Chemistry

Academic Year: 2013-2014 Marks: 70
Date: March 2014

Question 1: Answer any ONE of the following **[7]**

Question 1.1.i: Define boiling point **[7]**

Solution: The boiling point is the temperature at which the vapour pressure of a liquid becomes equal to the atmospheric pressure.

Question 1.1.ii:

Define cell constant.

Solution: Cell constant is the ratio of the distance between the electrodes divided by the area of cross-section of the electrode. It is denoted by b.
Thus, Cell constant = b = l/b, It is expressed in unit m^{-1}.

Question 1.1.iii:

Derive a relation between ΔH and ΔU for a chemical reaction. Draw neat labelled diagram of calomel electrode. Resistance and conductivity of a cell containing 0.001 M KCl solution at 298K are 1500Ω and 1.46×10^{-4} $S.cm^{-1}$ respectively.

Solution: Relation between ΔH and ΔU

The heat of reaction is given by enthalpy change

$\Delta H = H_2 - H_1$

by definition H= U+PV

$H_1 = U_1 + P_1V_1$

$H_2 = U_2 + P_2V_2$

$\Delta H = (U_1 + P1V_1) - (U_2 + P_2V_2)$

$= (U_2 - U_1) + (P_2V_2 - P_1V_1)$

$= \Delta U + (P_2V_2 - P_1V_1) (\because \Delta U = U_2 - U_1)$

Since PV=nRT

For initial state $P_1V_1 = n_1RT$

For final state $P_2V_2 = n_2RT$

$P_2V_2 - P_1V_1 = n_2RT - n_1RT$

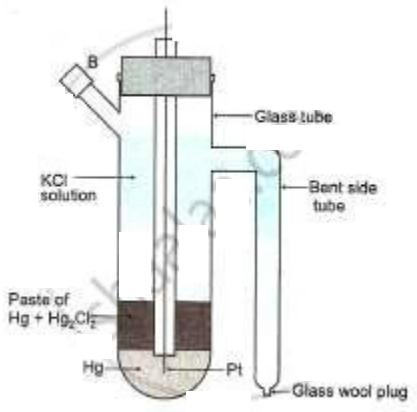
=(n2-n)RT

=ΔnRT

where Δn = number of moles of gaseous product - number of moles of gaseous reactant.

$\Delta H=\Delta U+\Delta nRT$

Diagram : Standard calomel electrode



Data: R =1500Ω

C=0.001M

k= $1.46x10^{-4}Scm^{-1}$

To find: b = ?

Solution : $k = \frac{b}{R}$

b=kxR

$=1.46x10^{-4}x1500$

$b=2190x10^{-4}\ cm^{-1}$

Question 1.2.i: Write molecularity of the following reaction: **[7]**

$2NO_{(g)}+O_{2(g)}\rightarrow 2NO_{2(g)}$

Solution 1: $2NO+O_2\rightarrow 2NO_2$

Molecularity of reaction = 3

Solution 2: The molecularity of the reaction is 3.

Explanation :

Molecularity : It is defined as the total number of reactant molecules taking part in the balanced equation of a reaction. It is a theoretical concept.

The given balanced chemical reaction is,

$2NO_{(g)}+O_{2(g)} \rightarrow 2NO_{2(g)}$

In this reaction, 2 NO molecules reacts with the 1 Oxygen molecule. Total number of reactant molecule = 2 + 1 = **3**

Therefore, the molecularity of the reaction is 3.

Question 1.2.ii:

What is calcination?

Solution: Calcination is a process in which the ore is heated to a high temperature below its melting point in the absence of air or in a limited supply of air.

Ex: $ZnCO_3 \xrightarrow{\Delta} ZnO + CO_2$

Question 1.2.iii:

How does calcination differ from roasting?

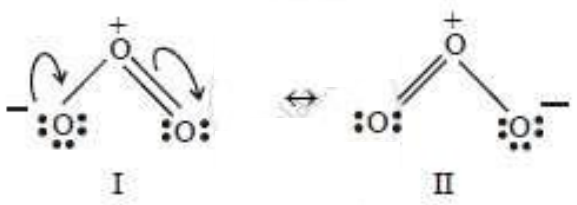
Solution:

Roasting	Calcination
Ore is heated in excess of air.	Ore is heated in the absence or limited supply of air.
This is used for sulphide ores.	This is used for carbonate ores.
SO_2 is produced along with metal oxide.	CO_2 is produced along with metal oxide.
e.g. $2\,ZnS + 3\,O_2 \xrightarrow{\Delta} 2\,ZnO + 2\,SO_2$	e.g. $ZnCO_3 \xrightarrow{\Delta} ZnO + CO_2$

Question 1.2.iv:

Write resonating structures of ozone.

Solution: Resorting structures of Ozone :



Question 1.2.v:

The decomposition of $N_2O_{5(g)}$ at 320K according to the following equation follows first order reaction:

$$N_2O_{5(g)} \rightarrow 2NO_{2(g)} + \frac{1}{2}O_{2(g)}$$

The initial concentration of $N_2O_{5(g)}$ is 1.24×10^{-2} mol. L-1 and after 60 minutes 0.20×10^{-2} $molL^{-1}$. Calculate the rate constant of the reaction at 320K.

