Chemistry

Academic Year: 2012-2013 Marks: 70
Date: March 2013

Question 1: Select and write the most appropriate answer from the given alternatives for each sub-question: **[7]**

Question 1.1: In body centred cubic structure the space occupied is about **[1]**

(A) 68% (B) 53%
(C) 38% (D) 32%

Solution: (a) 68%

Question 1.2: For a gaseous reaction the unit of rate of reaction is **[1]**

(A) L atm s^{-1}
(B) atm mol^{-1} s^{-1}
(C) atm s^{1}
(D) mol s

Solution: (c) atm /s

Question 1.3: Which of the following compounds contain S = O as well as S = S bonds? **[1]**

(A) Sulphuric acid
(B) Thiosulphuric acid
(C) Sulphurous acid
(D) Thiosulphurous acid

Solution: (b) Thiosuphuric acid

Question 1.4: Which of the following solutions shows maximum depression in freezing point? **[1]**

(A) 0.5 M Li_2SQ_4
(B) 1 M NaCl
(C) 0.5 M $A1_2(SO_4)_3$
(D) 0.5 $MBaC1_2$

Solution: (c) 0.5 M $A1_2(SO_4)_3$

Question 1.5: For a chemical reaction dS = 0.035 kJ/k and dH = 20kJ. At what temperature does the reaction turn nonspontaneous? **[1]**

5.14 K
57.14 K
571.4 K
5714.0 K

Solution: 571.4 k

Question 1.6: The standard e.m.f of the following cell is 0.463 V **[1]**

$Cu \mid Cu^{++}_{1m}$

What is the standard potential of Cu electrode?

(A) 1.137 V
(B) 0.337 V
(C) 0.463 V
(D) - 0.463 V

Solution: (b) 0.337 V

Question 1.7: Fe_2O_3 is reduced to spongy iron near the top of blast furance by **[1]**

(A) H_2
(B) CaO
(C) SiO_2
(D) CO

Solution: (d) CO

Question 2: (A) Answer any SIX of the following **[12]**

Question 2.1: 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 super cooled 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 2.2.i: State Kohlrausch Law **[2]**

Solution: Kohlrausch Law:

The equivalent conductivity of an electrolyte at infinite dilution is the sum of two values on depending upon the cation and the other upon the anion.

Question 2.2.ii:

Write mathematical expression of molar conductivity of the given solution at infinite dilution.

Solution:

$$\lambda^{\circ} = \lambda^{\circ}_{+} + \lambda^{\circ}_{-}$$

where,

λ° is molar conductivity of electrolytic solution

λ°_{+} is molar conductivity of cation

λ°_{-} is molar conductivity of anion

Question 2.3:

Write cell reaction in lead storage battery during discharge.

Solution: The electrode reaction that occurs during discharge.

At anode

$$Pb_{(s)} + SO^{-2}_{4(aq)} \rightarrow PbSO_{4(s)} + 2e^{-}$$

At Cathode

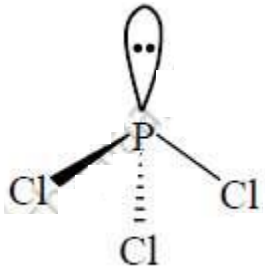
$$PbO_{2(s)} + 4H^{+}_{(aq)} + SO^{2-}_{4(aq)} + 2e^{-} \rightarrow PbSO_{4(s)} + 2H_2O(l)$$

Overall reaction

$$Pb_{(s)} + PbO_{2(s)} + 4H^{+}_{(aq)} + 2SO^{-2}_{4(aq)} \rightarrow 2PbSO_{4(s)} + 2H_2O$$

Question 2.4: Draw structure and write geometry of PCl_3 and PCl_5. **[2]**

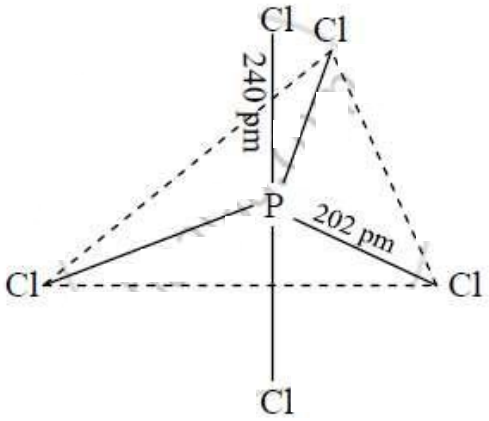
Solution: a)



Pyramidal structure of PCl3

Geometry of PCl3 : Pyramidal

b)



Bipyramidal structure of PCl5

Geometry of PCl5 : Trigonal bipyramidal

Question 2.5: Prove that $\Delta H=\Delta U+\Delta nRT$. what is the condition under which $\Delta U=\Delta H$? **[2]**

Solution: $\because \Delta H=\Delta U+P\Delta V$

$\Delta H=\Delta U+P(V_2-V_1)$

$\Delta H=\Delta U+PV_2-PV_1$

But $PV_1 = n_1RT$

$PV_2 = n_2RT$

$\therefore \Delta H= \Delta U+ n_1RT - n_2RT$

$\Delta H= \Delta U+RT(n_1-n_2)$

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

Condition
i) When reaction is carried out in a closed vessel, so that volume remain constant $\Delta V=0$
ii) When reaction involves only solids or liquids or solutions but no gaseous reactant or product.
iii) When reaction involves gaseous reactants and product but their number of mole are equal.

