Inter (Part-II) 2017

Chemistry	Group-II	PAPER: II
Time: 2.40 Hours	(SUBJECTIVE TYPE)	Marks: 68

SECTION-I

2. Write short answers to any EIGHT (8) questions: (16)

(i) Hydration energy depends on charge density of ion. Justify the statement.

Ans Hydration energy depends on charge density of ion because it is the amount of energy released when one mole of ions undergo hydration which is a special case of salvation.

(ii) Why anion is bigger in size than its parent atom?

Ans Neutral atoms that have gained an electron are called anions, and they are much larger than their respective atoms. As an additional electron occupies an outer orbital, there is increased electron-electron repulsion which pushes the electrons further apart.

(iii) Complete and balance the equation:

(a) $LiNO_3$ + heat ⇒ (b) $Mg(NO_3)_2$ + heat ⇒

Ans **(a) $LiNO_3$ + heat ⇒**

$4LiNO_3 + Heat \Rightarrow 2Li_2O + 4NO_2 + O_2$

(b) $Mg(NO_3)_2$ + heat ⇒

$2Mg(NO_3)_2 + Heat \Rightarrow 2MgO + 4NO_2 + O_2$

(iv) Why s-block elements are called as alkali metals and alkaline earth metals?

Ans Alkali metals have one electron in 's' orbital of their valence shell and alkaline earth metals have two electrons in 's' orbital of their valence shell. As maximum two electrons can reside in the s-orbital, so s-block elements are called alkali metals and alkaline earth metals.

(v) How Al reacts with dilute and conc. H_2SO_4?

Ans Aluminium does not react with dilute sulphuric acid. However, it is oxidized by hot concentrated sulphuric acid to liberate sulphur dioxide gas.

With Dilute:

$$2Al + 6HCl \rightarrow 2AlCl_3 + 3H_2$$

With H_2SO_4:

$$2Al + 3H_2SO_4 \Rightarrow Al_2(SO_4)_3 + 6H_2O + 2SO_2$$

(vi) Justify that solubility of borax changes with change in temperature.

Ans Borax is a white, crystalline solid. It is springly soluble in cold water but is more soluble in hot water. For example 100 grams of water dissolve 3 grams of decahydrate at 10°C and 99.3 grams at 100°C.

(vii) Complete and balance the equations:

(a) $FeSO_4$ (aq) + NO (g) ⇒ (b) NO + Cl_2 ⇒

Ans **(a) $FeSO_4$ (aq) + NO (g) ⇒**

$$FeSO_4 + NO \rightarrow FeSO_4.NO$$

(b) NO + Cl_2 ⇒

$$NO + Cl_2 \Rightarrow 2NOCl$$

(viii) Justify that N_2O is supporter of combustion.

Ans Burning of an alkane in presence of oxygen is known as combustion. N_2O is not combustible but ressembles oxygen in rekindling a glowing splinter. Similarly, it supports combustion if burning substances, such as sulphur, phosphorus, etc. are taken in the cylinder containing this gas.

$$S + 2N_2O \rightarrow SO_2 + 2N_2$$

$$P_4 + 10N_2O \rightarrow P_4O_{10} + 10N_2$$

(ix) Write structure of di-chromate ion $Cr_2O_7^{-2}$.

Ans $$2CrO_4^{2-} + 2H^+ \rightleftharpoons Cr_2O_7^{2-} + H_2O$$

(x) What do you mean by galvanizing?

Ans Galvanizing is done by dipping a clean iron sheet in a zinc chloric bath and heating. The iron sheet is then removed, rolled into zinc bath and air cooled.

(xi) Write note on hydrosphere.

Ans The hydrosphere includes all water bodies, mainly oceans, rivers, streams, lakes, polar ice-caps, glaciers and groundwater reservoirs of environment.

(xii) How CO (carbon monoxide) is a poisonous gas?

Ans CO is produced during incomplete burning of organic matter. CO primarily causes adverse effects by combining with haemoglobin to form carboxyhaemoglobin preventing the blood from carrying oxygen.

3. Write short answers to any EIGHT (8) questions: (16)

(i) How the halogen acids are ionized in water?

Ans Halogen acids are polar in nature and water is also polar. When halogen acids are added in water then hydrogen is converted into hydrogen ion and hydronium ions are solvated in water.

(ii) What are Freons and Teflon?

Ans **Freons:**

Freon is the commercial name of low molecular mass Chlorofluorocarbons, CCl_2F_2, $CClF_3$. These are being used as refrigerants and aerosol propellants.

Teflon:

Teflon $(-CF_2—CF_2-)_n$ is a polymerized tetrafluoro ethylene compound. It is a valuable plastic which resists the action of oxidants, acids and alkalies. Corrosion-proof parts of machinery are made of it. It is used for coating the electrical wiring.