Question 2: Answer any THREE of the following: **[9]**

Question 2.1: One mole of a gas expands by 3L against a constant pressure of 3 atmosphere. Calculate the work done in - **[3]**

(a) Atmosphere
(b) Joules
(c) Calories

Solution: Data: P = 3atm

$\Delta V = 3L$

Solution:

$W = -P\Delta V$

$W = -3 \times 3$

W = -9L.atm

1L.atm = 101.3J

-9L.atm = -9 × 101.3J

W = -911.7J

4.184J = 1cal

∴ -911.7J = -911.7/4.184

W = -217.9cal

Question 2.2: Calculate the amount of $CaCl_2$ (van't Hoff factor i = 2.47) dissolved in 2.5 L solution so that its osmotic pressure at 300K is 0.75 atmosphere. **[3]**

Given : Molar mass of $CaCl_2$ is 111g mol^{-1}
R=0.082 L.atm $K^{-1}mol^{-1}$

Solution: Data : V = 2.5 L

T = 300 K

π = 0.75atm

Molar mass of $CaCl_2$ = M_2 = 111g/mol

R = 0.082 $L.atm.k^{-1}mol^{-1}$.

Solution :

$$i = \frac{\pi_{obs}}{\pi_{cal}}$$

$$2.47 = \frac{0.75}{\pi_{cal}}$$

$$\pi_{cal} = \frac{0.75}{2.47}$$

$$\pi_{cal} = 0.303atm$$

$$\pi V = nRT$$

$$\therefore \pi V = \frac{W_2}{M_2} \times R \times T$$

$$\therefore \pi_{cal} \times V = \frac{W_2}{M_2} \times R \times T$$

$$\therefore W_2 = \frac{\pi_{cal} \times V \times M_2}{R \times T}$$

$$= \frac{0.303 \times 2.5 \times 111}{0.082 \times 300}$$

W_2=3.417gm

Mass of $CaCl_2$=3.417gm

Question 2.3: Describe anomalous behaviour of fluorine with the other elements of group 17 wilh reference to : **[3]**

(a) Hydrogen bonding
(b) Oxidation state
(c) Polyhalide ions

Solution: Fluorine exhibits anomolous behaviour as compared to other halogens atom in the group. The reasons for anomolous behaviour of fluorine are as follows.

(i) The smallest size of fluorine

(ii) The highest electronegativity

(iii) Low bond dissociation enthalphy of F- F. bond

(iv) Non availbility of d-orbitals in the valence shell

(a) Hydrogen bonding : Fluorine has the highest electronegativity other halogens. Fluorine forms strong hydrogen bonding in its hydrides unlike other halogens, because H-F bond is highly polar in nature. Hence HF is a liquid while other hydrogen halide are gauses at room temperature.

(b) Oxidation state : Fluorine is smallest in size and highly electronegativity thus fluorine shows only one oxidation state –1, while other halogen show variable oxidation states like –1,+1,+3,+5 and +7

(c) Polyhalides ions : Fluorine is smallest in size and d-orbitals are not availble in the valence shell of fluorine. Hence it has no tendency to form polyhalide in where as other halogen form polyhalide ions like

Cl_3^-, Br_3^-, I_3^-

Question 2.4: Face centred cubic crystal lattice of copper has density of 8.966 g.cm^{-3}. Calculate the volume of the unit cell. Given molar mass of copper is 63.5 g mol^{-1} and Avogadro number N_A is 6.022 x 10^{23} mol^{-1} **[3]**

Solution:

Data: d=8.966 g cm^{-1}

M.M. of copper = 63.5 gmol^{-1}

N_A=6.022XX10^{23}

Solution : $d = \frac{Z \times M}{V \times N_A}$

Z=4(∵ Fcc)

$$V = \frac{Z \times M}{d \times N_A}$$

$$= \frac{4 \times 63.5}{8.966 \times 6.023 \times 10^{23}}$$

V=4.704x10^{-23} cm^3

Question 3: Answer any SIX of the following **[12]**

Question 3.1.i: What is the action of the following reagents on ammonia : [2]
Nessler's reagent

Solution: With Nessler's reagent (an alkaline solution of K_2HgI_4) ammonia and ammonium salts give brown precipitate due to formulation of Million's base.

$$\underset{\text{Nessler's reagent}}{2\,K_2HgI_4} + NH_3 + 3\,KOH \longrightarrow \underset{\text{(Iodide of million's base)}}{H_2N-Hg-O-Hg-I} + 7\,KI + 2\,H_2O$$

Question 3.1.ii:

What is the action of the following reagents on ammonia :
Sodium metal

Solution:
Ammonia forms amides with active metals like Na, K, etc.

$$2\,Na + 2\,NH_3 \xrightarrow{575\,K} 2\,NaNH_2 + H_2$$

Question 3.2.i: State the first law of electrolysis **[2]**

Solution 1: First law : It states that the amount of substance that undergoes oxidation or reduction at each electrode during electrolysis is directly proportional to the amount of electricity that passes through the cell.

Solution 2: It is one of the primary laws of electrolysis. It states, during electrolysis, the amount of chemical reaction which occurs at any electrode under the influence of electrical energy is proportional to the quantity of electricity passed through the electrolyte.