Question 2.6: Mention names and formulae of two ores of alumunium. **[2]**

Solution: Gibbsite or hydragillite : $Al_2O_3.3H_2O$

Bauxite $Al_2O_3.2H_2O$

Dispore $Al_2O_3.H_2O$

Question 2.7: Derive the relationship between relative lowering of vapour pressure and molar mass of nonvolatile solute. **[2]**

Solution: Let W_2 g of solute of molar mass M_2 be dissolved in W_1 g of solvent of molar mass M_1. Hence number of
mole of solvent n_1 and number of mole of solute n_2 in solution.

$$n_1 = \frac{W_1}{M_1} \text{ and } n_2 = \frac{W_2}{M_2} \left(\because \text{Number of moles (n)} = \frac{\text{mass of the substance}}{\text{molar mass of the substance}} \right)$$

The mole fraction of solute x_2 is given by

$$x_2 = \frac{n_2}{n_1 + n_2}$$

$$x_2 = \frac{\frac{W_2}{M_2}}{\frac{W_1}{M_1} + \frac{W_2}{M_2}} \quad \text{.....(1)}$$

For a solution of two components A1 and A2 with mole fraction x1 and x2 respectively, if the vapour pressure of pure component A1 is

P_1^0 and that of component A_2 is p_2^0 The relative lowering of vapour pressure is given by,

$$\frac{\Delta p}{p_0^1} = \frac{p_1^0 - p}{p_1^0}$$

$$\frac{\Delta p}{p_0^1} = \frac{p_1^0 x_2}{p_1^0}$$

$$\frac{\Delta p}{p_0^1} = x_2 \text{ .....(2)}$$

Combining equations (1) and (2)

$$\frac{\Delta p}{p_0^1} = \frac{p_1^0 - p}{p_1^0} = x_2 = \frac{\frac{W_2}{M_2}}{\frac{W_1}{M_1} + \frac{W_2}{M_2}}$$

For dilute solutions n1 >> n2. Hence n2 may be neglected in comparison with n1 in equation (1) and thus equation (3) becomes

$$\frac{\Delta p}{p_0^1} = \frac{n_2}{n_1} = \frac{\frac{W_2}{M_2}}{\frac{W_1}{M_1}} = \frac{W_2 M_1}{W_1 M_2}$$

Knowing the masses of non-volatile solute and the solvent in dilute solutions and by determining experimentally vapour pressure of pure solvent and the solution, it is possible to determine molar mass of a non-volatile solute.

Question 2.8: What is pseudo first order reaction? Give one· example of it. **[2]**

Solution: A reaction which has higher order true rate law but experimentally found to behave as first order are called pseudo first order reaction.

e.g. $C_{12}H_{22}O_{11(aq)} + H_2O \rightarrow C_6H_{12}O_6 + C_6H_{12}O_6$

Sucrose Glucose fractose

is an example of pseudo first order reaction, because water takes part in the reaction the true rate law

rate = k'[$C_{12}H_{22}O_{11}$][H_2O]

indicates that the reaction must be second order. Similarly to the hydrolysis of ester,[H_2O] is constant and
the rate law became

rate=k[$C_{12}H_{22}O_{11}$]

Thus, the second order true law is converted, to first order rate law.

Question 3: Answer any THREE of the following: [9]

Question 3.1: Calculate the mole fraction and molality of HNO_3 in solution containing 12.2%HNO_3 (Given atomic mases : H=1, N=13,O=16) [3]

Solution: %purity = 12.2 %

∴mass of solute = 12.2 g.

mass of solvent = 100 – 12.2

= 87.8 g

$$\therefore \text{Mole of solute} = \frac{12.2}{63} = 0.193$$

$$\therefore \text{Mole of solvent} = \frac{87.7}{18} = 4.877$$

$$\therefore \text{mole fraction of solute} = \frac{0.193}{0.193 + 4.877}$$

$$= \frac{0.193}{5.07}$$

= 0.038

Mole fraction of HNO_3 = 0.038

$$\text{Molality of } HNO_3 = \frac{\text{Mass of } HNO_3}{\text{Molar mass of } HNO_3 \times \text{mass of solvent}}$$

$$\text{molality} = \frac{W_2}{M_2} . \frac{1000}{W_1}$$

$$= \frac{12.2}{63} \times \frac{1000}{87.8}$$

$$= \frac{12200}{5531.4}$$

= 2.2056

∴ Molality = 2.2056 mol/kg

Question 3.2: [3]

Consider the reaction

$3I^-_{(aq)} + S_2O^{2-}_8 \rightarrow I^-_{3(aq)} + 2S_2O^{2-}_4$

At particular time t, $\frac{d[SO^{2-}_4]}{dt} = 2.2 \times 10^{-2}\text{M/s}$

What are the values of the following at the same time?

