Inter (Part-II) 2016

Chemistry	Group-II	PAPER: II
Time: 20 Minutes	(OBJECTIVE TYPE)	Marks: 17

Note: Four possible answers, A, B, C and D to each question are given. The choice which you think is correct, fill that circle in front of that question with Marker or Pen ink in the answer-book. Cutting or filling two or more circles will result in zero mark in that question.

1-1- Which compound will have maximum repulsion with H_2O:

(a) C_6H_6 √ (b) C_2H_5OH

(c) $CH_3 - CH_2 - CH_2 - OH$ (d) $CH_3 - O - CH_3$

2- Which one of the following enzymes brings about the hydrolysis of fats:

(a) Lipase √ (b) Zymase

(c) Maltase (d) Urease

3- Among the elements of VA group which has highest ionization energy:

(a) Nitrogen √ (b) Phosphorus

(c) Antimony (d) Bismith

4- Which woody raw material is used for the manufacture of paper pulp:

(a) Cotton (b) Bagasse

(c) Poplar √ (d) Rice straw

5- Presence of a double bond in an organic compound is the sign of:

(a) Saturation (b) Substitution

(c) Unsaturation √ (d) Halogenation

6- Main pollutant of leather tanneries in waste water is:

(a) Lead (b) Chromium √

(c) Copper (d) Iron

7- Mild steel contains carbon percentage:

(a) 0.1 – 0.2 % √ (b) 0.3 – 0.7 %

(c) 0.7 – 1.5 % (d) 1.6 – 2.0 %

8- Point out the element which forms super oxide:

(a) Li (b) Na

(c) K √ (d) C

9- **Cannizzaro's reaction is given by:**
(a) Acetaldehyde (b) Formaldehyde ✓
(c) Propanal (d) Propanone

10- **Banana flavour is given by the ester:**
(a) Octyl acetate (b) Amyl butyrate
(c) Amyl acetate ✓ (d) Ethyl butyrate

11- **Which of the following can be used as catalyst in Friedel-Crafts reactions:**
(a) HNO_3 (b) $NaCl$
(c) $BeCl_2$ (d) $AlCl_3$ ✓

12- **Which metal is used in thermite process:**
(a) Iron (b) Copper
(c) Aluminium ✓ (d) Zinc

13- **– SH functional group is called:**
(a) Cyano (b) Mercapto ✓
(c) Nitro (d) Carboxyl

14- **Which of the following noble gas is used for arc welding and cutting:**
(a) Helium (b) Argon ✓
(c) Xenon (d) Radon

15- **In primary alkyl halides, the halogen atom is attached to a carbon which is further attached to how many carbon atoms:**
(a) Four (b) Three
(c) Two (d) One ✓

16- **To avoid the formation of toxic compounds with chlorine which substance is used for disinfecting water:**
(a) $KMnO_4$ (b) Ozone ✓
(c) Alums (d) Chloramines

17- **Which of the following form amphoteric oxide:**
(a) Na (b) Mg
(c) O (d) Zn ✓

Inter (Part-II) 2016

Chemistry	Group-II	PAPER: II
Time: 3.10 Hours	(SUBJECTIVE TYPE)	Marks: 83

Section-I

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

(i) Oxidation state usually remains the same in a group. Why?

Ans In group, elements have same electron configuration, and so the pattern of their oxidation state remain almost same.

(ii) Give any two resemblances of hydrogen with group IV A.

Ans Some of the characteristic properties of hydrogen also resemble with those of group IVA elements such as C and Si, etc. For example, valence shell of hydrogen is half-filled like those of group IVA elements. Both, hydrogen and group IV elements combine with other elements through covalent bonding. Like carbon, hydrogen also possesses remarkable reducing properties.

(iii) Give formulas of: (i) Natron. (ii) Halite.

Ans **(i) Natron:** $Na_2CO_3 . H_2O$

(ii) Halite (Rock salt): $NaCl$

(iv) Write any two points of difference of Be with its family members.

Ans Following are two points of difference of Be with its family members:

1. Be metal is almost hard as iron and hard enough to scratch glass. The other alkaline earth metals are much softer than Be.
2. The melting and boiling points of Be are higher than other alkaline earth metal.

(v) Give any two uses of sodium silicate.

Ans **Uses of Sodium silicate:**

1. It is used as a filler for soap in soap industry.
2. It is used in textile as a fire proof.

(vi) How borax can be prepared from colemanite? Give equation.

Ans $Ca_2B_6O_{11} + 2Na_2CO_3 \longrightarrow 2CaCO_3 + Na_2B_4O_7 + 2NaBO_2$

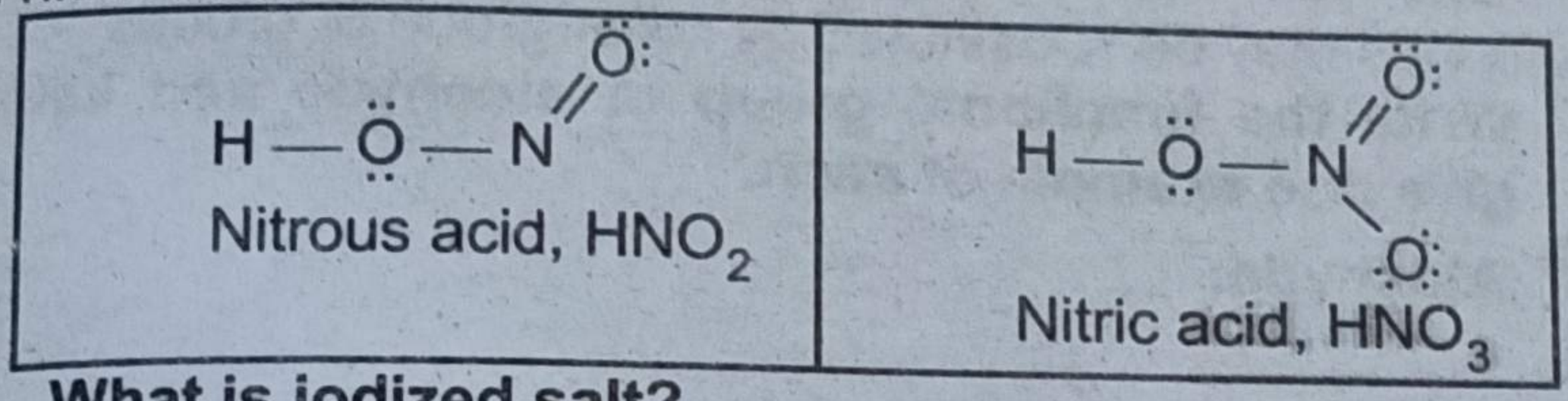
(vii) SO_3 dissolved in H_2SO_4 and not in water. Why?

Ans SO_3 gas is dissolved in H_2SO_4 but not in water. The reason is that the large amount of heat is evolved. This heat gives a dense fog of minute particles of H_2SO_4. These particles do not easily condense together.

(viii) Write names and formulas of oxyacids of nitrogen.

Ans Oxyacides of Nitrogen:

There are two important oxyacids of nitrogen, nitrous acid and nitric acid.



(ix) What is iodized salt?

Ans Iodized salt is table salt mixed with a minute amount of various salts of element iodine.

(x) Write any two uses of krypton.

Ans Following are two uses of krypton:

1. Krypton is used in some type of photographic flashes used in high speed photography.
2. Krypton gas is also combined with other gases to make luminous signs that glow with a greenish-yellow light.

(xi) What is chromyl chloride test? Write chemical equation.

Ans Chromyl Chloride Test:

When solid potassium dichromate is heated with solid metal chloride in the presence of concentrated sulphuric acid chromyl chloride is produced.

$$K_2Cr_2O_7 + 4NaCl + 6H_2SO_4 \longrightarrow 2KHSO_4 + 4NaHSO_4 + 2CrO_2Cl_2 + 3H_2O$$

Chromyl chloride

(xii) Define sacrificial corrosion.

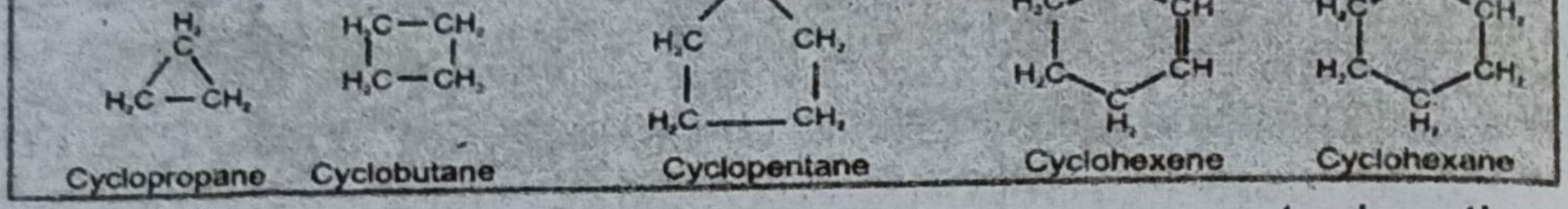
Ans A metal used as sacrificial anode in cathodic protection that corrodes to prevent a primary metal from corrosion is called sacrificial corrosion.

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

(i) What are alicyclic compounds? Give two examples.

