed limit. E.g.- Lead or Arsenic. • Impurities which are harmless- These may lower the active strength of the substance. E.g- impurities of Sodium salts in Potassium salts. • Impurities which affects the storage capacity of pharmaceuticals. E.g- presence of moisture beyond limit may affect the flow property of substance or decompose it. • Impurities causing technical difficulties. E.g.- presence of carbonate impurity in ammonia solution. • Impurities may cause changes in odour, colour, and taste thereby making the substance unethical and unhygienic. • Impurities may cause incompatibility with other substances. • Impurities may decrease the shelf life of substances. • Impurities, even when present in traces, may show a cumulative toxic effect after a certain period.	**1 M def. 3M effect.**
5	**c)**	**Discuss Arrhenius theory of acids and bases with examples. Write uses of Boric acid and Calcium hydroxide.** Acid is defined as a substance which when dissolved in water gives hydrogen ions. **(H^+)** E.g. $HCl \longrightarrow H^+ + Cl^-$ $CH_3COOH \longrightarrow H^+ + CH_3COO^-$	**1M each**

		Base is defined as a substance which when dissolved in water gives hydroxyl ions. **(OH^-)** e.g. $NaOH \longrightarrow Na^+ + OH^-$ $NH_4OH \longrightarrow NH_4^+ + OH^-$ Acid or Base on dissolution in water dissociates forming ions and establishes equilibrium between ionized and unionized molecule. **Uses of Boric acid-** • Boric acid is used in preparation of buffer solution. • It is used to maintain acidic pH in various topical medications. • Boric acid is used in ointment for emollient & antiseptic action. • Boric acid solutions are used mainly as eye & mouth wash for local anti-infective action. • Since boric acid has smooth unctuous nature it is employed as an ingredient in dusting powder. **Uses of Calcium hydroxide-** • It acts as an antacid. • Used as an astringent in infantile diarrhea & vomiting in the form of lime water. • It reacts with fatty acids, forming calcium soaps which act as emulsifying agent. • It is an ingredient in some skin lotions. • Calcium hydroxide along with sodium hydroxide in a particular mixture known as Soda Lime is used for its ability to absorb CO_2 from expired air. • Its CO_2 absorbing property is useful in certain types of gas traps.	
5	**d)**	**State the reactions and explain the principle of assay of hydrogen peroxide or ferrous sulphate.** **Hydrogen peroxide** **Theory:** • This assay is based upon the oxidation –reduction type of titration in which solution of potassium permanganate acts as an oxidizing agent and hydrogen peroxide in	**2 M each**

		presence of strong oxidizing agent like potassium permanganate acts as reducing agent. The potassium permanganate solution acts as self-indicator. • The ability of potassium permanganate solution to oxidize is due to the conversion of the MnO_4^- to Mn^{++} in acidic solution. MnO_4^- are purple in colour & solution of salts containing Mn^{++} are colourless, hence permanganate solution is decolorized by reducing agent like hydrogen peroxide. The moment there is an excess addition of potassium permanganate; solution becomes purple at the end point. **Chemical reaction for assay:** $2KMnO_4 + 3H_2SO_4 + 5H_2O_2 \rightarrow K_2SO_4 + 2MnSO_4 + 5O_2\uparrow + 8H_2O$ **Ferrous sulphate** **Theory-** • Assay of ferrous sulphate depends upon oxidation-reduction type of titration where Fe^{2+} (Ferrous ions) are readily oxidized by potassium permanganate in acidic solution (H_2SO_4) in to Fe^{3+}(ferric ion). • Thus ferrous sulphate acts as a reducing agent and potassium permanganate acts as an oxidising agent. • The ability of potassium permanganate solution to oxidize ferrous ion is due to conversion of the MnO_4^- ion to Mn^{++} in acidic solution. Solutions containing MnO_4^- ion are purple in colour , solution of salt containing Mn^{++} ions are colourless, hence potassium permanganate in acidic solution acts as a self-indicator. **Chemical reaction for assay:** $10\ FeSO_4 + 8H_2SO_4 + 2KMNO_4 \rightarrow 5Fe_2(SO_4)_3 + 2MNSO_4 + K_2SO_4 + 8H_2O$ $MnO_4 + 8H^+ + 5e^- \longrightarrow Mn^{+2} + 4H_2O$ $Fe^{2+} \rightarrow Fe^{3+} + e^-$	
5	**e)**	**Give properties, uses, storage and labelling of Nitrous oxide.** **<u>Properties</u>** • Nitrous oxide, commonly known as laughing gas or nitrous, is a chemical compound,	**1 M each**