a. $-\frac{d[I^-]}{dt}$

b. $-\frac{d[S_2O^{2-}_8]}{dt}$

c. $-\frac{d[I^-_3]}{dt}$

Solution:

Rate of reaction

$$-\left(\frac{1}{3}\right)\frac{d[I^-]}{dt} = -\frac{d[S_2O_8{}^{2-}]}{dt} = +\frac{d[I^-_3]}{dt} = +\left(\frac{1}{2}\right)\frac{d[SO_4{}^{2-}]}{dt}$$

$$\frac{d[SO_4{}^{2-}]}{dt} = 2.2 \times 10^{-2}\text{M/s}$$

(a)

$$-\left(\frac{1}{3}\right)\frac{d[I^-]}{dt} = \left(\frac{1}{2}\right)\frac{d[SO_4{}^{2-}]}{dt}$$

$$-\frac{d[I^-]}{dt} = \frac{3}{2} \times 2.2 \times 10^{-2}$$

$$-\frac{d[I^-]}{dt} = 3.3 \times 10^{-2}\ \text{M/s}$$

(b)

$$-\frac{d[S_2O_s{}^{2-}]}{dt} = \left(\frac{1}{2}\right)\frac{d[SO_4{}^{2-}]}{dt}$$

$$-\frac{d[S_2O_s{}^{2-}]}{dt} = \frac{1}{2} \times 2.2 \times 10^{-2}$$

$$-\frac{d[S_2O_s{}^{2-}]}{dt} = 1.1 \times 10^{-2}\ \text{M/s}$$

(c)

$$\frac{d[I^-_3]}{dt} = \left(\frac{1}{2}\right)\frac{d[SO_4{}^{2-}]}{dt}$$

$$\frac{d[I_3^-]}{dt} = \frac{1}{2} \times 2.2 \times 10^{-2}$$

$$\frac{d[I_3^-]}{dt} = 1.1 \times 10^{-2}$$

$$-\frac{d[I_3^-]}{dt} = -1.1 \times 10^{-2} \ \text{M/s}$$

Question 3.3: 300 M mol of perfect gas occupies 13 L at 320 K. Calculate the work done in joules when the gas expands- [3]

(a) Isothermally against a Constant external pressure of 0.20atm.
(b) Isothermal and reversible process.
(c) Into vaccum until the volume of gas is increased by 3L (R=8.314J mol^{-1} K^{-1})

Solution: (a) $W = -P_{ext} \Delta V$

=-0.20x3L

=-0.6L atm

= -0.6x101.3

W=-60.78J

(b) $W = -2.303nRT \log_{10}\left(\frac{V_2}{V_1}\right)$

$= -2.303 \times .0.3 \times 8.314 \times \log\left(\frac{16}{13}\right)$

= -2.303 x 0.3 x 8.314 x log(1.23)

= -2.303 x 0.3 x 8.314 x 0.0899 x 320

= -0.516 x 320

w=-165.12J

(c) $W=-P_{ext} \Delta V$

When a gas is expanded in vaccum, exteral opposing pressure is zero.

P_{ext}=-(0) x 3L

W=0

Question 3.4.i: What is the action of Excess of air on ammonia? [3]

Solution: $2NH_3 + 2O_2 \rightarrow N_2O + 3H_2O$

$4NH_3 + 3O_2 \rightarrow 2N_2 + 6H_2O$
Ammonia burns in excess of air to give N_2 and H_2O.

Question 3.4.ii:

What is the action of Excess of chlorine on ammonia?

Solution: $NH_3+3Cl_2 \rightarrow NCL_3+3HCl$

Question 3.4.iii:

What is the action of Na Metal on ammonia?

Solution:

$$2Na_{(s)} + 2NH_{3(1)} \rightarrow 2Na^{+}_{(aq)} + 2NH^{-}_{2(aq)} + H_{2(g)}$$

Question 4: Answer any one of the following **[7]**

Question 4.1.1: Explain with reason sign conventions of ΔS in the following reactions:

Question 4.1.1.1: Explain with reason sign conventions of ΔS in the following reaction **[1]**

$N_{2(g)} + 3H_{2(g)} \rightarrow 2NH_{3(g)}$

Solution: $N_{2(g)} + 3H_{2(g)} \rightarrow 2NH_{3(g)}$

The entropy of the system decrease because order decreases.

ΔS is negative.

Question 4.1.1.2: Explain with reason sign conventions of ΔS in the following reaction **[1]**

$CO_{2(g)} \rightarrow CO_{2(g)}$

Solution: $CO_{2(g)} \rightarrow CO_{2(g)}$

The entropy of the system decrease because disorder decreases.

ΔS is negative

Question 4.1.2: Explain the following terms **[2]**

Question 4.1.2.1: Explain the following term **[1]**

Smelting

Solution: Smelting:

It is a process of extracting the impure molten metal from its ore at a high temperature using suitable flux and reducing agent

Question 4.1.2.2: Explain the following term **[1]**

Flux

Solution: Flux:

A flux is a chemical substance added to the concentrated ore during smelting in order to remove the gangne
to form easily fusible slag.