Ans Alicyclic Compounds:

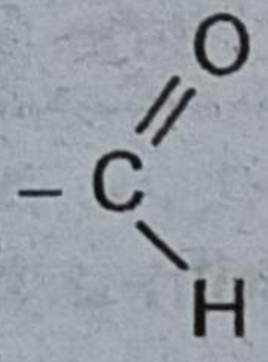
The homocyclic compounds which contain a ring of three or more carbon atoms and resembling aliphatic compounds are called alicyclic compounds. The saturated alicyclic hydrocarbons have the general formula C_nH_{2n}. Typical examples of alicyclic compounds are given below:



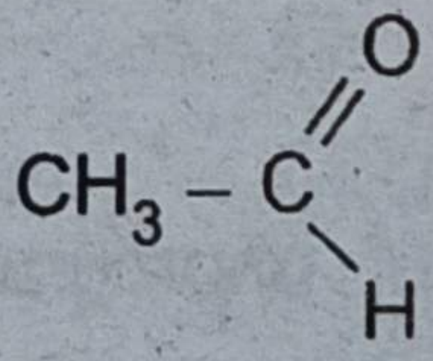
One or more hydrogen atoms present in these compounds may be substituted by other group or groups.

(ii) Write the functional group of aldehyde and ketone, give one example of each.

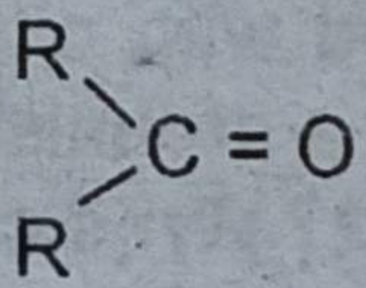
Ans Aldehyde:



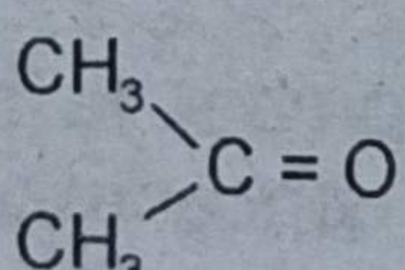
Example:



Ketone:



Example:



(iii) Define Markownikov's rule, give its one example.

Ans The rule states that in the addition of an unsymmetrical reagent to an unsymmetrical alkene, the negative part of the adding reagent goes to that carbon, which has least number of hydrogen atoms.

$$CH_3 - CH = CH_2 + HBr \longrightarrow CH_3 - \underset{\displaystyle Br}{\underset{|}{CH}} - CH_3$$

Propene — 2-Bromopropane

(iv) How acetylene is converted into benzene? Write its equation.

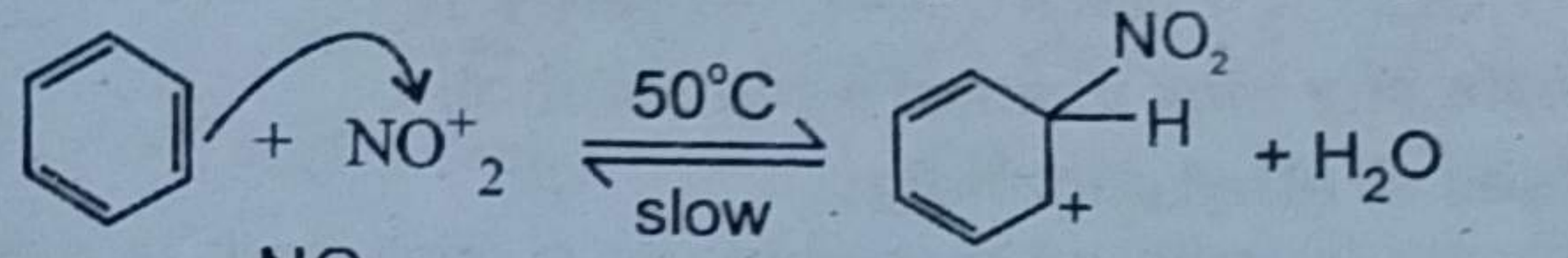
Ans

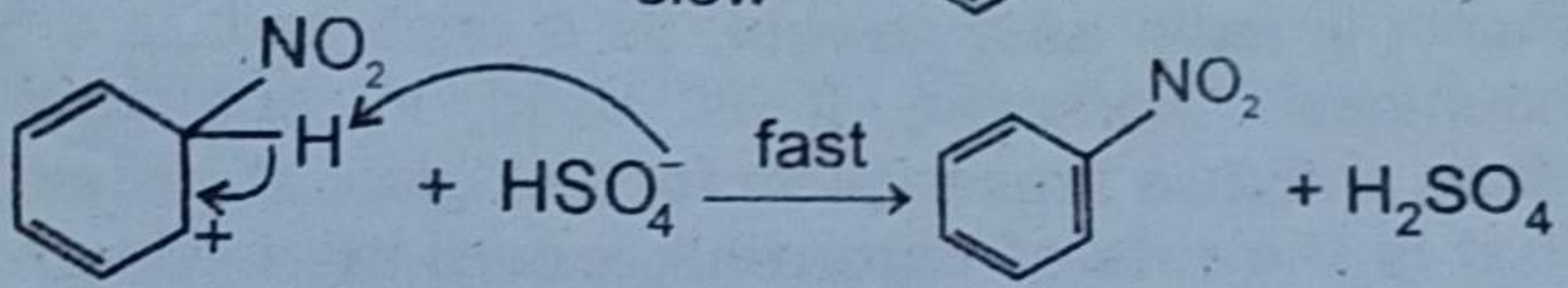
$$3\ \underset{\displaystyle CH}{\underset{|||}{CH}} \xrightarrow{\text{not Cu Tube}} C_6H_6 \text{ or } \bigcirc$$

(v) Write the mechanism of nitration reaction of benzene.

Ans Mechanism:

$$HONO_2 + H_2SO_4 \underset{}{\overset{50\text{-}55^\circ C}{\rightleftharpoons}} NO_2^+ + HSO_4^- + H_2O$$

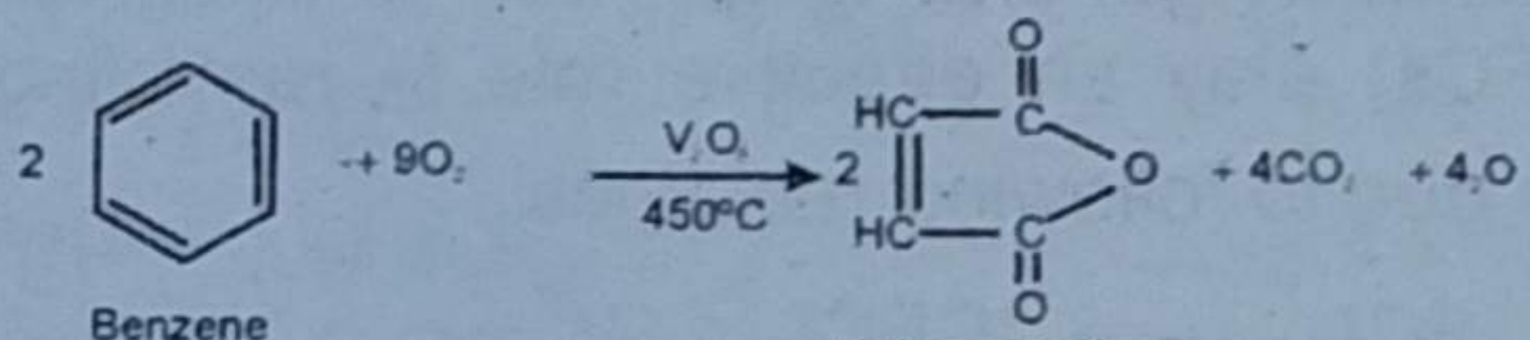




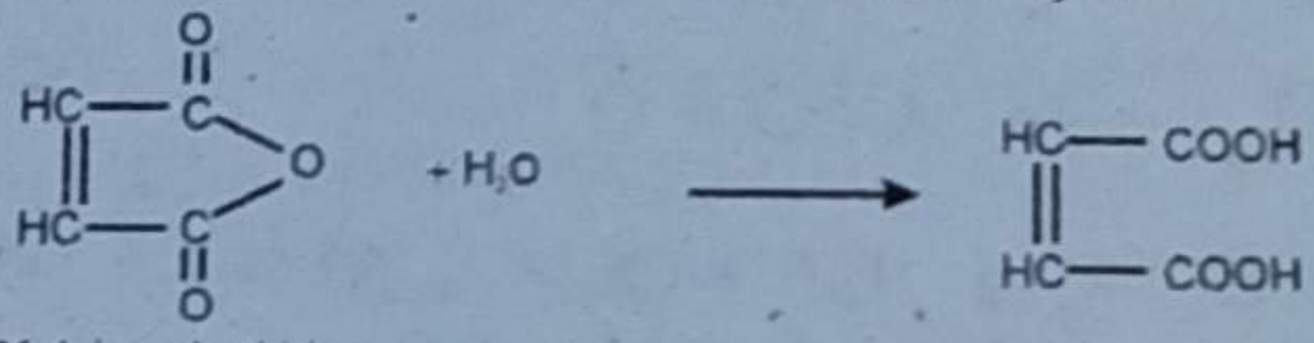
Nitrobenzene

(vi) How benzene is converted into maleic acid by catalytic oxidation?

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.



Benzene — Maleic anhydride



Maleic anhydride — Maleic acid

(vii) Starting from C_2H_5Br, how will you prepare ethane and ethene?

Ans Ethene: $C_2H_5Br + 2[H] \longrightarrow C_2H_6 + HBr$

Ethane

Ethene: $C_2H_5Br + KOH \longrightarrow \underset{\text{Ethene}}{CH_2 = CH_2} + KBr + H_2O$

(viii) How will you prepare diethyl amine from C_2H_5Br?