(iii) How does cracking and reforming differ from each other?

Ans Cracking is the process whereby complex molecules are broken down into simpler molecules while reforming is a process used to convert molecules having low octane ratings into high-octane liquid products.

(iv) What is Baeyer's test?

Ans When alkenes are treated with mild oxidizing reagent like dilute alkaline $KMnO_4$ solution, it is Baeyer's test at low temperature.

(v) Write structural formulas of the following:

(a) but-1-en-3-yne (b) Vinyl acetylene

Ans **(a) but-1-en-3-yne**

$$CH \equiv C — CH = CH_2$$

(b) Vinyl acetylene

$$CH \equiv C — CH = CH_2$$

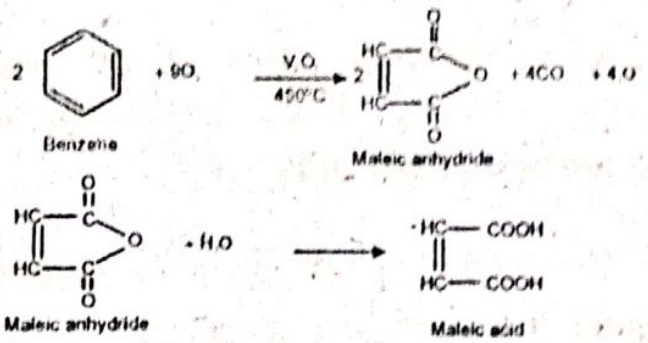
(vi) Give four uses of ethene.

Ans Ethene is used:

1. for the manufacture of polythene, a plastic material used for making toys, cables, bags, boxes, etc.
2. for artificial ripening of the fruits.
3. as a general anaesthetic.
4. as a starting material for a large number of chemicals of industrial use such as glycols, ethyl halide, ethyl alcohol, etc.

(vii) What happens when a mixture of benzene vapours and air are passed over heated vanadium pentoxide?

Ans Benzene is not oxidized by $KMnO_4$ or $K_2Cr_2O_7$ at room temperature. The ring is destroyed when benzene is strongly heated with air in the presence of V_2O_5 as a catalyst.

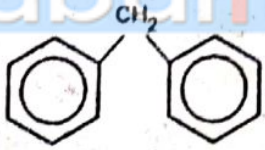


(viii) Write structural formulas of:

(a) Naphthalene (b) Diphenylmethane

Ans **(a) Naphthalene:**

(b) Diphenylmethane:



(ix) Define electrophile, give two examples.

Ans An electrophile is a species that accepts a pair of electrons to form a new covalent bond. Bromobenzene and chlorobenzene are two examples of electrophiles.

(x) What is Grignard reagent? What is the cause of its reactivity?

Ans Alkyle halides react in anhydrous ether with magnesium to form alkyl magnesium halides, known as Grignard Reagent. The cause of its reactivity is that Grignard reagents decompose on treatment with water or dilute acid to give alkanes.

(xi) Why water has higher boiling point than ethanol?

Ans Water has higher boiling point than ethanol because water has strong hydrogen bonding than ethanol.

(xii) Ethyl alcohol is a liquid while methyl chloride is a gas. Explain.

Ans Ethyl alcohol is a colourless flammable liquid that has a pungent taste. Produced by fermentation, it is the alcohol found in alcoholic beverages and used as a solvent. While methyl chloride is a colorless extremely flammable gas with a mildly sweet odor. It was once widely used as a refrigerant.

4. Write short answers to any SIX (6) questions: (12)

(i) How will you distinguish chemically between acetaldehyde and benzaldehyde?

Ans

Acetaldehyde $CH_3-\overset{\overset{O}{\|}}{C}-H$

Benzaldehyde $C_6H_5-\overset{\overset{O}{\|}}{C}-H$

(ii) How will you convert ethanal into propanone?

Ans

$$CH_3-\overset{\overset{O}{\|}}{C}-H + [O] \longrightarrow CH_3-\overset{\overset{O}{\|}}{C}-OH$$

$$2CH_3-\overset{\overset{O}{\|}}{C}-OH + Ca(OH)_2 \longrightarrow CH_3-\overset{\overset{O}{\|}}{C}-O \quad Ca + 2H_2O \quad O-\overset{\overset{O}{\|}}{C}-CH_3$$

(iii) What happens when calcium acetate is heated?

Ans If calcium acetate is heated up to 160 degrees, it will melt and decompose into acetone vapours and calcium carbonate.

(iv) How acetic acid is obtained from methyl cyanide?

Ans **Hydrolysis of Methyl Cyanide:**

Ethane nitrite on hydrolysis with dilute HCl, gives acetic acid through acetamide.