Question 4.1.3: Gold occurs as face centred cube and has a density of 19.30 kg dm^{-3}. Calculate atomic radius of gold (Molar mass of Au = 197) [3]

Solution:

Unit cell of FCC $= \frac{1}{8} \times 8 + 6 \times \frac{1}{2}$

=4 atoms

Mass of unit cell of FCC $= 4 \times \frac{197}{6.022 \times 10^{23}}$

=130.85 x 10^{-23}g

$\rho = 19.3$ g/cm^{-3}

Volume of unit cell= $\frac{130.85 \times 10^{-23}}{19.3}$

=6.78x10^{-23} cm^3

a^3=6.78x10^{-23}

a is edge of unit cell

$a = \sqrt[3]{6.78 \times 10^{-23}}$

=4.08x10^{-8} cm

For FCC

$a = \sqrt{8}.r$

$a = \sqrt{8}.r$

$r = \frac{a}{\sqrt{8}} = \frac{4.08 \times 10^{-8}}{\sqrt{8}}$

r=1.44x10^{-8} cm

r=144 pm

Question 4.2.i: a. Explain the trends in the following properties with reference to group 16: **[7]**

1 Atomic radii and ionic radii
2 Density
3 ionisation enthalpy
4 Electronegativity
b. In the electolysis of $AgNO_3$ solution 0.7g of Ag is deposited after a certain period of time. Calulate the quantity of electricity required in coulomb. (Molar mass of Ag is 107.9g mol^{-1})

Solution: (a) Trends in 16-Group

(i) Atomic radii and ionic radii
Down the group atomic radii increases.

(ii) Density
Down the group density increased.

(iii) Ionization enthalpy
The Ist ionization enthapies of the elements of group 16 are unexpectedly lower, while their IInd ionization enthalpies are higher than those of the corresponding element of group 15.

(iv) Electronegativity
The element of group 16 have higher value of electronegativity then the corresponding element of group 15.

(b) $\text{Mass of sub} = \frac{Q}{96500} \times \text{mole ratio} \times \text{mol mass}$

Mass of sub = 0.7 g

$\text{Mole ratio} = \frac{1}{1}$

Molar mass = 107.9

$\therefore 0.7 = \frac{Q}{96500} \times 1 \times 107.9$

$Q = \frac{0.7 \times 96500}{107.9}$

$= \frac{67550}{107.9}$

=626.04

Quantity of electricity = 626.04 C

Question 4.2.ii: Define Osmosis

Solution: Osmosis is a passive process and happens without any expenditure of energy. It involves the movement of molecules from a region of higher concentration to lower concentration until the concentrations become equal on either side of the membrane.

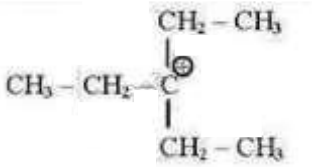
Question 5: Select and write the most appropriate answer from the given alternatives for each sub-question: **[7]**

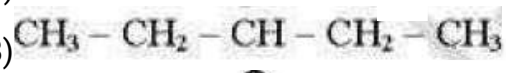
Question 5.1: In which pair highest oxidation states of transition metals are found: **[1]**

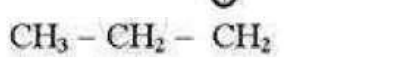
nitriles and chlorides
fluorides and chlorides
fluorides and oxides
nitriles and oxides

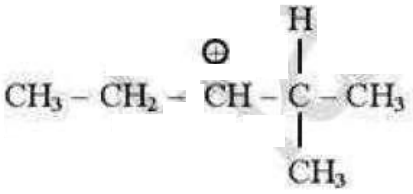
Solution: fluorides and oxides

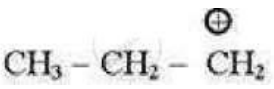
Question 5.2: Which of the following carbocations is least stable? **[1]**

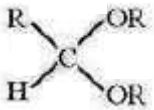
(A) 

(B) 

(C) 

(D) 

Solution: (c) 

Question 5.3: Compound having general formula  is called **[1]**
(A) diester
(B) acid anhydride
(C) hemiacetal
(D) acetal

Solution: (d) acetal

Question 5.4: **[1]**

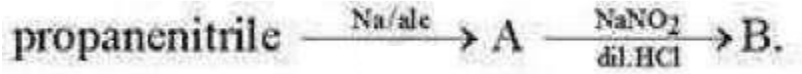
The complex ion $[Co(H_2O)_5(ONO)]^{2+}$
(A) linkage isomer
(B) ionisation isomer
(C) co-ordination isomer
(D) geometrical isomer

Solution: (d) acetal

Question 5.5: Inflammation of the tongue is due to the deficiency of: **[1]**
Vitamin B_1
Vitamin B_2
Vitamin B_5
Vitamin B_6

Solution: Vitamin B_2

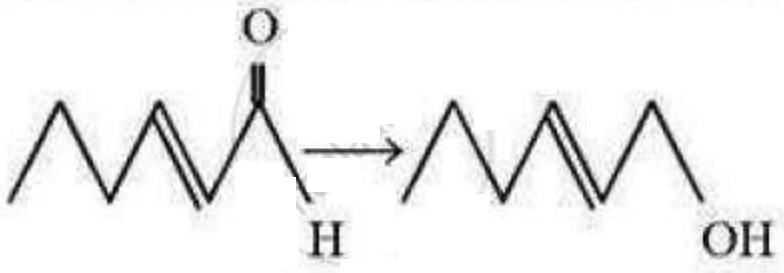
Question 5.6: Identify the compound 'B' in the following series of reaction: **[1]**