Ans $CH_3 - CH_2 - Br + CH_3 - CH_2 - NH_2 \rightarrow \underset{\text{Diethylamine}}{(CH_3 - CH_2)_2NH} + HBr$

(ix) How will you distinguish between methanol and ethanol by one test?

Ans Ethanol gives iodoform with iodine in the presence of NaOH. Formation of yellow crystals indicate that the alcohol is ethanol. Methanol does not give iodoform test.

$$C_2H_5OH + 4I_2 + 6NaOH \longrightarrow \underset{\text{Iodoform}}{CHI_3} + HCOONa + 5NaI + 5H_2O$$

$$CH_3OH + I_2 + NaOH \longrightarrow \text{No yellow ppt.}$$

(x) Write any four uses of ethyl alcohol.

Ans Uses of ethyl Alcohols:

Ethanol is used as a solvent, as a drink and as a fuel in some countries. Moreover, it is used in pharmaceutical preparations and as a preservative for biological specimen.

(xi) What is the role of chlorofluorocarbons in destroying ozone?

Ans Role of Chloroflurocarbons (CEFCs) in Destroying Ozone:

Chlorofluorocarbons used as refrigerants in air-conditioning and in aerosol sprays are inert in the troposphere but slowly diffuse into stratosphere, where they are subjected to ultraviolet radiation generating $Cl^{\cdot}$ free radicals. Chlorofluoro-carbons (CFCs) play an effective role in removing O_3 in the stratosphere due to following reactions:

$$CFCl_3 \longrightarrow CFCl_2 + Cl^{\cdot}$$

$$Cl^{\cdot} + O_3 \longrightarrow Cl^{\cdot}O + O_2$$

$$ClO^{\cdot} + O \longrightarrow Cl^{\cdot} + O_2$$

(xii) What is depolymerization of plastic and where it is used?

Ans Depolymerization:

In this process, the used plastic are converted into their original reactants by chemical or thermal process and again

polymerized *e.g.*, Depolymerization of polythene is done by help of catalytic thermalization.

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

(i) Describe preparation of formalin on commercial scale from methyl alcohol.

Ans The mixture of 40% formaldehyde, 8% methyl alcohol and 52% water is called formalin.

(ii) Tollen's test is also called silver mirror test. Justify it.

Ans **Tollen's Test [Silver Mirror Test]:**

Aldehydes form silver mirror with Tollen's reagent (ammoniacal silver nitrate solution). Add Tollen's reagent to an aldehyde solution in a test tube and warm. A silver mirror is formed on the inside of the test tube.

$$AgNO_3 + 3NH_4OH \longrightarrow [Ag(NH_3)_2]OH + NH_4NO_3 + H_2O$$

$$R - CHO + 2[Ag(NH_3)_2]OH \longrightarrow R - COONH_4 + 2Ag + 2NH_3 + H_2O$$

Silver mirror

(iii) Define with example neutral amino acids.

Ans The amino acids which contain one carboxyl group and one amino group are called neutral amino acids.

e.g., glycine, alanine.

(iv) How carboxylic acids are converted into α-amino acids?

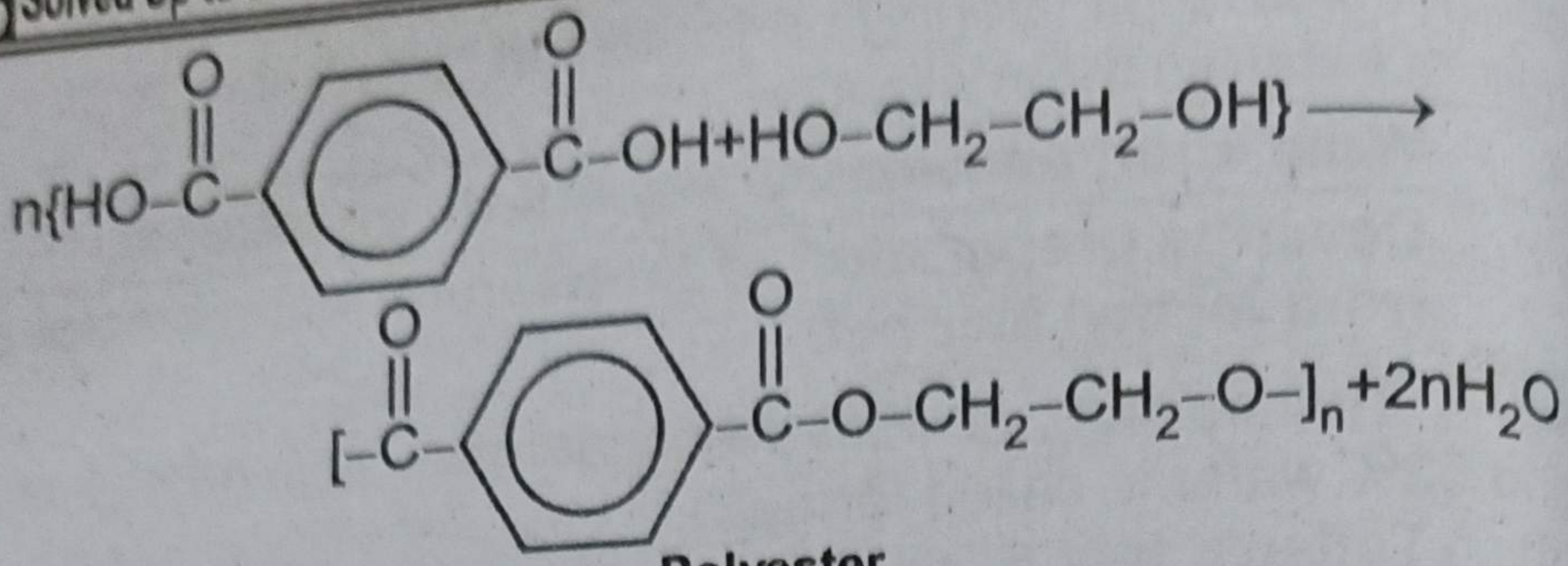
Ans All naturally occurring amino acids are called α-amino acids because amino group is bonded to α carbon.

$$NH_2 - \overset{\alpha}{\underset{\displaystyle CH_3}{\underset{|}{CH}}} - COOH$$

(v) Define with example condensation polymerization.

Ans **Condensation Polymerization:**

This type of polymerization results from the mutual reaction of two functional groups. The reaction usually involves the removal of a water molecule or a methanol molecule. It takes place at both ends of the growing chain. For example; dicarboxylic acids or esters combine with diols to get the desired polymer like nylon and polyester fibre. Such polymerizations are generally ionic in nature.



Polyester

(vi) State saponification number.

Ans It is defined as the number of milligrams of potassium hydroxide required to saponify one gram of the fat or oil. For example, one mole of glycerol tripalmitate (mol. wt. = 836) requires 168,000 mg of KOH for saponification. Therefore, one gram of fat will require 168000/836 mg of KOH. Hence, the saponification number of glycerol tripalmitate is 208.

(vii) What do you mean by the rancidity of oils and fats?

Ans Fats or oils are liable to spoilage and give off an odour known as rancidity. It is mainly caused by the hydrolytic or oxidative reactions which release foul smelling aldehydes and fatty acids. Oils from sea animals which contain a relatively high proportion of unsaturated acid chains deteriorate rapidly.

(viii) What is a need for fertilizers?

Ans To increase the fertility of soil and provide essential elements to the plants, the fertilizer is used.

(ix) What do you mean by prilling of urea?

Ans The concentrated urea solution is brought to prilling tower. Here it is sprayed in form of shower. The droplets solidify to give prills.

SECTION-II

NOTE: Attempt any Three (3) questions.

Q.5.(a) Write two similarities and two dissimilarities of hydrogen with IV A group elements. (4)

Ans Some of the characteristic properties of hydrogen also resemble with those of group IVA elements such as C and Si, etc. For example, valence shell of hydrogen is half-filled like those of group IVA elements. Both, hydrogen and group IV elements combine with other elements through covalent

bonding. Like carbon, hydrogen also possesses remarkable reducing properties.

$$CuO + H_2 \longrightarrow Cu + H_2O$$

$$SnO_2 + C \longrightarrow Sn + CO_2$$

Hydrogen also shows marked differences with carbon and rest of the group members. For example, carbon and silicon form long chain compounds, when their atoms combine with each other, while hydrogen do not form such compounds. Similarly, carbon can simultaneously form bonds with more than one elements, whereas hydrogen due to having only one electron can combine with only one element at a time.

(b) Describe the role of lime in industries. (4)

Ans Role of Lime in Industries:

1. Large quantities of lime are used in the extraction and refining of metals.
2. Lime is also used in paper, cement and leather industries.
3. The ability of lime to react with sand at high temperature forming calcium silicate ($CaSiO_3$) serves as an important basis for glass manufacture.
4. Lime is used in ceramic industry for producing different types of sanitary materials.
5. Ordinary mortar, also called lime mortar, is prepared by mixing freshly prepared slaked lime (one volume) with sand (three or four volumes) and water to form a thick paste. This material when placed between the stones and bricks hardens or sets, thus binding the blocks firmly together. The equations for the chemical reactions which take place when mortar hardens are:

$$CaO + H_2O \rightarrow Ca(OH)_2$$

$$Ca(OH)_2 + CO_2 \rightarrow CaCO_3 + H_2O$$

$$Ca(OH)_2 + SiO_2 \rightarrow CaSiO_3 + H_2O$$

6. Lime is also used in refining of sugar and other food products.
7. Lime is used in the manufacturing of bleaching powder, which is used for the bleaching of the fabric and paper pulp.
8. A suspension of the calcium hydroxide is called milk of lime and is used as white-wash.