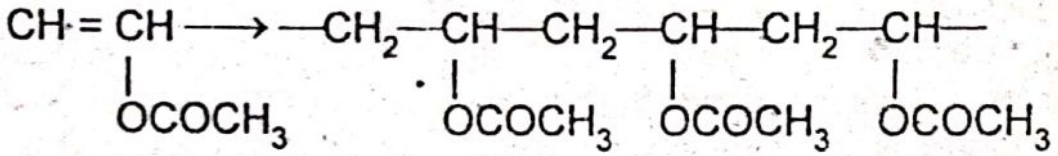
$$CH_3CN \xrightarrow{H_2O/H^+} \underset{\text{Acetamide}}{CH_3-CO-NH_2} \xrightarrow{H_2O/H^+} CH_3COOH + NH_4^+$$

(v) Define homopolymer with an example.

Ans **Homopolymer:**

A homopolymer is formed by the polymerization of a single type of monomer.

For example, the polymerization of vinyl acetate.

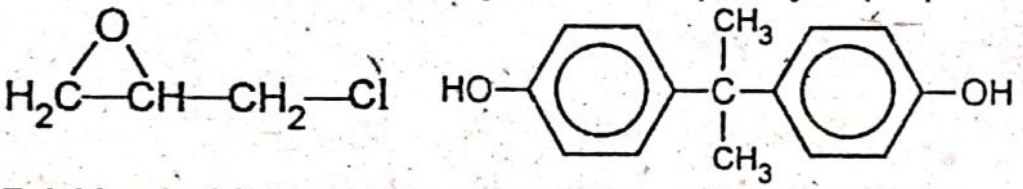


Vinyl acetate — Homopolymer (Polyvinyl acetate)

(vi) What are epoxy resins? How are they prepared?

Ans **Epoxy Resins:**

The epoxy resins are fundamentally polyethers but retain their name on the basis of their starting materials and the presence of epoxide group in the polymer. The epoxy resin is made by condensing epichlorohydrin with diphenylol propane.



Epichlorohydrin **Diphenylolpropane**

(vii) Give two importance of proteins.

Ans Following are the two importance of proteins:

1. Proteins take an essential part in the formation of protoplasm which is the essence of all forms of life.
2. Nucleoproteins which are complexes of proteins with nucleic acids serve as carriers of heredity from one generation to other.

(viii) What type of reactions take place in 1 to 7 days during the setting of cement?

Ans **Reactions Taking Place Between 1 to 7 Days:**

Tricalcium silicate ($3CaO \cdot SiO_2$) and tri-calcium aluminate ($3CaO \cdot Al_2O_3$) get hydrolyzed to produce calcium hydroxide and aluminium hydroxide. The calcium hydroxide, thus formed, starts changing into needle-shaped crystals, which get studded in the colloidal gel and impart strength to it. Aluminium hydroxide, on the other hand, fills the interstices resulting in hardening the mass. The gel formed starts losing water partly by evaporation and sets to a hard mass.

(ix) What are fertilizers? Why are they needed for plants?

Ans The substances which are added to the soil to make up the deficiency of essential nutrients for plant for their proper growth.

The first prerequisite to the use of fertilizers was an understanding of the function of plant nutrients in plant growth. Compounds of these elements namely nitrogen, phosphorus and potassium are considered to be the most important nutrients essential for plant growth.

SECTION-II

NOTE: Attempt any Three (3) questions.

Q.5.(a) Discuss analogy of hydrogen with group IA and VIIA elements. (4)

Ans **Analogy of Hydrogen:**

1. With Group IA:

Although it is not a metal but in most of the modern versions of periodic table, hydrogen is placed at the top of the group IA. This is because of the fact that some of the properties of hydrogen resemble with those of alkali metals. Like alkali metals, hydrogen atom has one electron in 1s subshell which it can lose to form H^+. Both hydrogen and alkali metals have a strong tendency to combine with electronegative elements such as halogens. Similar to alkali metals, hydrogen also forms ionic compounds, which dissociate in water. However, hydrogen is also markedly different from alkali metals. For example, hydrogen is a nonmetal in true sense. It does not lose electron as easily as most of the alkali metals do. Unlike alkali metals, molecular hydrogen exists in open atmosphere.

(ii) With Group VIIA:

Hydrogen resembles halogens in certain respects and can be placed at the top of VIIA group in the periodic table. Hydrogen is a gas like most of the halogens and is stable in diatomic form such as F_2, Cl_2 and Br_2. As required by halogens, hydrogen also needs one electron to complete its outermost shell. By accepting one electron hydrogen forms H (Hydride ion). Similarly to F^-, Cl^- and Br^-, both hydrogen and halogens form stable ionic compounds with alkali metals. However, hydrogen differs from halogens as well. By losing its only electron, hydrogen forms H^+ but halogens do not form positive

ions. Combining with oxygen, hydrogen forms very stable oxides while halogens lack this property.