(A) n-propyl chloride
(B) Propanamine
(C) n-propyl alcohol
(D) Isoproply alcohol

Solution: (c) n-propyl alcohol

Question 5.7: Which of the following reagents is best for the following conversion? **[1]**



(A) $LiAlH_4$
(B) $\overset{+}{H_3O}$
(C) H_2/Ni, 453 K
(D) Zn-Hg+$HCl_{(con)}$

Solution: (a) $LiAlH_4$

Question 6: Answer any SIX of the following **[12]**

Question 6.1: **[2]**

Calculate magnetic moment of $Fe^{2+}_{(aq)} ion (Z = 26)$.

Solution:

Data: Fe^{2+}

Z=26

Electronic configuration of

$Fe^{2+} = 1s^2 2s^2 2p^6 3s^2 3p^6 4s^\circ 3d^6$

No. of unpaired electrons = 4

To find: Magnetic moment = u

Formula: $u = \sqrt{n(n+2)} B.M.$

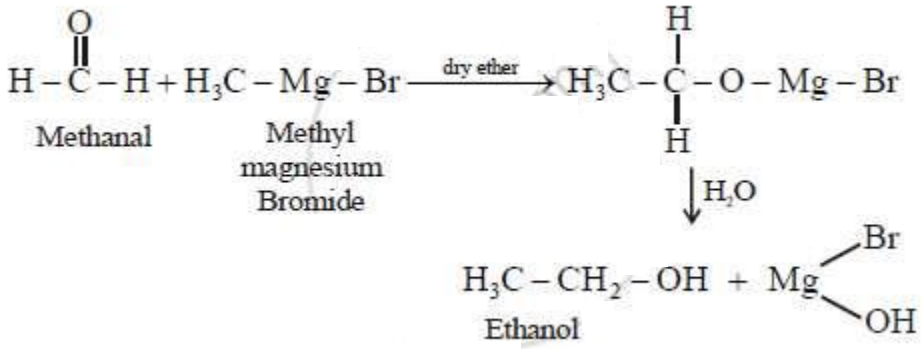
Solution: $u = \sqrt{4(4+2)}$

$= \sqrt{24}$

u = 4.90 B.M.

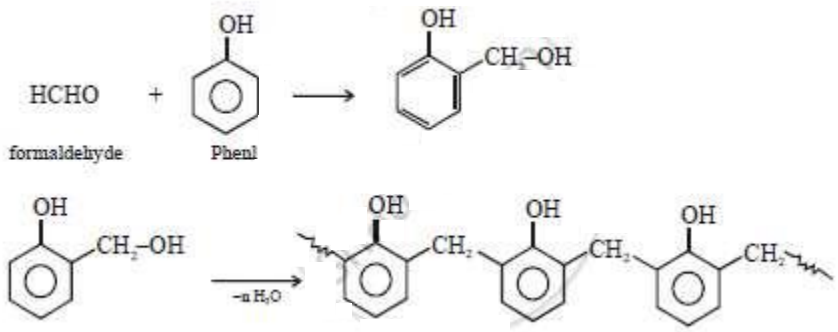
Question 6.2: How is ethanol prepared from methanal by using Grignard reagent? **[2]**

Solution:



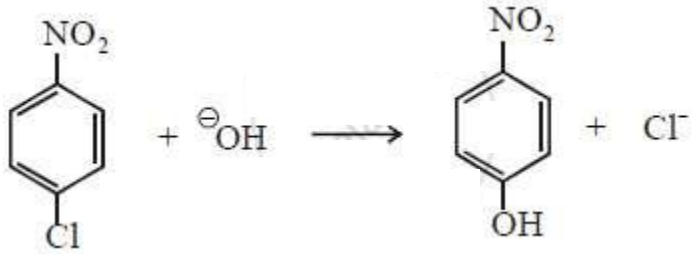
Question 6.3: Write the chemical reaction to prepare novolac polymer. **[2]**

Solution:

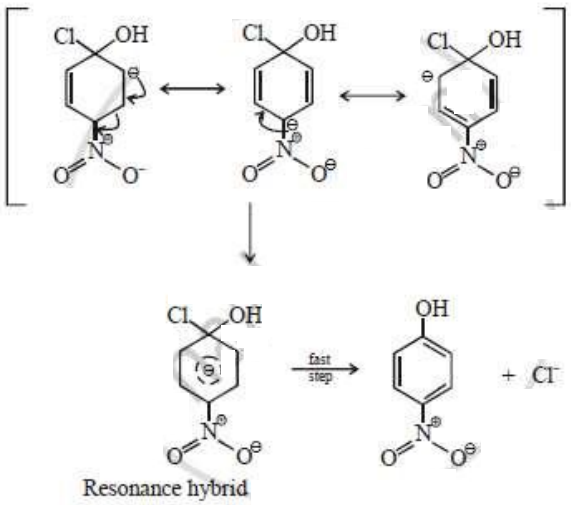


Question 6.4: Why does p-nitro chlorobenzene undergo displacement reactions readily with attack of nucleophilic $HO^{\ominus}$ ion? **[2]**

Solution:



Aryl halides undergo nucleophilic displacement reactions readily when a strong electron withdrawing group like $–NO_2$ is present at ortho or para positions. When p-nitro chlorobenzene reacts with alkali, p-nitro phenol is obtained when $–NO_2$ group at para position with respect to halogen, then mechanism of reaction is as follows.