9. When lime is heated with coke at about 2800°C in an electric furnace, calcium carbide is produced, which on hydrolysis yields acetylene (C_2H_2).

$$CaO + 3C \longrightarrow \underset{\text{Calcium carbide}}{CaC_2} + CO$$

10. Lime is often employed as a dehydrating agent. For example, in the preparation of absolute alcohol and the drying of ammonia gas, a mixture of sodium hydroxide and calcium hydroxide (soda lime) is often employed to remove both water and carbon dioxide from certain gases.

Q.6.(a) Write a method of preparation of water glass. Also write uses of water glass. **(1,3)**

Ans Sodium silicate, Na_2SiO_3:

This is a sodium salt of metasilicic acid, H_2SiO_3. It is known as water glass or soluble glass. It is prepared by fusing sodium carbonate with pure sand. The process is carried out in a furnace called reverberatory furnace.

$$Na_2CO_3 + SiO_2 \longrightarrow \underset{\text{Sodium silicate}}{Na_2SiO_3} + CO_2$$

Properties:

Sodium silicate is soluble in water and its solution is strongly alkaline due to the hydrolysis.

Chemical Garden:

When crystals of soluble coloured salts like nickel chloride, ferrous sulphate, copper sulphate or cobalt nitrate, etc. are placed in a solution of sodium silicate, they produce a very beautiful growth, like plant, which is called chemical garden.

Uses of Sodium Silicate:

1. It is used as a filler for soap in soap industry.
2. It is used in textile as a fire proof.
3. It is used as furniture polish.
4. It is also used in calico printing.

(b) Write uses of neon and argon. **(2,2)**

Ans Uses of neon and argon

1. Neon is largely used in making neon advertising signs, in high voltage indicators and TV tubes.
2. Neon and helium arc is used in making glass lasers.

3. Argon is used in electric light bulbs, in fluorescent tubes, in radio tubes, and in Geiger counters (used to detect radioactivity).
4. Argon is also used for arc welding and cutting.

Q.7.(a) Describe sp hybridization. Explain it with the example of ethyne. (4)

Ans sp-Hybridization:

The structure of alkynes can be explained by yet another mode of hybridization called sp hybridization. In this type, one 2s and one 2p orbitals of the carbon atom mix together to give rise to two degenerate sp hybridized atomic orbitals. These orbitals have a linear shape with a bond angle 180°.

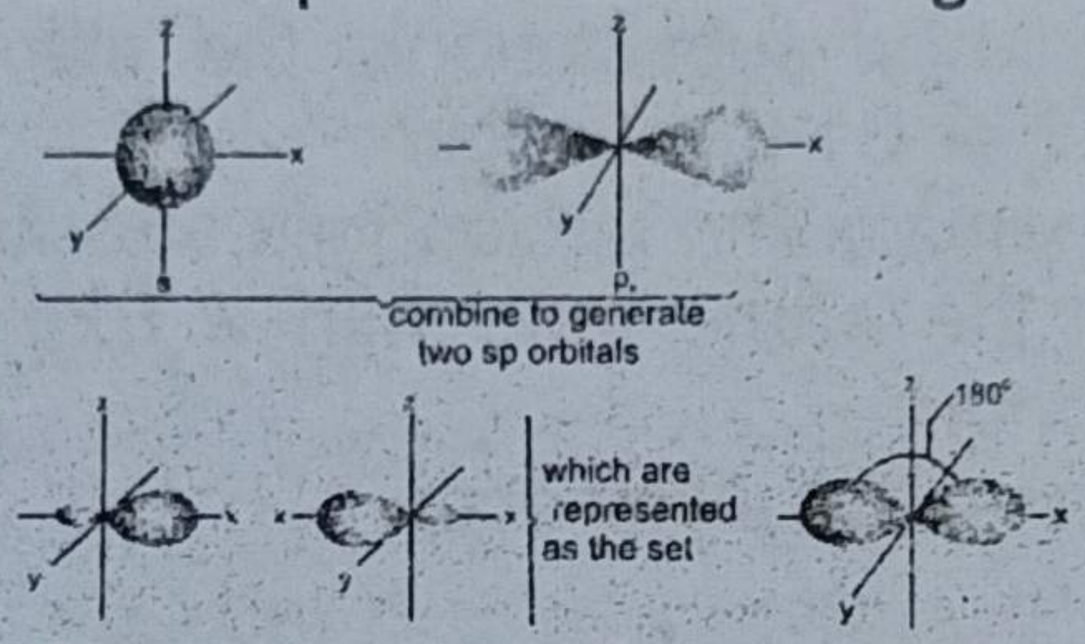


Fig. sp-Hybridization of carbon.

The two unhybridized atomic orbitals, $2p_y$ and $2p_z$, are perpendicular to their sp hybridized orbitals.

Ethyne molecule is formed when two sp hybridized carbon atoms join together to form a σ-bond by sp-sp overlap. The other sp orbital is utilized to form a σ-bond with 1s orbital of hydrogen atom.

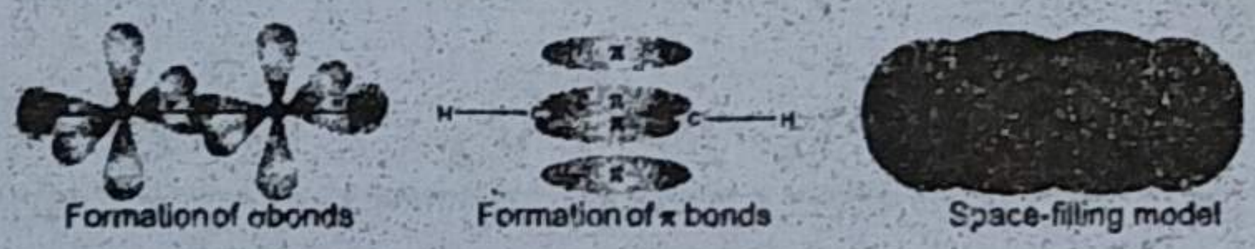


Fig. Formation of ethyne.

The two unhybridized p orbitals on a carbon atom will overlap separately with the p orbitals of the other carbon atom to give two π-bonds both perpendicular to the σ-framework of ethyne. The presence of a σ and two π-bonds between two carbon atoms is responsible for shortening the bond distance.

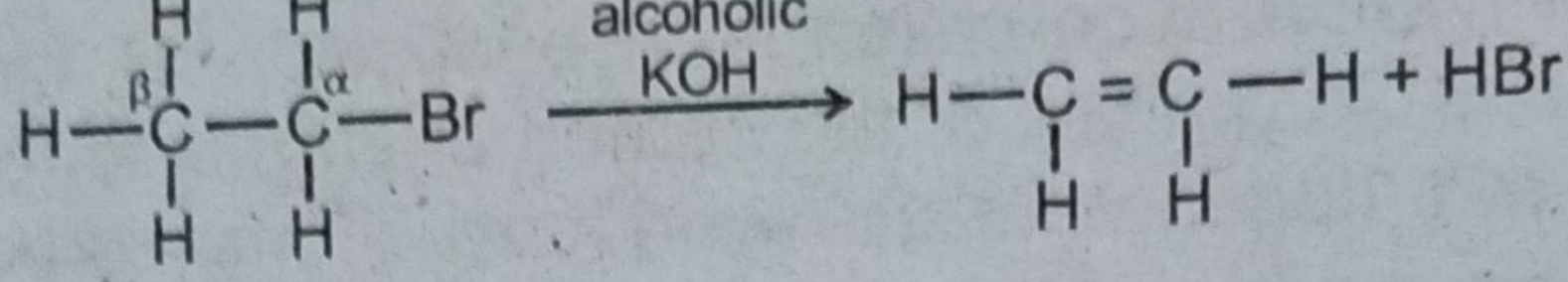
(b) Describe the β elimination reaction "E_2" with example. (4)

Ans β-Elimination Reactions:

During nucleophilic substitution reactions, the attacking nucleophile attacks the electrophilic carbon atom of the alkyl

halide. There is another site present in the alkyl halide molecule where the nucleophile can attack at the same time. Such a site is an electrophilic hydrogen atom attached to the β-carbon of the alkyl halide. When the attack takes place on hydrogen, we get an alkene instead of a substitution product. Such a type of reactions are called elimination reactions.

These reactions take place simultaneously with substitution reactions and often compete with them.