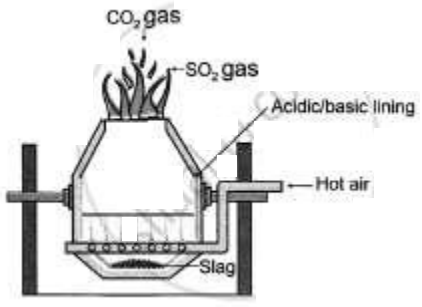
Question 3.2.ii:

State second law of electrolysis

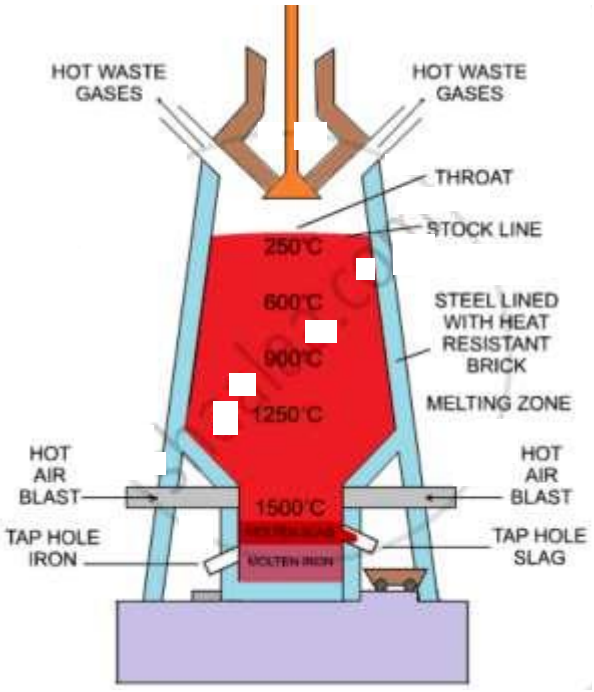
Solution: Second law : It states that when the same amount of electricity is passed through different cells containing different electrolytes and arranged in series, the amount of substances oxidized or reduced at the representive electrode are directly proportional to their chemical equavalent masses.

Question 3.3: Draw neat and labelled diagram of Bessermer converter used in the extraction of copper. **[ ]**

Solution 1:



Solution 2:



Question 3.4: Derive the relation between half-life and rate constant for a first order reaction **[2]**

Solution: The integrated rate law for the first order reaction is given by the equation

$$k = \frac{2.303}{t} \log_{10} \frac{[A]_o}{[A]_t}$$

Where $[A]_0$ = initial concentration of the reactant at t = 0

The concentration falls to $[A]_t$ at time t from the start of the reaction.

The concentration of the reactant falls to $[A]_0/2$ at time $t_{1/2}$.
Therefore, $t = t_{1/2}$
$[A]_t = [A]_0/2$
So, the equation can be written as

$$k = \frac{2.303}{t_{\frac{1}{2}}} \log_{10} \frac{[A]_o}{\frac{[A]_o}{2}}$$

$$= \frac{2.303}{\frac{t_1}{2}} \log_{10} 2$$

$$= \frac{2.303}{\frac{t_1}{2}} \cdot 0.301 = \frac{0.693}{\frac{t_1}{2}}$$

$$t_{\frac{1}{2}} = \frac{0.693}{k}$$

Question 3.5: Derive the relation between ΔG° and equilibrium constant (K) for the reaction - **[2]**

aA_bB ⇌ cC+dD.

Solution: The free energy (G) of any substance at a temperature T is represented as

$$G = G^{\circ} + RT \ln[$$

A+B ⇌ C+D

G_A, G_B, G_C and G_D are standard free energies

$$G_A = G_A^0 + RT \ln[A]$$

$$G_B = G_B^0 + RT \ln[B]$$

$$G_C = G_c^0 + RT \ln[C]$$

$$G_D = G_D^0 + RT \ln[D]$$

$$\therefore \Delta G = \sum G_{\text{product}} - \sum G_{\text{reactant}}$$

$$= [G_C + G_D] - [G_A + G_B]$$

$$= \{G_C^0 + RT \ln[C] + G_D^0 + RT \ln[D]\} - \{G_A^0 + RT \ln[A] + G_B^0 + RT \ln[B]\}$$

$$\{(G_C^0 + G_D^0) - (G_A^0 + G_B^0)\} + \{RT \ln[C] + RT \ln[D] - RT \ln[A] + RT \ln[B]\}$$

if $\Delta G^0 = \{(G_C^0 + G_D^0) - (G_A^0 + G_B^0)\}$

$$\therefore \Delta G = \Delta G^0 + (RT \ln[C] \times [D] - RT \ln[A] \times [B])$$

$$\Delta G = \Delta G^0 + RT \ln$$

or $\Delta G = \Delta G^0 + RT \ln Q$

or $\Delta G = \Delta G^0 + RT \ln Q$

$$Q = \frac{[\text{product}]}{[\text{reactant}]}$$

$$Q = K = \frac{[C] \times [D]}{[A] \times [B]}$$

Hence from above equation

$$\Delta G = \Delta G^0 + RT \ln k$$

since at equillibrium ΔG=0

$$\therefore O = \Delta G^0 + RT \ln K$$

$$\therefore \Delta G^0 = -RT \ln K$$

or

$$\therefore \Delta G^0 = -2.303 RT \log_{10} K$$

Question 3.6: Explain brown ring test with the help of chemical equation **[2]**

Solution: Brown Ring Test: The iron (II) iron, Fe^{2+} reduces nitrate to nitric oxide. The nitric oxide formed reacts with Fe^{2+} to form a brown coloured complex. Concentrated sulphuric acid is added to an aqueous solution of nitrate ions, it is heated, cooled and then dilute ferrous sulphate solution is added carefully along the sides of the test tube. A brown ring at the junction of the layers of the solution and sulphuric acid is obtained which confirms the presence of nitrate ions in the solution.