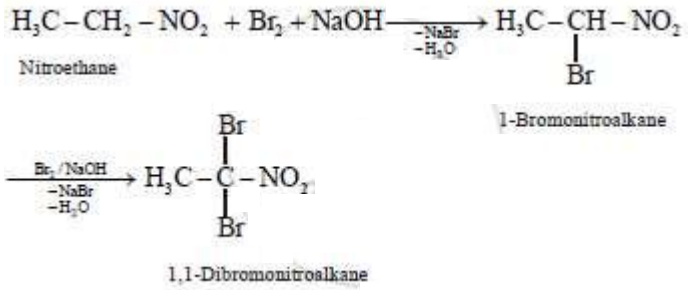


Question 6.5: What is the action of bromine in alkaline medium on **[2]**

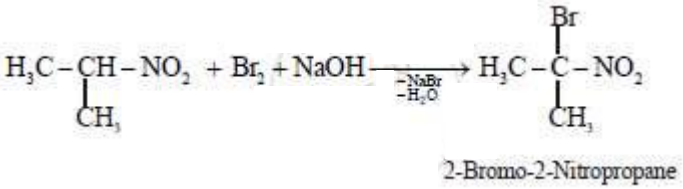
i. $CH_3CH_2NO_2$

ii. 

Solution:



(a)



(b)

Question 6.6: Define antioxidants? **[2]**

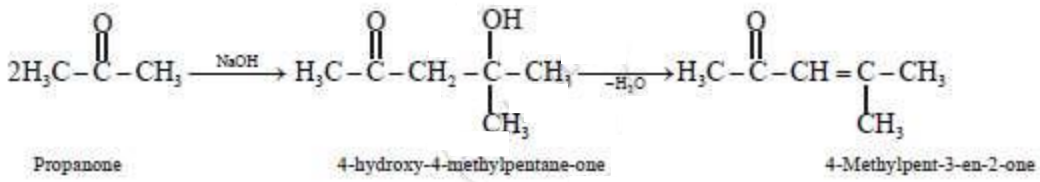
Solution 1: Antioxidant is a substance which when added to food retards or prevents the oxidative deterioration of food.

Examples:
BHA, BHT

Solution 2: Antioxidant: is a substance which when added to food, retards or prevents oxidative deterioration of food. Fats and oils are oxidized easily, turn rancid and becomes unpalatable

Question 6.7: How is 4-methylpent-3-en-2-one obtained from propan-2-one? **[2]**

Solution:



Question 6.8: What are hormones? **[2]**

Solution: Hormones:

a) Hormones are the chemicals secreted by the ductless glands (endocrine glands) and transported by the blood stream, to different parts of the body where they control different physiological actions of the body.

b) The blood provides the required chemicals in the form of raw materials for secretion of hormones and also act as a vehicle for transport of hormones to reach the specific organs of the body

c) The parts of the body organs where hormones are produced are called effectors and where they act on cells are called targets

d)Hormones are easily diffusible, have low molecular weight and affect biological processes

e) Hormones are normally derived from amino acid derivatives or peptides and proteins or steroids.

eg. Thyroxine, Insulin, Androgens, Estrogens and Progesterone.

Question 7: Answer any THREE of the following **[9]**

Question 7.1.i: Write the different oxidation states of manganese. **[3]**

Solution: Element Oxidation state

Mn +2, +3, +4, +5, +6, +7

Question 7.1.ii:

Why +2 oxidation state of manganese is more stable?

Solution: Mn
Atomic number = 25
Mn^{2+}
No. of electrons = 23

Electronic configuration of Mn^{2+} = $[Ar]3d^5 4s^0$

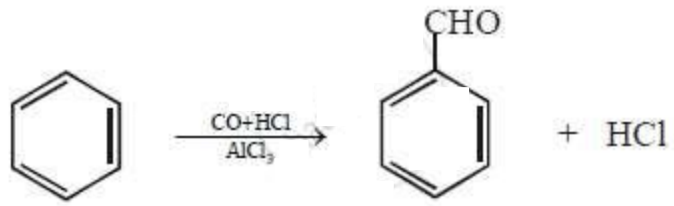
(1) It is seen from the electronic configuration of Mn2+ that d-orbital is half filled.

(2) A half filled d-orbital is more stable as compared to empty or partially filled orbital.

(3) Hence Mn^{2+} ion is more stable oxidation state of manganese.