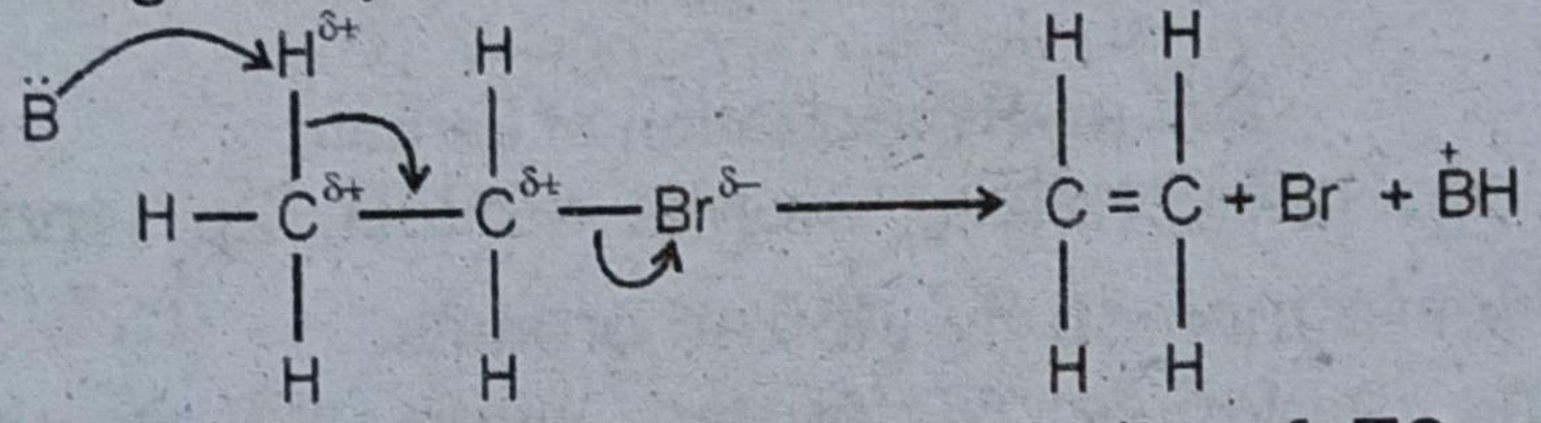


Bromoethane Ethene

Like nucleophilic substitutions, the elimination reactions can also follow E2 or E1 mechanism.

In E2 mechanism, the nucleophile attacks and the leaving group leaves at the same time with a formation of carbon-carbon double bond.

The single step E2 elimination



Like S_N2 reactions, the molecularity of E2 reactions is also two and these reactions show second order kinetics.

Q.8.(a) Write the chemical reaction of ethane with the following: (4)

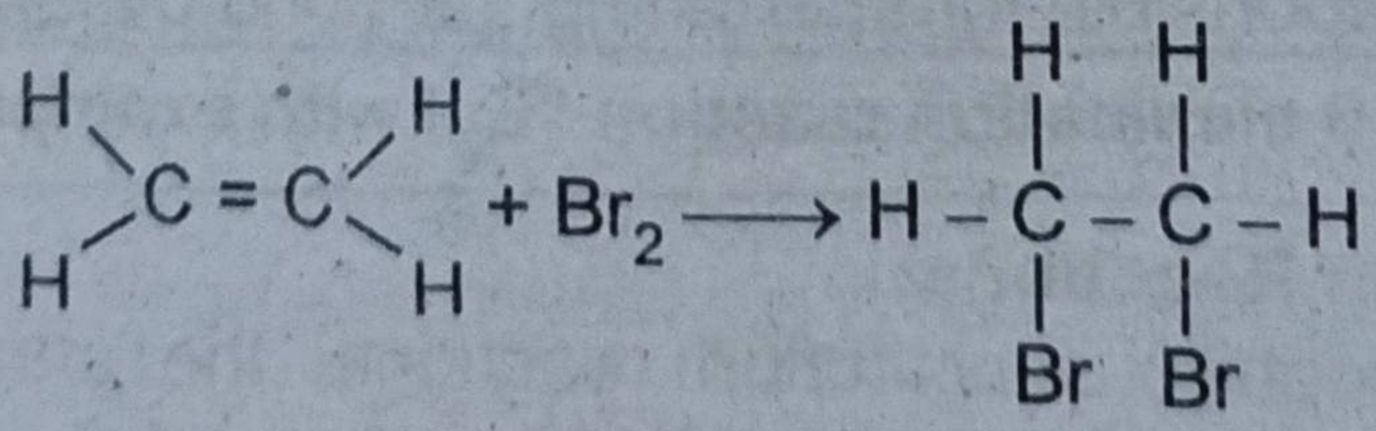
(i) HCl (ii) Br_2 (iii) O_3 (iv) HOX

Ans (i) HCl

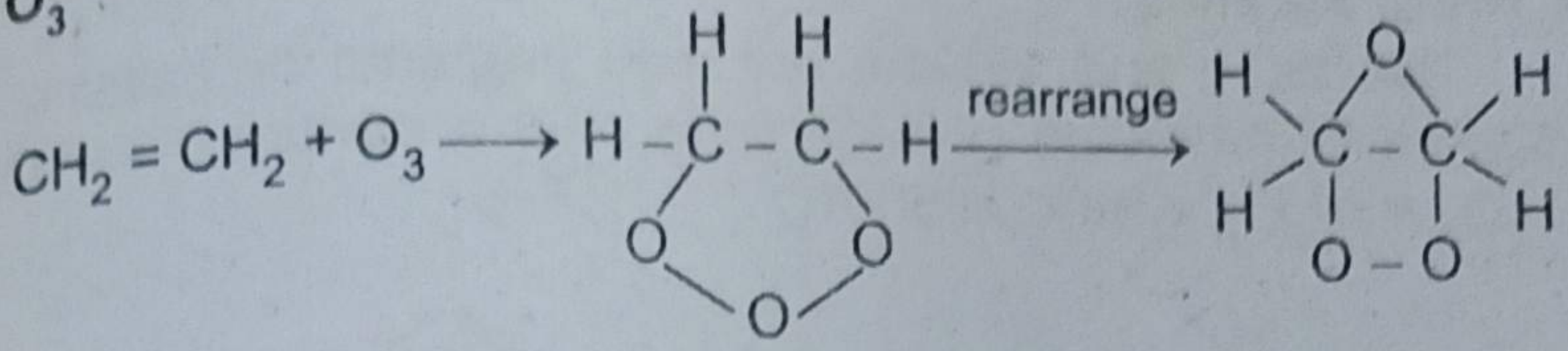
$$CH_2 = CH_2 + HCl \longrightarrow CH_3 - \underset{Cl}{CH_2}$$

Ethene

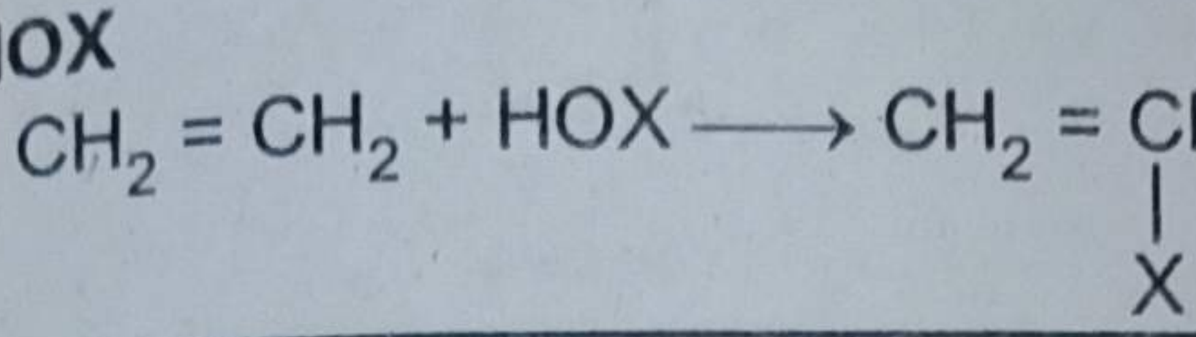
(ii) Br_2



(iii) O_3



(iv) HOX



(b) Write any four uses of acetaldehyde. (4)

Ans Following are four uses of Acetaldehyde:

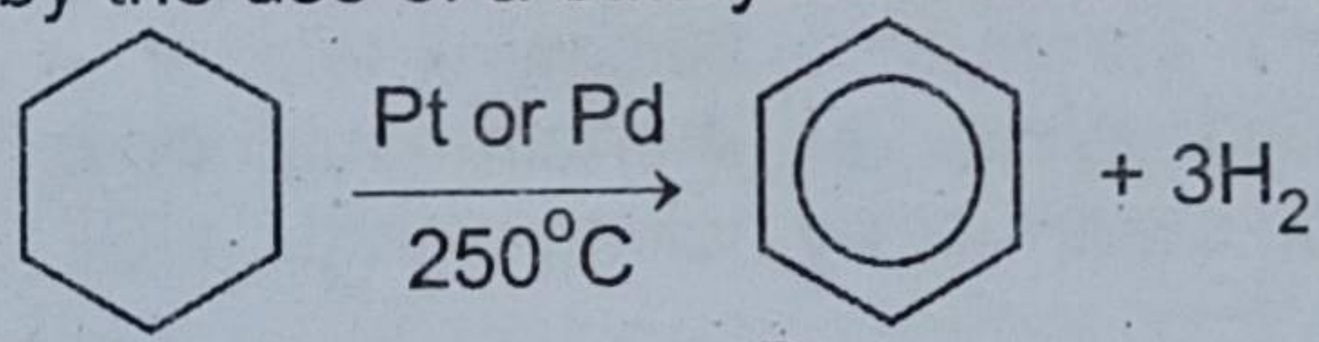
1. It is used in the production of acetic acid, acetic anhydride, n-butanol, ethanol, 2-ethyl-l-hexanol, vinyl acetate, paraldehyde, ethylacetate, etc.
2. It is used to make acetaldehyde ammonia used as a rubber-accelerator.
3. It is used to make chloral hydrate, ethanol trimer and tetramer. Chloral hydrate and ethanol trimer are both used as hypnotic drugs whereas ethanol tetramer is used as a slug poison.
4. It is used as an antiseptic inhalant in nasal infections.