(b) Describe commercial preparation of sodium hydroxide by Nelson cell. (4)

Ans Commercial Preparation of Sodium Hydroxide by the Nelson Cell:

Sodium hydroxide is manufactured on a large scale by the electrolysis of aqueous solution of common salt in a diaphragm cell. Fig. (a) The cell is made of steel tank. An oblong perforated steel vessel lined inside with asbestos diaphragm serves as a cathode. It is provided with a constant level device to keep the vessel filled to the specified level with brine. A graphite anode is held within the U-shaped diaphragm and it projects into the salt solution. The steam is blown during the process which keeps the electrolyte warm and helps to keep the perforations clear.

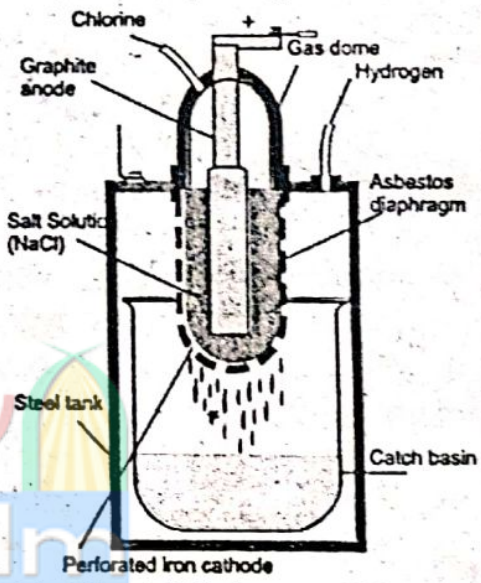


Fig. (a) Nelson cell for the production of NaOH.

The chlorine released at the anode, rises into the dome at the top while hydrogen released at the cathode, escapes through a pipe. The sodium hydroxide solution slowly percholates into a catch basin. The Fig. (b) shows a simplified version of the cell in order to understand the purpose of diaphragm. When the electrolysis takes place, chlorine is given off at the anode according to the following reaction:

$$2Cl^-(aq) \longrightarrow Cl_2(g) + 2e^-$$

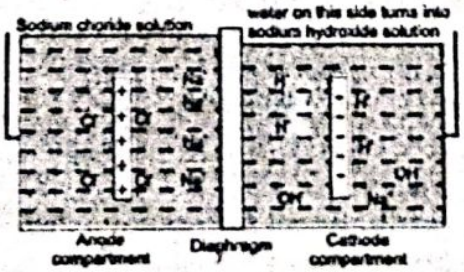


Fig. (b)

At the cathode, hydrogen is discharged by the reaction of water.

$$2H_2O + 2e^- \longrightarrow 2OH^-(aq) + H_2(g) \text{ (Cathode)}$$

The overall result of the above reactions is that the brine loses its chloride ions and the solution turns increasingly alkaline in cathode compartment.

We can face two major problems during the working of the cell:

1. Chlorine produced can react with hydroxide ions in cold giving hypochlorite ions.

$$Cl_2(g) + 2OH^-(aq) \longrightarrow OCl^-(aq) + Cl^-(aq) + H_2O$$

2. Hydroxide ions may be attracted towards anode, where they can be discharged releasing oxygen gas. This oxygen gas may contaminate the chlorine and renders it impure.

The first problem is solved by using asbestos diaphragm. This keeps the two solutions separate while allowing sodium ions to move towards the cathode. This movement of ions keep the current flowing through the external current.

The second problem is solved keeping the level of brine in anode compartment slightly higher, this keeps the direction of flow of liquid toward the cathode and thus preventing the possibility of hydroxides ions to reach the anode.

The solution that flows out of the cathode compartment contains 11% NaOH and 16% NaCl. Evaporation of this solution crystallizes the less soluble NaCl which is filtered off, the liquid left contains about 50% NaOH and only 1% NaCl as an impurity. For commercial purposes, this small impurity is not important.

Q.6.(a) Describe the open hearth process for the manufacture of steel. (4)

Ans Open Hearth process:

This is the most modern method of manufacture of steel. The furnace used in this method is called open hearth furnace. This furnace has low roof. It deflects the hot gases and the flames downward. In this way, the charge is melted.

Principle:

Open hearth furnace works on the regenerative system of heat economy. The hot gases which are supplied to the charge are changed periodically. In this way, the heat of the fuel gases is used to heat the incoming fuel gases.