Question 7.2.i: How are the following compounds prepared? **[3]**
benzaldehyde from benzene

Solution: (a) Benzaldehyde from benzene

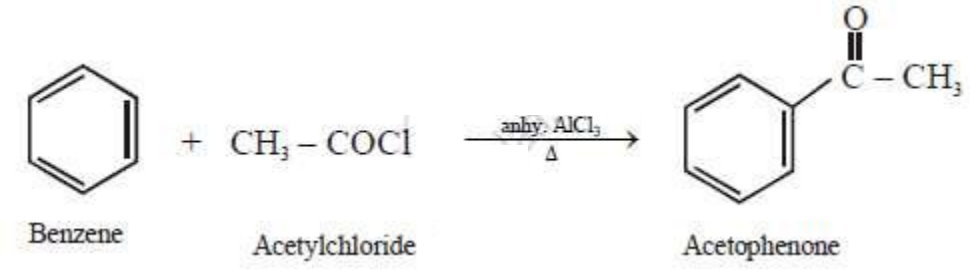


Benzene
Gatterman Koch synthesis

Question 7.2.ii:

How are the following compounds prepared?
acetophenone from benzene

Solution: (b)Acetophenone from benzene

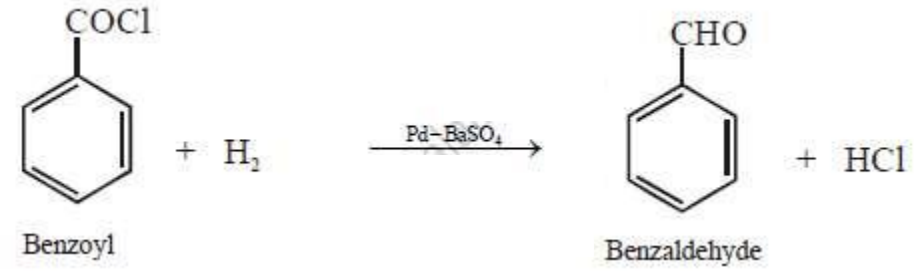


Friedal craft reaction

Question 7.2.iii:

How are the following compounds prepared?
benzaldehyde from benzoyl chloride

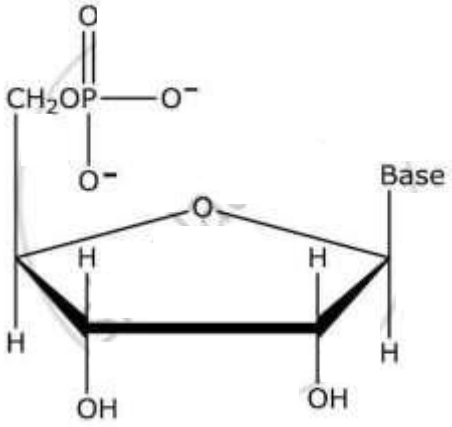
Solution: Benzaldehyde from benzoyl chloride



Rosenmund Reduction

Question 7.3.i: Write the structure of a nucleotide **[3]**

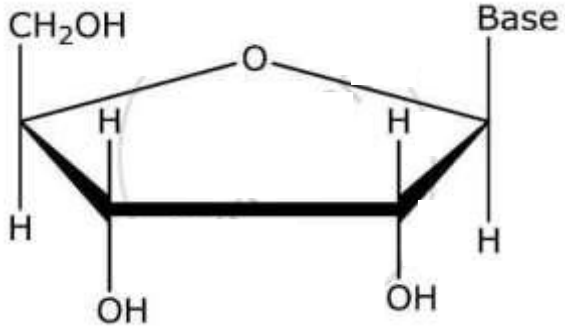
Solution:



Question 7.3.ii:

Write the structure of a nucleoside

Solution:



Question 7.3.iii:

Define complex lipids

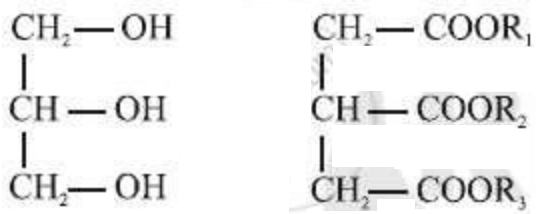
Solution: Complex lipids : -

(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 triacylglycerols. R1, R2 and R3 may be same or different and may be saturated or unsaturated.

Question 7.4.i: Write the formulae of the following compounds **[3]**
Sodium hexanitrito- N - cobaltate (III)

Solution: $Na_3[Co(NO_2)_6]$ → Sodium hexanitrito-N-cobaltate (III)

Question 7.4.ii:

Write the fomulae of the following compounds :
Tetraaquodichlorochromium (III) chloride

Solution: $[Cr(H_2O)_4Cl_2]Cl$→ Tetra aquodichlorochromium (III) chloride

Question 7.4.iii:

Write the fomulae of the following compounds
Potassium tetracyanoaurate (III) ion

Solution: $k[Au(CN)_4]$→ Potassium tetracyanoaurate (III)

Question 8: Answer any ONE of the following **[7]**

Question 8.1.i: Explain the following term: Homopolymers **[7]**

Solution: Homopolymers

A polymer made from identical repeating unit of one monomer is called homopolymer.