Q.9.(a) Write any four different chemical methods for preparation of benzene. (4)

Ans Some of the methods generally used for the preparation of benzene are as follows:

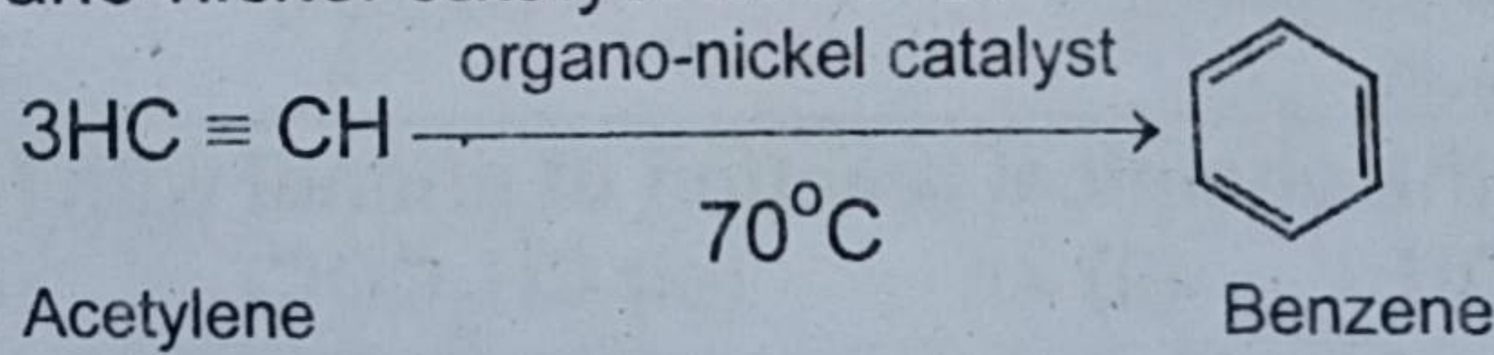
1. Dehydrogenation of Cyclohexane:

When cyclohexane or its derivative is dehydrogenated, we get benzene or a substituted benzene. The reaction is carried out by the use of a catalyst at elevated temperature.



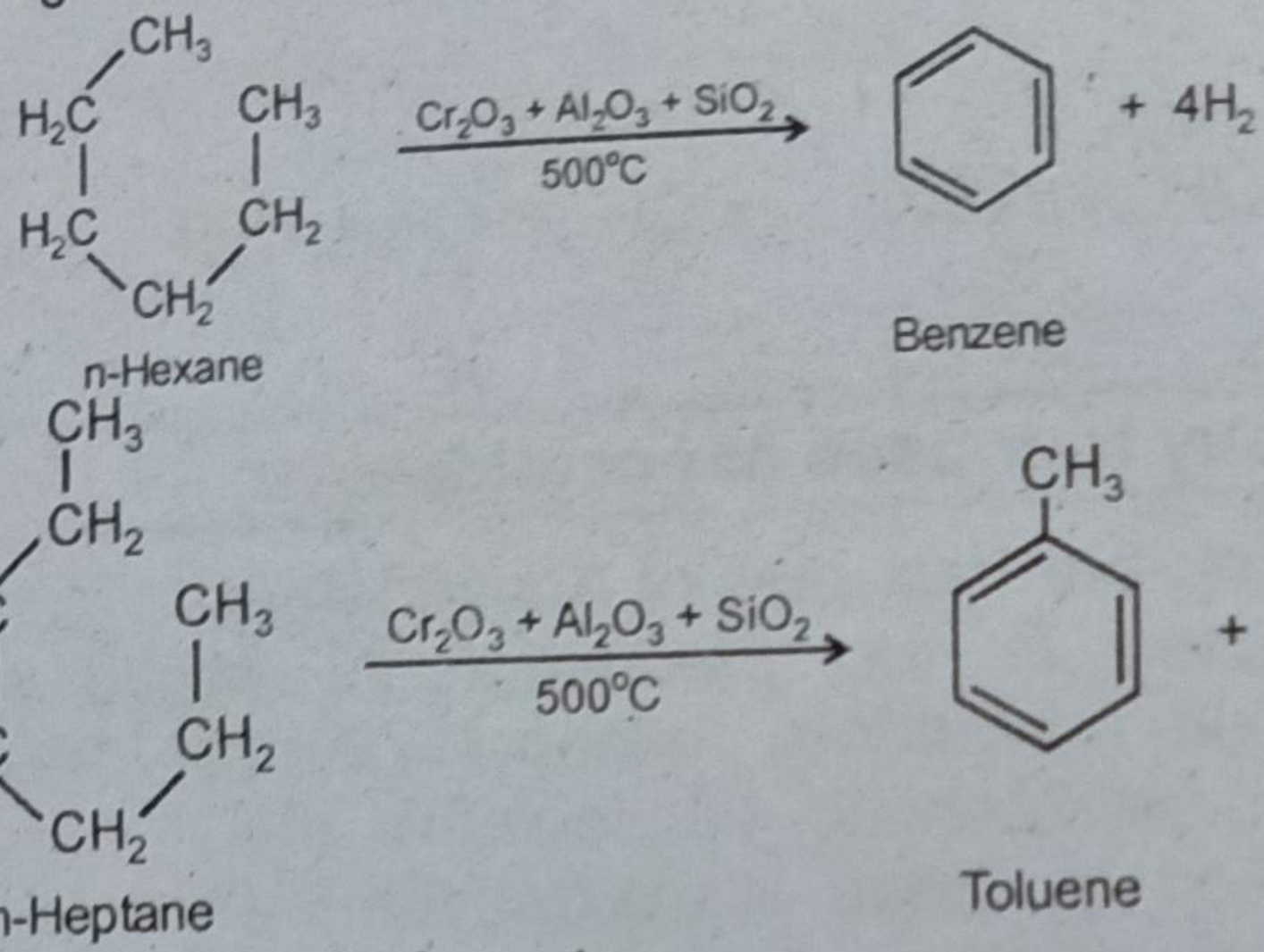
2. From Acetylene:

Benzene is formed by passing acetylene under pressure over an organo-nickel catalyst at 70°C.



3. From Alkanes:

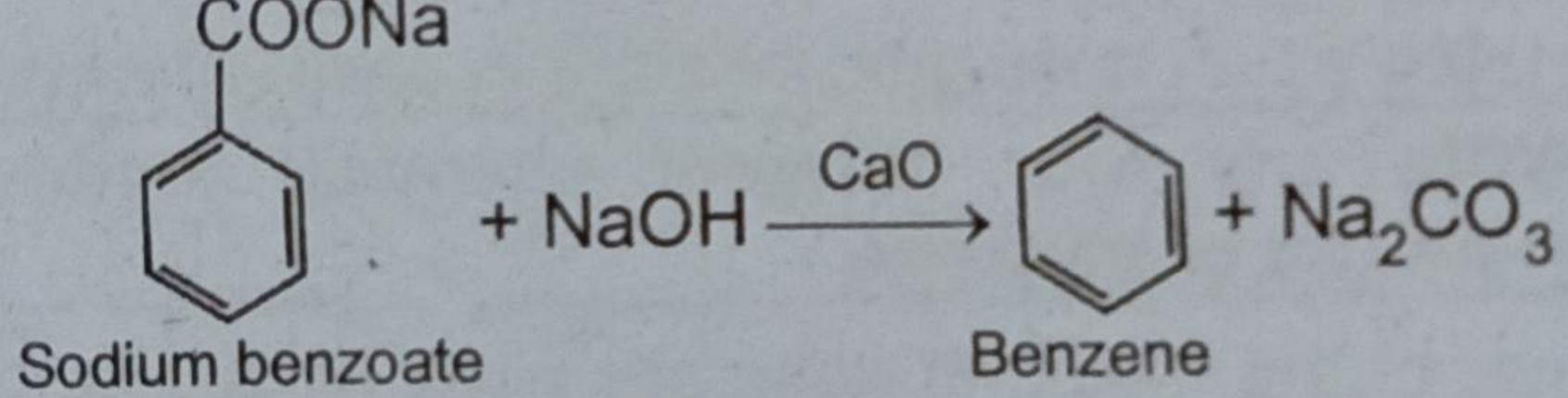
Benzene and toluene are also prepared by passing the vapours of n-haxane or n-heptane over a mixture of catalysts $Cr_2O_3 + Al_2O_3 + SiO_2$ at 500°C.