Types of open hearth process:

Open hearth process is of two types:

(1) A furnace with acidic lining:

Acidic lining is of SiO_2. This lining is used when the impurities in the cast iron are manganese and silicon etc.

(2) The furnace with basic lining:

Basic lining is of dolomite, which is a mixture of CaO and MgO. This lining is used when the impurities in the cast iron are acidic in nature. The presence of phosphorus and sulphur need basic lining.

Following diagram shows that how the hot gases are burnt in the presence of air and the flame can melt the charge and oxidize the impurities.

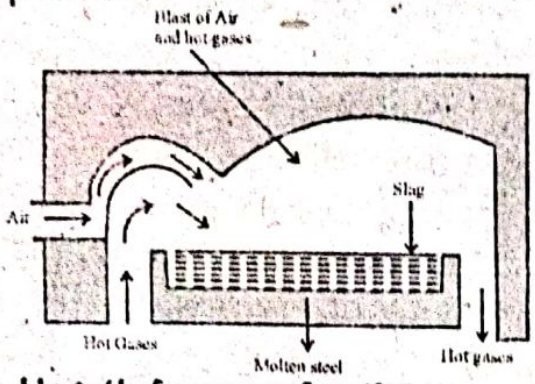


Fig. Open Hearth furnace for the manufacture of steel from cast iron.

Process:

A mixture of pig iron and scrap steel, along with quick lime is charged into the furnace. The temperature is maintained around 1600°C. The following impurities are burnt out. They are converted into their oxide. The impurities are:

(i) Carbon (ii) Silicon
(iii) Manganese (iv) Sulphur
(v) Phosphorus

The reactions are as follows:

$$C + \frac{1}{2} O_2 \longrightarrow CO$$

$$Si + O_2 \longrightarrow SiO_2$$

$$Mn + \frac{1}{2} O_2 \longrightarrow MnO$$

Sulphur and phosphorus react with Fe_2O_3 to give SO_2 and P_2O_5.

$$2Fe_2O_3 + 3S \longrightarrow 4Fe + 3SO_2$$

$$5Fe_2O_3 + 6P \longrightarrow 10Fe + 3P_2O_5$$

SiO_2, SO_2 and P_2O_5 react with different types of metal oxides to give slag. Slag floats on the surface of the molten metal and is removed.

The equation for the slag formation are as follows:

$$SiO_2 + CaO \longrightarrow \underset{\text{slag}}{CaSiO_3}$$

$$SiO_2 + MnO \longrightarrow \underset{\text{slag}}{MnSiO_3}$$

$$SiO_2 + FeO \longrightarrow \underset{\text{slag}}{FeSiO_3}$$

$$P_2O_5 + 3CaO \longrightarrow Ca_3(PO_4)_2 \text{ [Fertilizer]}$$

$$SO_2 + CaO \longrightarrow CaSO_3$$

Checking of Steel:

The samples of the steel are taken from the open hearth furnace at intervals. The percentage of carbon in the steel is determined regularly.

Addition of Metals:

When the percentage of carbon is reduced to 0.1 %, then the calculated weight of ferromanganese is added. Ferromanganese is the mixture of iron, manganese and carbon. The manganese removes the sulphur from the steel. Carbon raises the carbon content to the required value. After giving time for mixing, a little more manganese is added. The charge is sent to the moulds where it solidifies to ingots.

The whole process takes almost ten hours. The slag contains $Ca_3(PO_4)_2$. It is ground to give powder and sold as a fertilizer.

(b) What is smog? Explain the pollutants which are the main cause of photochemical smog. (4)

Ans Smog:

The word smog is a combination of smoke and fog. If it contains high contents of SO_2, it is chemically reducing in nature and is known as 'reducing smog'. The main cause of reducing smog is combustion of coal. Photochemical smog consists of higher concentrations of oxidants like ozone and is also termed as oxidizing smog, it is a yellowish-brownish-grey haze which is formed in the presence of water droplets and chemical reactions of pollutants in the air. It has unpleasant odour because of its gaseous components. The main reactants of photochemical smog are nitric oxide NO and unburnt hydrocarbons. Nitric oxide is oxidized to nitrogen dioxide within minutes to hours depending upon the concentration of pollutant

gas. The yellow colour in photochemical smog is due to the presence of nitrogen dioxide.

The following conditions are required for the formation of smog:

1. There must be sufficient NO, hydrocarbons and volatile organic compounds (VOC) emitted by the vehicular traffic.
2. Sunlight, so that some of the chemical reactions may occur at a rapid rate.
3. The movement of air mass must be little so that reactions are not disturbed.

The overall result of photochemical smog in afternoon is the built up of oxidizing agents such as H_2O_2, HNO_3, peroxyacetyl nitrate (PAN) and ozone in the air.