$$NO_3^-$$

$$(Fe(H_2O)_6)^{2+} + NO \rightarrow [Fe(H_2O)_4NO]^{2+} + H_2O$$

Brown complex

Question 3.7: Explain, why do aquatic animals prefer to stay at lower level of water during summer? **[2]**

Solution: Solubility of gases decrease with increase temperature. During summer concertration of dissolved oxygen low at upper level of water therefore aquatic animals prefer to stay at lower level of water during summer.

Question 3.8: Distinguish between crystalline solid and amorphous solid **[2]**

Solution:

	Crystalline solid		**Amorphous solid**

(i)	They have a definite geometrical shape	(i)	They have an irregular shape
(ii)	They have a sharp melting point	(ii)	They melt over a range of temperature
(iii)	They are anisotropic	(iii)	They are isotropic
(iv)	They are pure solid	(iv)	They are supercooled liquid.
(v)	They have long-range order of regular pattern of arrangement of constituent particles.	(v)	They have short-range order of regular pattern of arrangement of constituent particles.
(vi)	They have definite heat of fusion.	(vi)	They do not have a definite heat of fusion.

Question 4: Select and write the most appropriate answer from the alternative given below each sub-question : [7]

Question 4.1: To prepare n-type semiconductor the impurity to be added to silicon should have the following number of valence electrons: **[1]**

(a) 2
(b) 3
(c) 4
(d) 5

Solution: (d) 5

Question 4.2: Number of faradays of electricity required to liberate 12 g of hydrogen is: **[1]**

1
8
12
16

Solution: 12

- The molecular mass of Hydrogen is 1 gram and has a single electron in its configuration as it is the first most element of the periodic table.
- The 12 grams of Hydrogen contains 12 moles of the electrons in it. Usually, the electricity will be passed through the free electrons.
- The 12 grams of Hydrogen contains 12 electrons which are free electrons.
- Each free electron is capable of conducting 1 Faraday of electricity.
- Since 12 grams of Hydrogen are having 12 electrons in it, we require 12 Faraday of electricity.

Question 4.3: What is molecular formula of oleum? **[1]**

(a) H_2SO_3
(b) H_2SO_4
(c) $H_2S_2O_7$
(d) $H_2S_2O_8$

Solution: (c) $H_2S_2O_7$

Question 4.4: Purification of aluminium by electrolytic refining is carried out by **[1]**

(a)Hoope process
(b)Hall process
(c)Baeyer process
(d)Serperck process

Solution: Hoope process

Question 4.5: **[1]**

The rate of reaction for certain reaction is expressed as :

$$\frac{1}{3}\frac{d[A]}{dt} = -\frac{1}{2}\frac{d[B]}{dt} = -\frac{d[C]}{dt}$$

The reaction is

(a) 3A→2B+C

(b) 2B→3A+C

(c) 2B+C→3A

(d) 3A+2B→C

Solution: (c) 2B+C⟶3A

Question 4.6: A system absorbs 640 J heat and does work of 260 J, the change in internal energy of the system will be **[1]**

(a) +380J
(b) -380J
(c) +900J
(d) -900J

Solution: +380J

Question 4.7: Which of the following is not a colligative property? **[1]**

Vapour pressure
Depression in freezing point
Elevation in boiling point
Osmotic pressure

Solution: Vapour pressure

Vapour pressure as it not a colligative property

Question 5: Answer any ONE **[7]**

Question 5.1.i: Write the structural formula and IUPAC names of all possible isomers of the compound with molecular formula C_3H_8O. **[7]**

Solution:

$CH_2-CH_2-CH_2-OH$

Propan – 1 – 01

$CH_2-CH(OH)-CH_3$

Propan – 2 – 01

$CH_3-CH_2-O-CH_3$

Methoxy ethane

Question 5.1.ii:

Write 'two' uses of phenol.

Solution: Uses of Phenol:

(i) It is used in the manufacturing of Bakelite.

(ii) It is used as an antiseptic

(iii) It is used as a disinfectant.

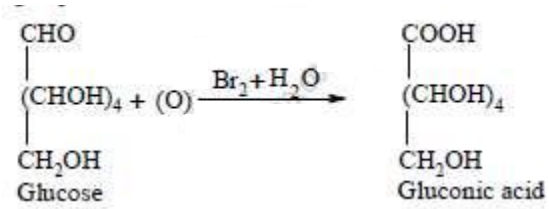
(iv) It is used in the manufacturing of drugs.

(v) It is used in the manufacturing of dyes.