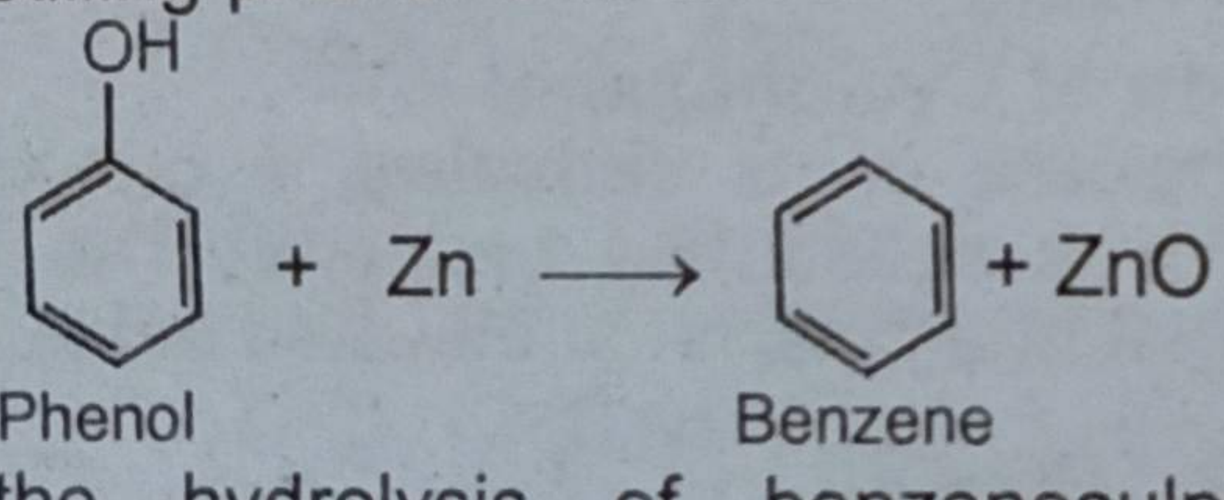
4. Preparation in the Laboratory:

Benzene can be prepared in the laboratory by any one of the following methods:

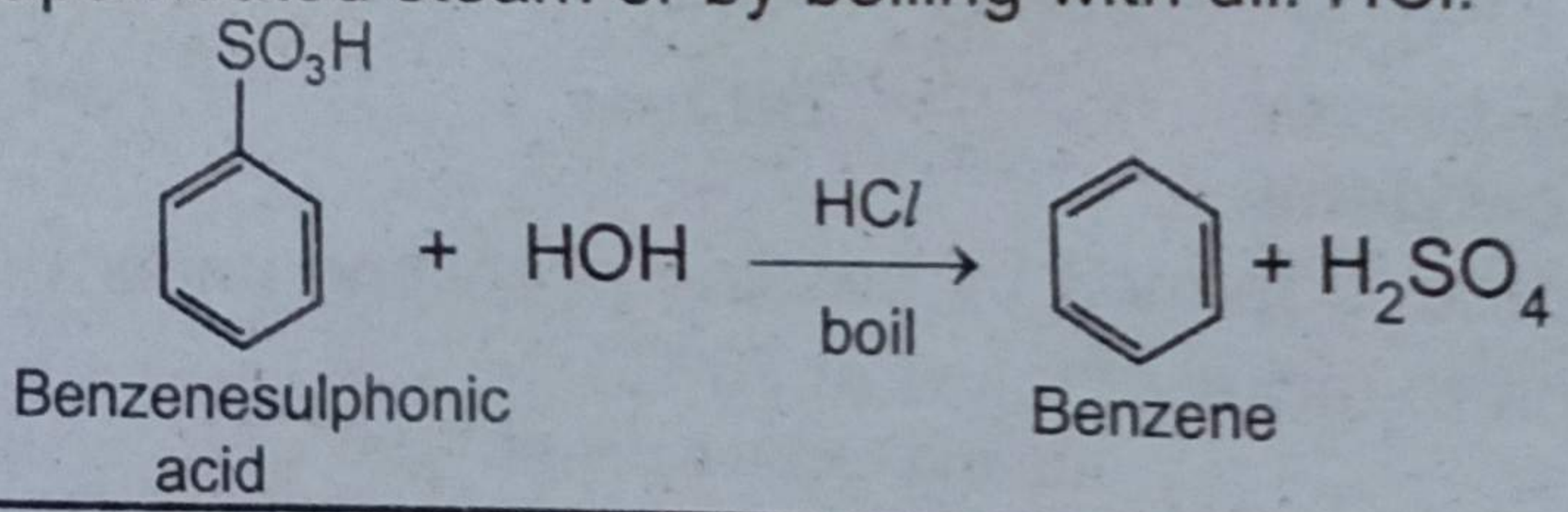
(i) By heating sodium salt of benzoic acid with soda lime.



(ii) By distilling phenol with zinc dust.

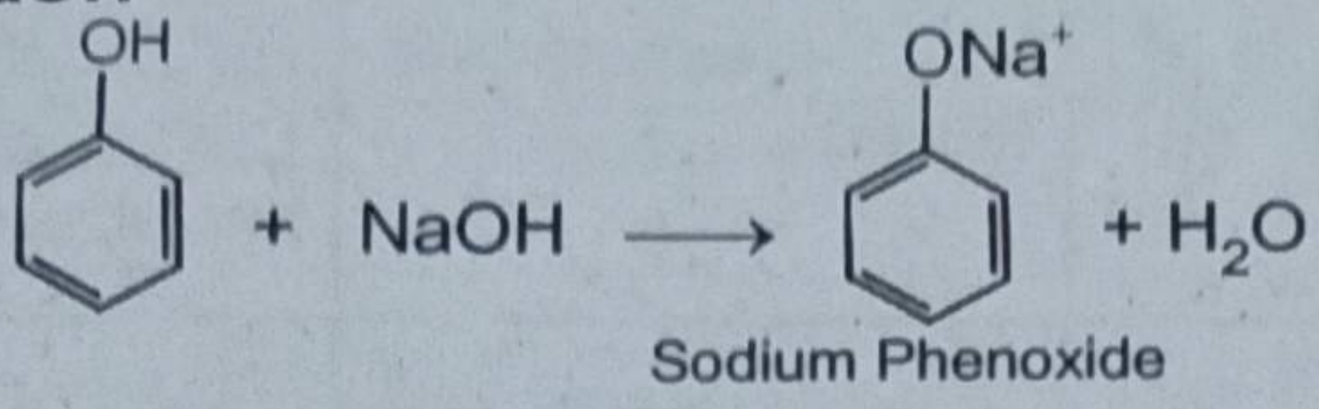


(iii) By the hydrolysis of benzenesulphonic acid with superheated steam or by boiling with dil. HCl.



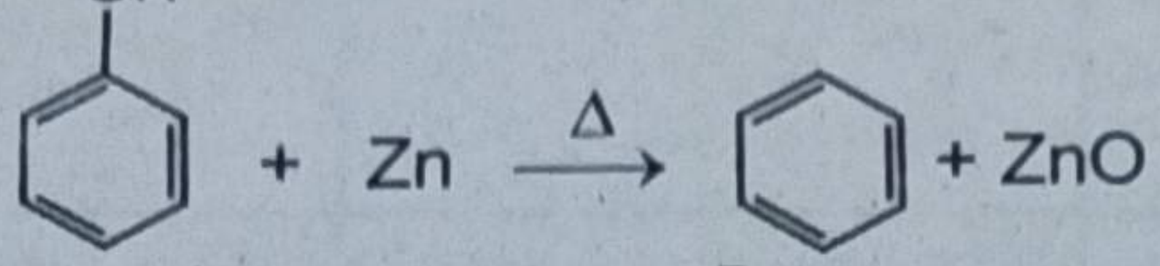
(b) Write the chemical reaction of phenol with following:
(i) NaOH (ii) Zn (iii) CH_3COCl (iv) H_2 (4)

Ans **(i) NaOH**



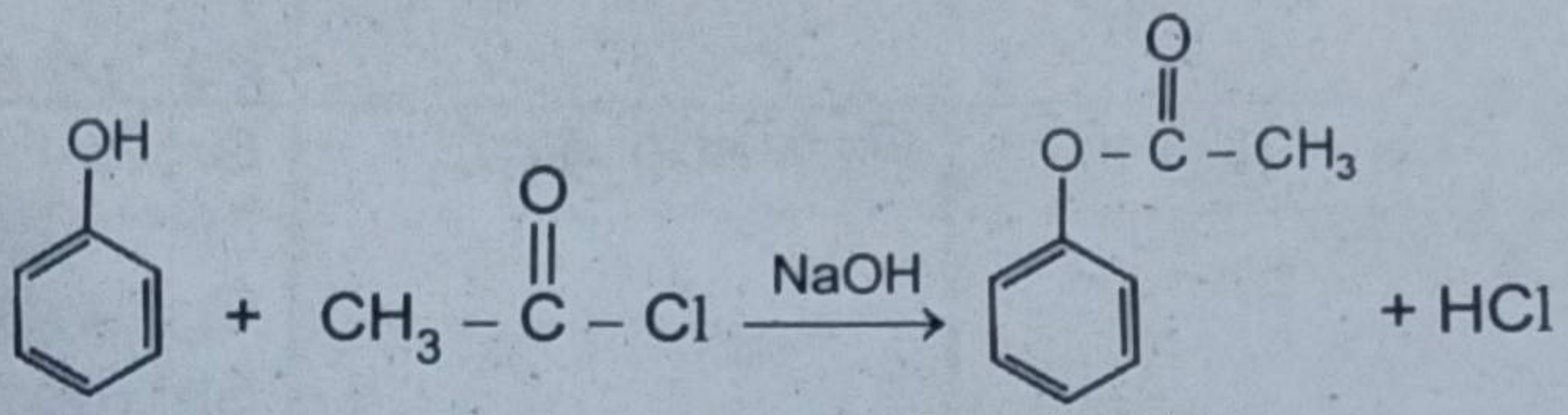
Sodium Phenoxide

(ii) Zn



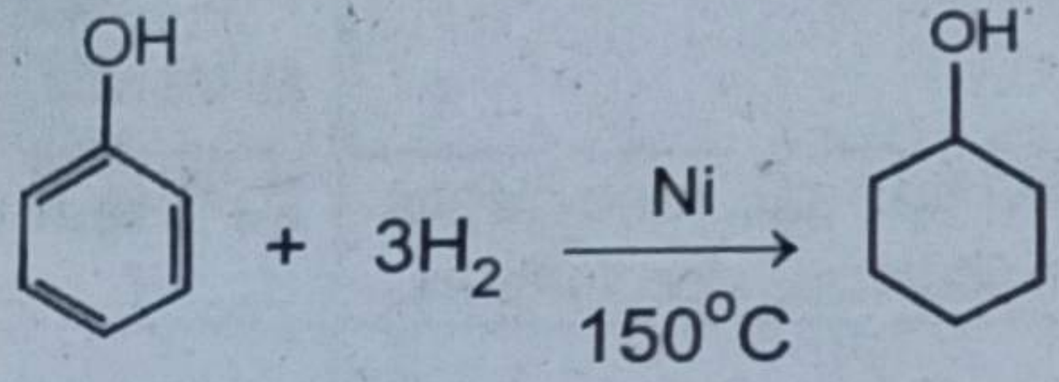
Phenol Benzene

(iii) CH_3COCl



Phenylacetate

(iv) H_2



SECTION-III

(Practical Part)

NOTE: Attempt any Three (3) questions.