PAN is an eye irritant and is also toxic to plants.

Q.7.(a) Differentiate between homocyclic and heterocyclic compounds with two examples each. (4)

Ans **Homocyclic or Carboncyclic Compounds:**

The compounds in which the ring consists of only carbon atoms.

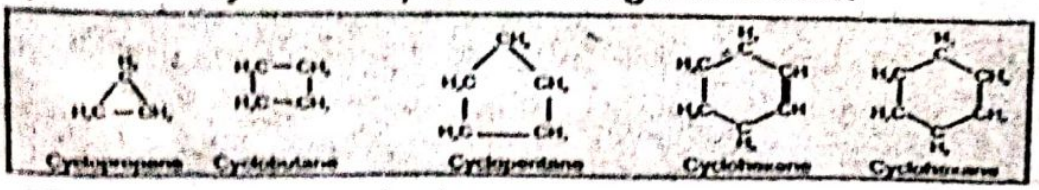
Homocyclic or carbocyclic compounds.

Homocyclic compounds are further classified as:

(i) Alicyclic compounds (ii) Aromatic compounds

(i) Alicyclic Compounds:

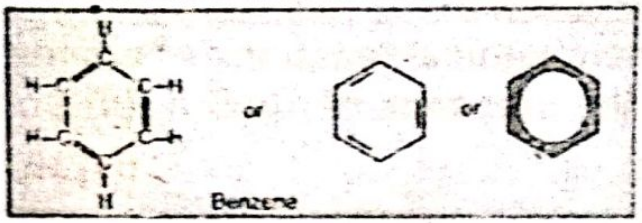
The homocyclic compounds which contain a ring of three or more carbon atoms and resembling aliphatic compounds are called alicyclic compounds. The saturated alicyclic hydrocarbons have the general formula C_nH_{2n}. Typical examples of alicyclic compounds are given below:



One or more hydrogen atoms present in these compounds may be substituted by other group or groups.

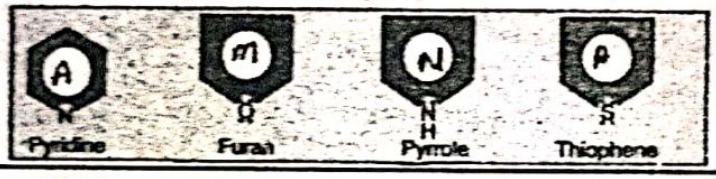
(ii) Aromatic Compounds:

These carbocyclic compounds contain at least one benzene ring, six carbon atoms with three alternate double and single bonds. These bonds are usually shown in the form of a circle. Typical examples of aromatic compounds are given below:



Heterocyclic Compounds:

The compounds in which the ring consists of atoms of more than one kind are called **heterocyclic** compounds or **heterocycles**. In heterocyclic compounds, generally one or more atoms of elements such as nitrogen (N), oxygen (O) or sulphur (S) are present. The atom other than carbon viz, N, O, or S, present in the ring is called a **hetero atom**.



(b) Write reactions of ethyl magnesium bromide with:

(i) Water **(ii) Ammonia**

(iii) Ethyl alcohol **(iv) CO_2**

Ans **(i) Water:**

$$CH_3-CH_2-MgBr + H-O-H \xrightarrow{\text{Ether}} CH_3-CH_3 + Mg(Br)(OH)$$

Ethylmagnesium bromide, Water

(ii) Ammonia:

$$CH_3-CH_2-MgBr + H-NH_2 \xrightarrow{\text{Ether}} CH_3-CH_3 + Mg(Br)(NH_2)$$

Ammonia

(iii) Ethyle alcohol:

$$CH_3-CH_2-MgBr + CH_3-CH_2-O-H \xrightarrow{\text{Ether}} CH_3-CH_3 + Mg(Br)(OCH_2CH_3)$$

Ethanol

(iv) CO_2:

$$CH_3-CH_2-MgBr + O=C=O \xrightarrow{\text{Ether}} O=C(CH_2CH_3)-OMgBr \xrightarrow{H_2O} O=C(CH_2CH_3)-OH + Mg(Br)(OH)$$

Carbon dioxide, Propanoic acid

Q.8.(a) Give the chemical reactions of ethane with: (4)

(i) O_2 in the presence of Ag_2O (ii) Conc. H_2SO_4

(iii) S_2Cl_2 (iv) HOCl

Ans **(i) O_2 in the presence of Ag_2O:**

$$H_2C = CH_2 + \frac{1}{2}O_2 \xrightarrow[300^\circ C]{Ag_2O} H_2C\!-\!CH_2 \quad (O \text{ bridge})$$

(Ethylene oxide)

(ii) Conc. H_2SO_4:

$$C_2H_5OH \xrightarrow[180^\circ C]{\text{Conc. } H_2SO_4} CH_2 = CH_2 + H_2O$$

(iii) S_2Cl_2:

$$2CH_2 = CH_2 + S_2Cl \longrightarrow S(CH_2\!-\!CH_2\!-\!Cl)_2$$

(Mustard Gas)

(iv) HOCl:

$$H_2C = CH_2 + HOCl \longrightarrow Cl\!-\!OH$$

(b) Give four chemical reactions by which aldehydes and ketones can be distinguished from each other. (4)

Ans The reactions of the above stated ammonia derivatives with aldehydes and ketones are as follow.