Question 5.1.iii:

What happens when glucose is treated with Bromine water

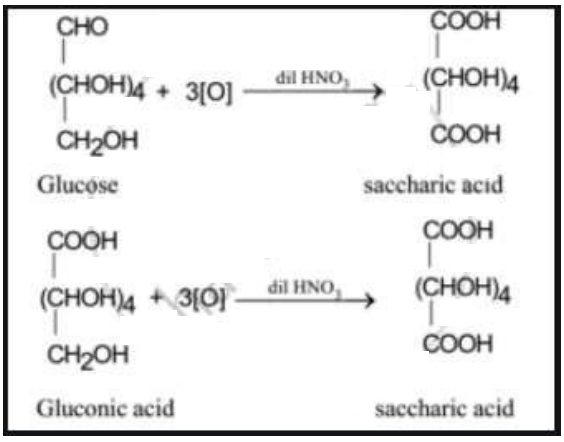
Solution: Action of bromine water (mild oxidsing agent) :- Glucose is oxidized with a mild oxidising agent like bromine water. It forms gluconic acid. In this reaction, aldehyde group of glucose is oxidized to carboxyl group.



Question 5.1.iv:

What happens when glucose is treated with - Dilute nitric acid

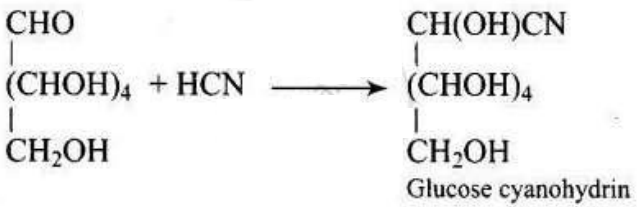
Solution: Action of HNO3 (strong oxidising agent) :- Nitric acid is a strong agent. It oxidizes both the terminal group(-CHO and -CH2OH) of glucose to give a dicarboxylic acid i.e. gluconic acid (saccharic acid) containing same number of carbon atom.



Question 5.1.v:

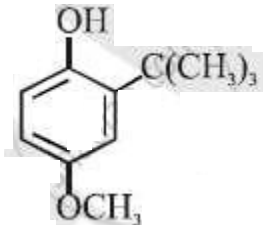
What happens when glucose is treated with Hydrogen cyanite (HCN).

Solution: Glucose reacts with hydroxylamine to form an oxime and also adds a molecule of hydrogen cyanide to give cyanohydrin. The carbonyl group is present in the open-chain structure of glucose.

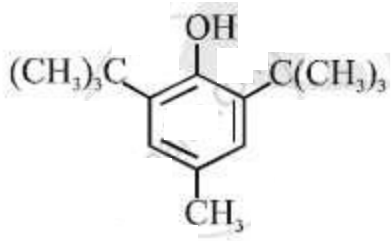


Question 5.2.i: Write the molecular formula and structural formula of BHA and BHT. **[7]**

Solution: M.F. of BHA :$C_{11}H_{16}O_2$



M.F. of BHT:$C_{15}H_{24}O$

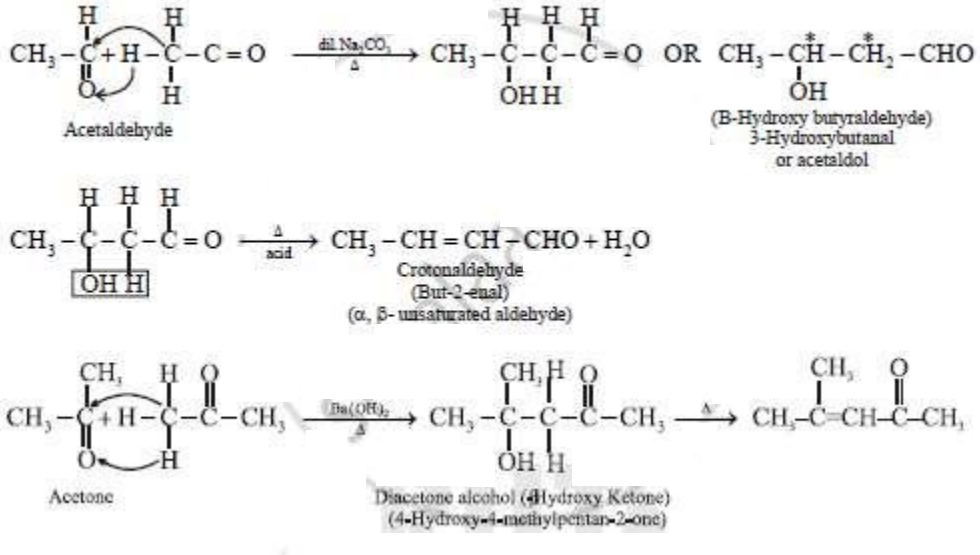


Question 5.2.ii:

Write a note on aldol condensation.

Solution: Aldol Condensation : -

When aldehyde or ketone containing α -hydrogen atom is warmed with dilute alkali like dil. NaOH then condensation reaction takes place, a β -hydroxy aldehyde or β -hydroxyl ketones is obtained and the reaction is called as Aldol condensation.



Question 5.2.iii:

What are thermoplastic polymers?