A- Write complete qualitative analysis for basic radical $(Al)^{3+}$ aluminium in a systematic manner. (5)

Ans

Experiment	Observation	Inference
Dry Test: 1. Note the colour of salt.	White salt.	Cu^{2+}, Cr^{3+}, Fe^{2+}, Ni^{2+}, Co^{2+}, Mn^{2+} are absent.
2. Note the smell of salt.	No smell of NH_3.	NH_4^+ is absent.

Flame Test: 3. Made a paste of salt with conc. HCl and burnt it on flame with Pt wire.	No characteristic flame.	Na^+, K^+, Cu^{2+}, Ca^{2+}, Ba^{2+}, Sr^{2+} are absent.
Filter Ash Test: 4. Dipped a filter paper strip in a solution of salt and $Co(NO_3)_2$ solution and burnt it.	Blue ash.	May be Al^{3+}.
Wet Tests: 5. O.S + dil. HCl.	No precipitates.	Group-I (Ag^+, Hg_2^{2+}, Pb^{2+}) is absent.
6. O.S + dil. HCl + H_2S gas.	No precipitates.	Group-II (Cd^{2+}, Bi^{2+}, Hg^{2+}, Pb^{3+}, Cu^{2+}, Sn^{2+}, As^{3+}, Sb^{3+}) is absent.
7. O.S + $NH_4Cl_{(s)}$ + boil + cool + $NH_4OH_{(excess)}$.	Gelatinous white ppt.	Group-III (Fe^{2+}, Fe^{3+}, Cr^{3+}, Al^{3+}) is present.
8. Note the colour of salt and precipitates.	White salt and white gelatinous precipitates.	Al^{3+} is indicated.
Confirmatory Tests: 9. O.S + $NaOH_{(sol)}$.	White gelatinous ppt. soluble in excess NaOH.	Al^{3+} is confirmed.
10. O.S + $Na_3PO_{4(sol)}$.	White ppt. ($AlPO_4$)	Al^{3+} is confirmed.
11. Lake Test: O.S + few drops of litmus solution + dil. HCl + NH_4OH.	Blue precipitates float over colourless solution.	Al^3 is confirmed.

B- Write complete qualitative analysis for basic radical (Ba^{2+}) barium in a systematic manner. (5)

Ans

Experiment	Observation	Inference
Dry Test: 1. Note the colour	White salt.	Cu^{2+}, Cr^{3+}, Fe^{2+},

of salt.		Ni^{2+}, Co^{2+}, Mn^{2+} are absent.
2. Note the smell of salt.	No smell of NH_3.	Hg_2^{2+} is absent.
Flame Test: 3. Made a paste of salt with conc. HCl and burnt it on flame with Pt wire.	Apple green flame.	May be Ba^{2+}.
Filter Ash Test: 4. Dipped a filter paper strip in a solution of salt and $Co(NO_3)_2$ solution and burnt it.	No characteristic ash.	Sn^{2+}, Al^{2+}, Mg^{2+}, Zn^{2+} are absent.
Wet Tests: 5. O.S + dilute + HCl.	No precipitates.	Group-I (Ag^+, Hg_2^{2+}, Pb^{2+}) is absent.
6. O.S + dil. HCl + $H_2S_{(gas)}$.	No precipitates.	Group-II (Cd^{2+}, Hg^{2+}, Bi^{3+}, Pb^{2+}, Cu^{2+}, Sn^{2+}, As^{3+}, Sb^{3+}) is absent.
7. O.S + $NH_4Cl_{(s)}$ + boil + cool + $NH_4OH_{(excess)}$.	No precipitates.	Group-III (Fe^{2+}, Fe^{3+}, Cr^{3+}, Al^{3+}) is present.
8. O.S + $NH_4Cl_{(s)}$ + boil + cool + $NH_4OH_{(excess)}$ + $H_2S_{(gas)}$.	No precipitates.	Group-IV (Ca^{2+}, Ba^{2+}, Sr^{2+}) is present.
9. O.S + NH_4Cl + boil + cool + $NH_4OH_{(excess)}$ + $(NH_4)_2CO_3$.	White precipitates.	Group-V (Ca^{2+}, Ba^{2+}, Sr^{2+}) is present.
10. Above ppt. is dissolved in CH_3COOH and made three parts. 1st part +	No white precipitates.	Sr^{2+} is absent.

$(NH_4)_2SO_{4(sol)}$.		
11. 2nd part + $(NH_4)_2C_2O_{4(sol)}$.	No white precipitates.	Ca^{2+} is absent.
12. 3rd part + $K_2CrO_{4(sol)}$.	Yellow ppt. of $BaCrO_4$.	Ba^{2+} is indicated.
Confirmatory Tests: 13. O.S + dilute H_2SO_4.	White ppt. ($BaSO_4$).	Ba^{2+} is confirmed.
14. O.S + $(NH_4)_2C_2O_{4(sol)}$.	White ppt. (BaC_2O_4).	Ba^{2+} is confirmed.

C- Write complete qualitative analysis for acid radical (HCO_3^-) bicarbonate in a systematic manner. (5)

Ans Bicarbonate:

Colourless, odourless gas is evolved with effervescences; turns lime water milky.

1. O.S + $MgSO_4$ = White ppt. on heating only.
2. O.S + $CaCl_2$ = White ppt. on heating only.

D- How will you identify and confirm carboxylic acid (COOH) functional group in the given organic compound? (5)

Ans Test for Carboxylic acids:

1. $NaHCO_3$ Test:

Take 5 cm^3 of $NaHCO_3$ solution in a test tube and add one pinch of organic compound in it. Effervescence due to the evolution of carbon dioxide shows the presence of carboxylic acid.

$$RCOOH + NaHCO_3 \longrightarrow RCOONa + CO_2 + H_2O$$

(Phenols do not perform this test)

2. Ester Test (Esterification):

Take some organic compound in test tube. Add C_2H_5OH and conc. H_2SO_4 in it and heat gently. A fruity smell due to the formation of an ester shows the presence of carboxylic acid.

$$RCOOH + C_2H_5OH \xrightarrow{H_3O^+} RCOOC_2H_5 + H_2O$$

E- Write the materials/chemicals, chemical equation and procedure for production of aspirin. (5)

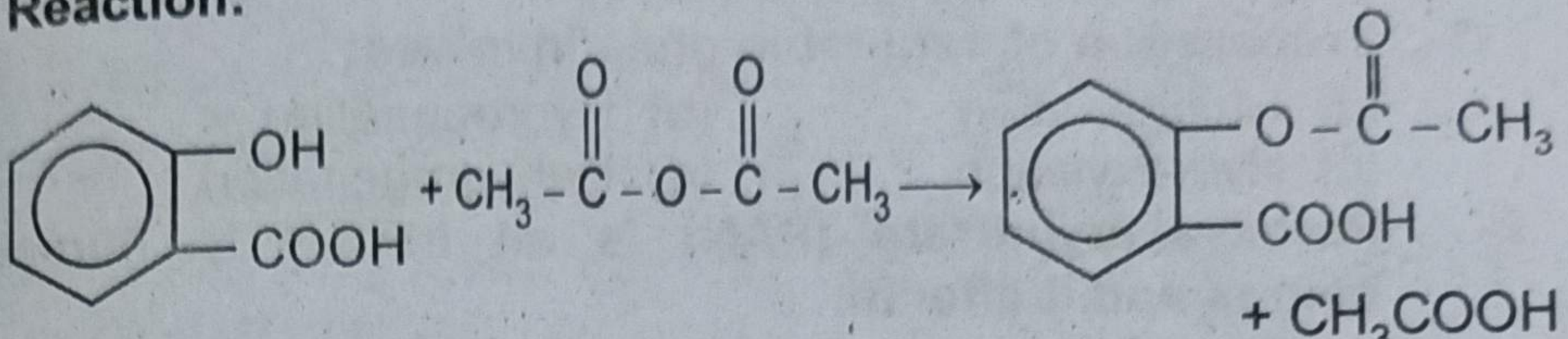
Ans Theory:

Aspirin is formed by the acetylating of salicylic acid. The addition of acetyl group – $COCH_3$ to an organic molecule is called acetylation. Acetylation takes place in acidic medium.

Material Required and Apparatus:

Ethyl alcohol 20 cm^3, sodium carbonate 20 g, Iodine 10 g.

Reaction:



Calicylix acid Acetic anhydride Acetyl-salicylis acid (Aspirin)

Procedure:

Take 10 cm^3 of acetic acid and 10 cm^3 of acetic anhydride in round bottom flask. It is called acetylating mixture. Add 10 g of salicylic acid in it. Boil this mixture under reflux for 30 minutes. Stop heating and pour about 200 cm^3 of ice cold water in it. Stir the mixture vigorously. White crystals of aspirin will be formed, filter these crystals. Dry the crystals and show to the examiner.