(i) Reaction with Hydroxylamine:

Aldehydes and ketones react with hydroxylamine to form oximes in the presence of an acid.

$$CH_3CH{=}O + H_2NOH \xrightarrow{H^+} CH_3CH{=}N\!-\!OH + H_2O$$

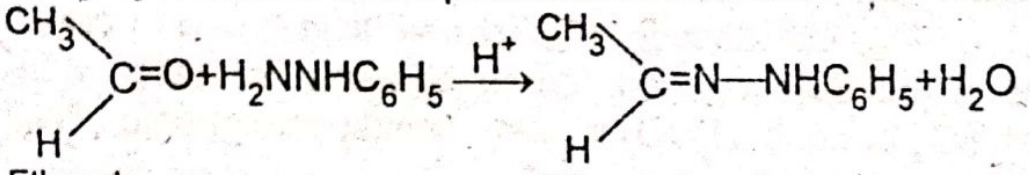
Ethanal — Ethanaloxime

$$(CH_3)_2C{=}O + H_2NOH \xrightarrow{H^+} (CH_3)_2C{=}N\!-\!OH + H_2O$$

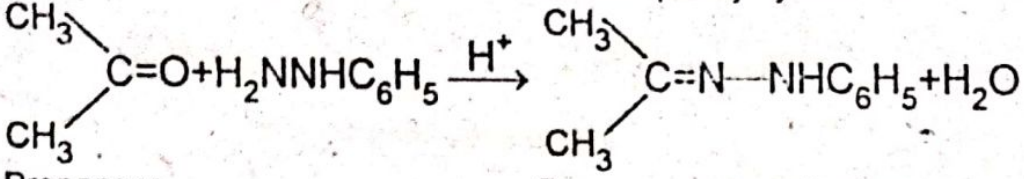
Propanone — Propanoneoxime

(ii) Reaction with Phenylhydrazine:

Aldehydes and ketones react with phenylhydrazine to form phenylhydrazones in the presence of an acid.



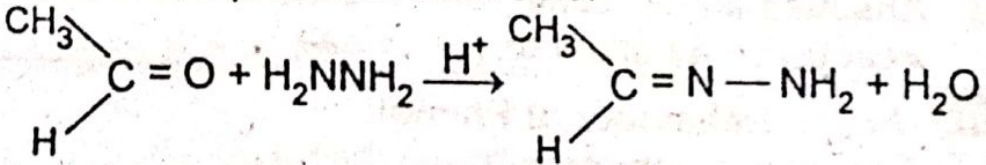
Ethanal — Ethanal phenylhydrazone



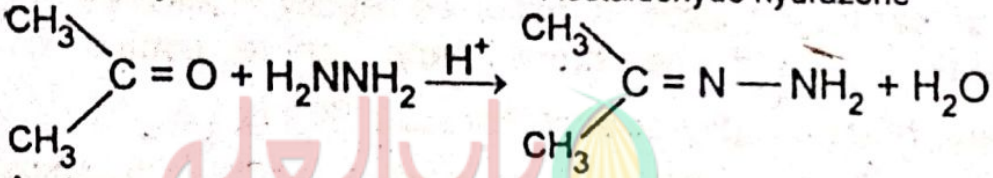
Propanone — Propanone phenylhydrazone

(iii) Reaction with Hydrazine:

Aldehydes and ketones react with hydrazine to form hydrazones in the presence of an acid.