Solution: Thermoplastic polymer :-

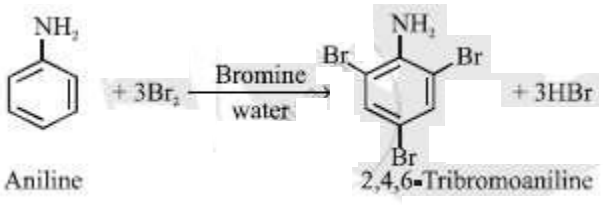
Their properties are in between elastomers and fibers. These polymers are called thermoplastic as on heating they become soft and on cooling become hard. Hence these polymers can be remoulded and recycled. Example PVC

Question 6: Answer any THREE **[9]**

Question 6.1.i: What is the action of the following reagents on aniline? **[3]**

Bromine water

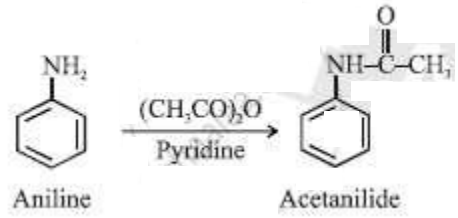
Solution: Aniline reacts with bromine water at room temperature to give white precipitate of 2, 4, 6, - tribromoaniline.



Question 6.1.ii:

What is the action of the following reagents on aniline?
Acetic anhydride

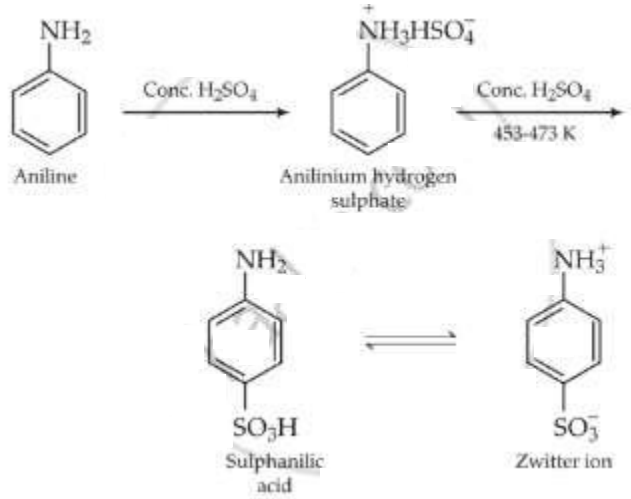
Solution: Aniline is heated with acetic anhydride to give acetanilide.



Question 6.1.iii:

What is the action of the following reagents on aniline?
Hot and conc. sulphuric acid

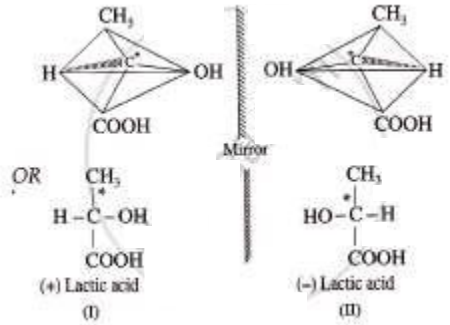
Solution: Aniline reacts with conc. sulphuric acid to give anilinium hydrogen sulphate which on heating with sulphuric acid at 453-473 K gives p-aminobenzene sulphonic acid (sulphanilic acid) as a major product.



Question 6.2: Discuss the optical activity of lactic acid. **[3]**

Solution: (1) Lactic acid contains one asymmetric carbon atom which is attached to four different groups, COOH, CH_3, OH and H.

(2) Two different arrangements of these groups around the carbon atom are possible as shown in the figure. Hence, it exist as a pair of enantiomers. The two enantiomers are mirror images of each other and are non-superimposable.



(3) Hence, lactic acid can exist in two different forms, d-Form and l-form, which are non-superimposable mirror images of each other. d-form rotates the plane of plane-polarized light to the right, while l-form rotates the same to the left.

(4) A mixture containing equimolar amounts of the d- and l-forms is a racemic mixture which is optically inactive (dl - form). This inactivity arises due to external compensation.

Question 6.3.i: Write balanced chemical equations for action of potassium permanganate on: Hydrogen **[3]**

Solution:

$$2\,KMnO_4 + 3\,H_2 \longrightarrow 2\,MnO_2 + 2\,KOH + 2\,H_2O$$

Question 6.3.ii:

Write balanced chemical equations for action of potassium permanganate on Warm conc. sulphuric acid

Solution: $4KMnO_4+6H_2SO_4 \rightarrow 2K_2SO_4+4MnSO_4+6H_2O+5O_2$

Question 6.3.iii:

Explain why Mn^{2+} ion is more stable than Mn^{3+}? (Given: Mn→ Z=25)

Solution: The electronic configuration of Mn^{+2} ion is $[Ar]3d^5 4s^0$

It has five unpaired electrons in its d-orbitals which is maximum value for a transition metal ion. While Mn^{+3} ion has electronic configuration [Ar] $3d^4$ $4s^0$.

Mn^{+2} ions are more stable than Mn^{+3} ions.

Question 6.4.i: What is effective atomic number (EAN.)? **[3]**

Solution: It is the total of electron around the central metal ion present in a complex and calculated as the sum of the electron on the metal ion and the number of electron donated by the ligands.