		an oxide of nitrogen with the formula N_2O. • At room temperature, it is a colourless non-flammable gas, with a slight metallic scent and taste. • At elevated temperatures, nitrous oxide is a powerful oxidizer similar to molecular oxygen. • It is soluble in water. **Uses** • It is used by inhalation for operation of short duration like dental extractions, minor operations of boils and abscesses. • It produces anesthesia with analgesia. • It is also effective in calming excited mental patients. • Nitrous oxide is given by inhalation in 60-80% or with oxygen 20-40% as required. **Storage and Labeling:-** • The gas is stored in metal cylinder under compression and at a temperature not exceeding 37ºC. • The cylinder is painted blue and carries a label stating the name of gas and symbol N_2O stenciled in paint.	
6		**Attempt any THREE of the following.**	**12M (3X4)**
6	**a)**	**Explain the importance of Electrolyte combination therapy and ORS mixture and give recommended by WHO and UNICEF.** • Electrolyte combination therapy-Usually when patient is unable to take normal diet before or after surgery, the electrolyte combination therapy is used. • Infusions containing glucose and normal saline are used. • But when the patient is deficient or in protracted illness, other electrolytes are also needed and in such cases the combination of electrolytes are prepared and given as per the need of the patient. • Various combinations of electrolytes, varying in concentration are available commercially.	**2M impor tance 1M each formu la**

- Electrolyte combination products are divided in two categories:-
  (i) Fluid maintenance therapy.
  (ii) Electrolyte replacement therapy.

Oral rehydration salt (ORS):

- 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 anhydrc 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.

Ingradients	**Formula-WHO**	**Formula-UNICEF**
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**	**…….**

6	**b)**	**Define and classify Dental products. Give the role of fluorides in dental caries.** **Dental products**-The products which are used in cleaning, polishing, treating dental caries, desensitizing, or for any dental infection are called as dental products. They are also known as dentifrices. **Classification :** 1.Anticaries agents: Dental caries is a disease of teeth caused by acids formed by action of microorganism on carbohydrate and it is characterized by decalcification of tooth and foul mouth odour. Anticaries agents help in the prevention of dental caries. Ex. Sodium fluoride, Stannous fluoride 2. Cleaning agents: It helps to remove stains from teeth and gives abrasiveness. Ex. Calcium phosphate dibasic ,sodium metaphosphate 3. Polishing agents: It gives whiteness to the teeth. Ex. Calcium carbonate, Calcium pyrophosphate 4. Desensitizing agents: It reduces the sensitivity of teeth to hot and cold. Ex. Zinc chloride, Strontium chloride **Role of fluorides in dental caries** • Administration of traces of fluoride containing salts or their use in topical use to the teeth has found to give encouraging results. • When a fluoride containing salt or solution is taken internally, it gets readily absorbed, transported and deposited in the bone or developing teeth and remainder is excreted by the kidneys. • The deposited fluoride on the surface of teeth prevents the action of acids or enzymes in producing lesions. • The mechanism by which fluoride inhibits caries formation is still to be completely elucidated. There are two current hypotheses: (1) decreased acid solubility of enamel; & (2) bacterial inhibition.	**4 M**

6	c)	**Write the molecular formula and uses of the following.** **(i) Ferrous Sulphate-$FeSO_4.7H_2O$** **Uses-** • It is used as a haematinic and used in the treatment anaemia. • It is used to dye fabrics and in tanning leather, manufacturing of ink and in photography. It has disinfectant properties. **(ii) Magnesium Sulphate-$MgSO_4$** **Uses-** • Magnesium sulphate is given orally in dilute solutions. Because of bitter and nauseating taste it is given in fruit juices. • The mechanism of action is that magnesium sulphate is not absorbed from intestinal tract and thus retains sufficient water within the lumen. The hydrostatic pressure promotes motor activity or peristalsis of bowel. • It should be used with care in patients with impaired renal function. • It is also used as antidote in heavy metal poisoning. • Wet dressings of a 25% solution of magnesium sulphate are sometimes used in the treatment of carbuncles & boils.	**1M each**
	d)	**Write the principle and reaction involved in the limit test for chloride IP.** **Principle-** • The principle for limit test for chloride is based upon the measurement of opalescence or turbidity produced in the known amount of substance (by addition of precipitating reagent), and comparing it with the standard opalescence or turbidity. • The limit test for chlorides is based upon the chemical reaction between soluble chloride ions with silver nitrate reagent in a nitric acid media. • The insoluble silver chloride renders the test solution turbid (depending upon the amount of silver chloride formed and therefore on the amount of chloride present in the substance under test). • This opalescence is compared with the standard opalescence produced by the addition of silver nitrate, to the known amount of chloride ion (sodium chloride)	**3M principle** **1M react.**

		solution. • If the test solution shows less opalescence than the standard the sample complies the test. **Reaction:-** **$NaCl^- + AgNO_3 \rightarrow AgCl \downarrow + NaNO_3^-$**	
6	**e)**	**Explain Lowry-Bronsted theory with examples. Discuss advantages of this theory over other acid-base theories.** According to Bronsted Lowry concept, an acid is any substance capable of donating a proton in a chemical reaction. A base is any substance capable of accepting a proton in a chemical reaction. An acid is a proton donor and a base is a proton acceptor. This theory is also called Protonic concept. 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: $HCl \rightarrow H^+ + Cl^-$ Bronsted base accepts a proton & forms conjugate acid. This is shown by: $OH^- + H^+ \rightarrow H_2O$ **Advantages over other acid-base theories-** 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.	**2M for each**