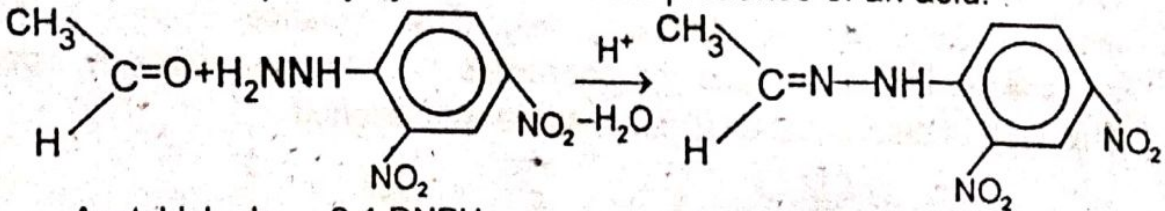
Acetaldehyde — Acetaldehyde hydrazone



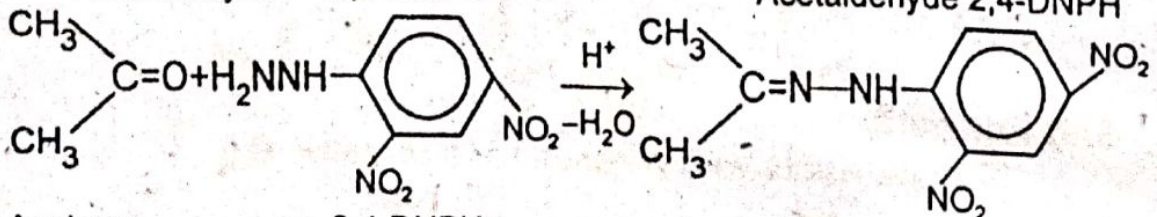
Acetone — Acetone hydrazone

(iv) Reaction with 2, 4-Dinitrophenylhydrazine [2, 4-DNPH]

Aldehydes and ketones react with 2, 4-dinitrophenyhyldrazine to form 2, 4-dinitrophenylhydrazones in the presence of an acid.



Acetaldehyde — 2,4-DNPH — Acetaldehyde 2,4-DNPH



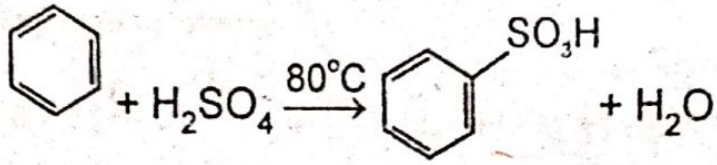
Acetone — 2,4-DNPH — Acetone 2,4-DNPH

The reaction can be used for the identification of aldehydes and ketones because 2, 4-dinitrophenylhydrazones are usually yellow or orange crystalline solids.

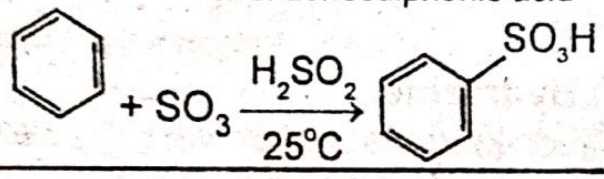
Q.9.(a) Explain sulphonation of benzene with mechanism. (4)

Ans **Benzene sulphonic acid:**

The introduction of sulphonic acid group in benzene ring is called Sulphonation. When benzene is heated with fuming H_2SO_4 or conc. H_2SO_4 it yields benzene sulphonic acid.



Benzenesulphonic acid



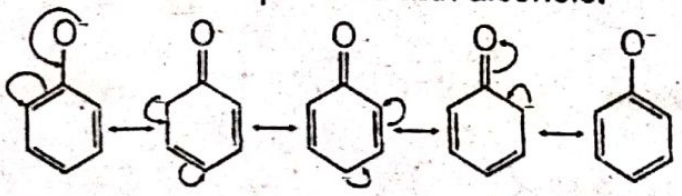
(b) Discuss acidic behaviour of phenol. How does phenol react with an alkali to give a salt? (4)

Ans **Acidic Behaviour of Phenol:**

Phenol is much more acidic than alcohols but less acidic than carboxylic acids. It dissolves readily in alkalies but it is too weak to affect the litmus paper or to evolve CO_2 from carbonates. Its dissociation constant (K_a) is 1.3×10^{-10}.

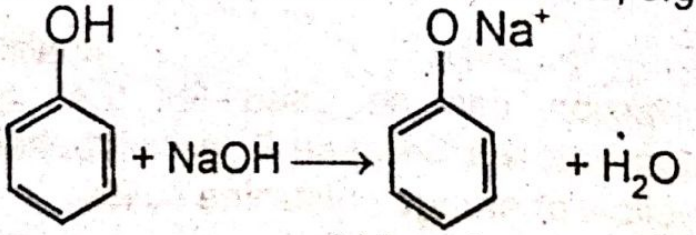
Phenol is partially soluble in water and its solution has a pH of around 5 or 6. This makes phenol different from aliphatic alcohols.

The reason why phenol is acidic lies in the nature of the phenoxide ion. The negative charge on oxygen atom can become involved with the π-electron cloud on the benzene ring. The negative charge is thus delocalized in the ring and the phenoxide ion becomes relatively stable. This type of delocalization is not possible with alcohols.



Salt Formation:

Phenol reacts with alkalies to form salts, *e.g.*,



Sodium phenoxide