EAN=Z-X+Y

Z – Atomic number

X – Number of e^- Lost

Y – Number of e^- donated by the ligands

Question 6.4.ii:

Calculate EAN of cobalt (Z=27) in $[CO(NH_3)_6]^{+3}$ and of zinc (Z=30) in $[Zn(NH_3)_4]SO_4$.

Solution: For Cobalt $[Co(NH_3)_6)]^{+3}$

Z = 27 X = 3 Y = 12

EAN = 27 – 3 + 12 = 36

For Zinc $[Zn(NH_3)_4]SO_4$

Z = 30
X = 2
Y = 8

EAN = 30 – 2 + 8 =36

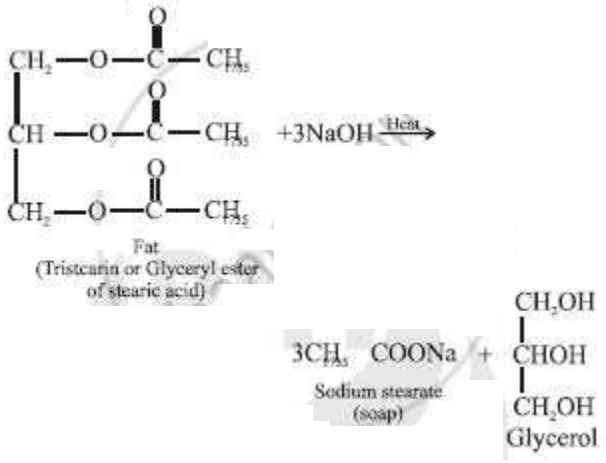
Question 7: Answer any SIX: **[12]**

Question 7.1.i: What is a soap? **[2]**

Solution: Soaps: Soaps are sodium or potassium salts of higher acids such as lauric ($C_{11}H_{23}COOH$), palmitic acid($C_{15}H_{31}COOH$) , stearic acid ($C_{15}H_{31}COOH$) , oleic acid ($C_{17}H_{33}COOH$) or linoleic acid ($C_{17}H_{31}COOH$).

Question 7.1.ii: How soap is prepared?

Solution: Soaps are formed by heating fat or oil (i.e. glyceryl esters of fatty acids) with aqueous sodium hydroxide solution. This reaction is called saponification.



During the process of hydrolysis esters of fatty acids are hydrolyzed and the soap is obtained in the colloidal form. It floats in solution as curd. It is precipited from the solution by adding sodium chloride.

Question 7.2: Identify the compounds 'A' and 'B' in the following equation: **[2]**

$$CH_3 - CH_3 + HNO_3 \xrightarrow{423-600\ K} 'A'$$

$$\xrightarrow{Sn/conc.HCl} 'B' + H_2O$$

Solution:

$$CH_3 - CH_3 + HNO_3 \xrightarrow{423-600K} CH_3 - CH_2 - NO_2 + H_2O$$

$$CH_3 - CH_2 - NO_2 \xrightarrow{Sn/ConHCl} CH_3 - CH_2 - NH_2 + H_2O$$

A:CH_3-CH_2-NO_2

(Nitro ethane)

B:CH_3-CH_2-NH_2

(Ethanamine)

Question 7.3: Write a note on the self oxidation-reduction reaction of an aldehyde with a suitable example. **[2]**

Solution: Cannizaro's Reaction:-

(a) This is a characteristic reaction of those aldehydes which do not contain α - hydrogen atom.

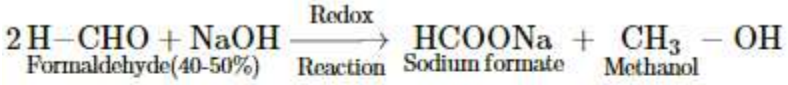
(b) When such aldehydes are heated with concentrated alkali solutions like NaOH or KOH then simultaneous oxidation-reduction takes place.

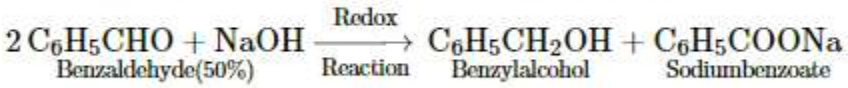
(c) Out of two molecules of aldehyde one molecule, gets oxidised to form sodium or potassium salt of carboxylic acid and the second molecule is reduced to form corresponding primary alcohol.

(d) It is an auto oxidation-reduction reaction under the influence of base

(e) Formaldehyde and benzaldehyde undergo Cannizaro's reaction as they do not contain α -hydrogen atom.

e.g.





(f) Acetaldehyde does not give this reaction since it contains α -Hydrogen atoms.

Question 7.4: Write names and chemical formulae of monomers used in preparing Buna-S. **[2]**

Solution: CH_2=CH-CH=CH_2

(1,3- butadiene)

CH_2=CH-C_6H_5

(Styrene)

Question 7.5.i: Define complex lipids **[2]**

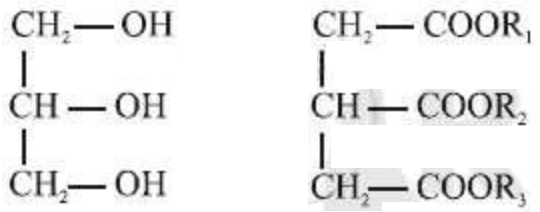
Solution: Complex lipids : -

(a)They are esters of long chain fatty acids. It can be hydrolysed.

(b) They include triglycerides (animal fats and vegetable oils), glycolipids, phospholipids and waxes.

(c) Triglycerides are the triesters of glycerol with higher fatty acids.

(d) They are also called triacylglycerols (TAG).



Fats and oil are mixture of triacylglycerol's. R1, R2 and R3 may be same or different and may be saturated or unsaturated.

Question 7.5.ii:

Mention 'two' functions of lipids

Solution: Functions :-

(i) Fats and oils have a convenient and concentrated means of storing food energy in plants and animals.

(ii) Glycolipids are components of cell membrane. Glycolipids occur in bacterial cell wall.

(iii) In plants, glycolipids are principal lipid constituents of chloroplasts.

(vi) Waxes provide vital waterproofing for body surface. Waxes are water repelling solids that are protective coatings on leaves, fruits, berries, animal fur and feather of birds.

Question 7.6: Distinguish between SN^1 and SN^2 mechanisms. **[2]**

Solution:

No	Factor	SN^2	SN^1
i	Kinetics	2^{nd} order	1^{st} order
ii	Molecularity	Bimolecular	Unimolecular
iii	Number of steps	One step	Two step
iv	Bond making and bond breaking	Simultaneous	First the bond in the reactant breaks and then a new bond in product is formed
v	Transition state	One step, one transition state	Two steps, two transition state
vi	Direction of attack of nucleophile	Only back side attack	Back side attack and front side attack
vii	Nucleophile	Strong Nucleophile favourable	Weak Nucleophile favourable

Question 7.7: What are lanthanoids? **[2]**

Solution: The series involving the filling of 4f-orbitals following lanthanum La (Z = 57) is called lanthanoid series. The elements present in this series are called lanthanoids.

Question 7.7.i: What are lanthanoids?

Solution: The series involving the filling of 4f-orbitals following lanthanum La (Z = 57) is called lanthanoid series. The elements present in this series are called lanthanoids.

Question 7.7.ii:

What is the position of actinoids in periodic table?

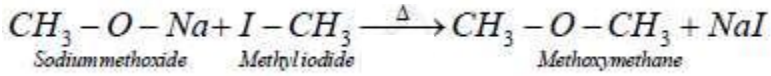
Solution: Position : -

Actinoids belongs to the IIIB group of periodic table in the seventh period.

Question 7.8.i: How is Methoxymethane prepared from : Methyl iodide **[2]**

Solution: Methoxyethane, also known as ethyl methyl ether, is an ethyl group with a bonded methoxy. Methoxyethane is a colourless gaseous ether with a medicine-like odour. It is extremely flammable, and its inhalation may cause asphyxiation or dizziness. As a Lewis base, it can react with Lewis acids to form salts and reacts violently with oxidizing agents.

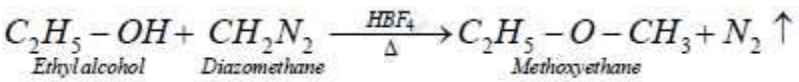
a) Preparation of Dimethyl ether (Methoxymethane) from methyl iodide : When methyl iodide is heated with alcoholic sodium methoxide, it gives dimethyl ether.



Question 7.8.ii: How is Methoxyethane prepared from : Diazomethane

Solution: Methoxyethane from diazomethane : -

When ethyl alcohol is treated with diazomethane in presence of fluoroboric acid, methoxyethane is formed.



Question 8: Select and write the most appropriate answer from the given alternatives for each sub-question **[7]**

Question 8.1: IUPAC name of $K_4[Fe(CN)_6]$ is **[1]**

tetrapotassium ferrocyanide
potassium ferricyanide
potassium ferrocyanide
potassium hexacyanoferrate

Solution: potassium hexacyanoferrate

Question 8.2: Carbon atom in methyl carbocation contains how many pairs of electrons? **[1]**

(a) 8
(b) 4
(c) 3
(d) 5

Solution: (c) 3

Question 8.3: How many moles of acetic anhydride will be required to form glucose Penta acetate from 2M of glucose? **[1]**

(a) 2
(b) 5
(c) 10
(d) 2.5

Solution: (c) 10

Question 8.4: Identify the weakest base amongst the following : **[1]**

(a) p- methoxyaniline
(b) o-toluidine
(c) benzene - 1, 4 - diamine
(d) 4 - amino benzoic acid

Solution: (d) 4 – amino benzoic acid

Question 8.5: Bakelite is the polymer of: **[1]**

(a) Benzaldchyde and phenol
(b) Acetaldehyde and phenol
(c) Formaldehyde and phenol
(d) Formaldehyde and benzyl alcohol

Solution: (c) Formaldehyde and phenol

Question 8.6: Formalin is 40% aqueous solution of: **[1]**

(a) Methanal
(b) Methanoic acid
(c) Methanol
(d) Methanamine

Solution: (a) Methanal

Question 8.7: Which among the following pairs of elements is 'not' an example of chemical twins? **[1]**

Zr and Hf
Nb and Ta
Mo and W
Ta and Re

Solution: Ta and Re