Example: Polyethene, PVC, Nylon-6

Question 8.1.ii:

Explain the following term: Elastomers

Solution: In the polymers, the intermolecular forces of attraction between the polymer chains are the weakest. They have high degree of elasticity.

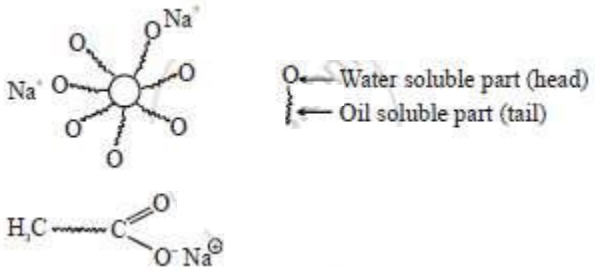
Examples: Vulcanised rubber, Buna-s

Question 8.1.iii:

Explain the mechanism of cleansing action of soaps.

Solution: Mechanism of cleansing actum of soaps

Soap and detergents have two parts, a long chain, of hydrocarbon tail soluble in oil and other part (head) soluble in water



(1) When soap is added to an oily part of cloth as vessel, the hydrocarbon part of soap dissolves in oil and ionic end of soap dissolves in water.

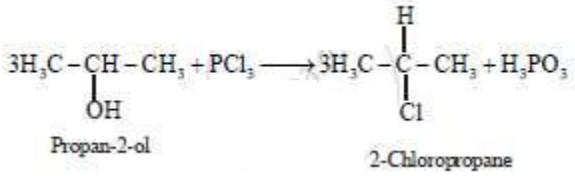
(2) The soap molecules form micelles where one of the molecules is towards the oil droplet, while ionic end faces outside.

(3) This results in an emulsion in water.

(4) The soap micelle assist in dissolving the dirt in water. Thus we can wash our clothes.

Question 8.1.iv:
Write balanced chemical equations for the action of phosphorous trichloride on propan-2-ol

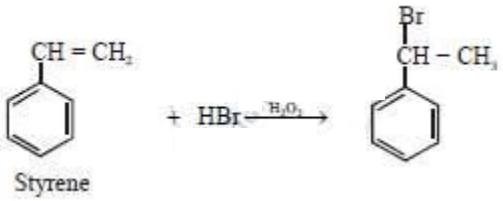
Solution:



Question 8.1.v:

Write balanced chemical equations for the action of hydrogen bromide on styrene in the presence of a peroxide

Solution:



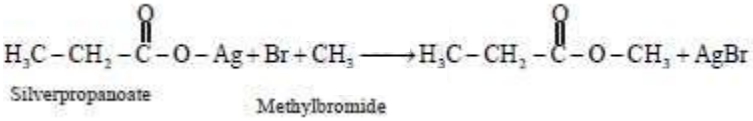
Balance equation is

$$\underset{\text{styrene}}{C_6H_5CH = CH_2} + HBr \xrightarrow{\text{Peroxide}} C_6H_5CH_2 - CH_2Br$$

Question 8.1.vi:

Write balanced chemical equations for the action of methyl bromide on silver propanoate

Solution:



Question 8.2.i: Write a short note on Hoffmann bromamide degradation. **[7]**

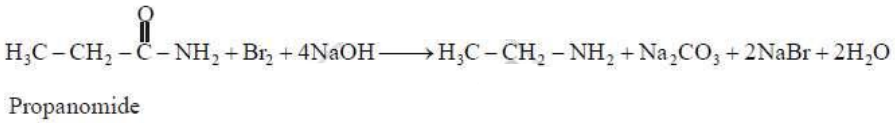
Solution 1: (a) **Hoffmann Bromanide degradation**

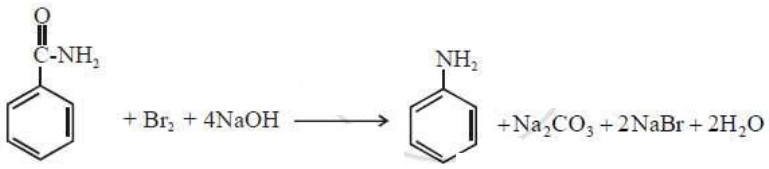
(1) The conversion of amides into amine in presence of bromine and alkali is known on Hoffmann degradation of amides.

(2) An important characteristic of this reaction is that on amine with one carbon less than those in the amide is formed.

(3) This reaction is an example of molecular rearrangement and involves migration of an alkyl or aryl group from the carbonyl carbon to this adjacent nitrogen atom.

Example:

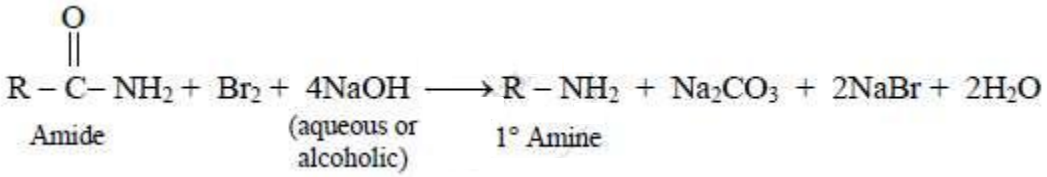




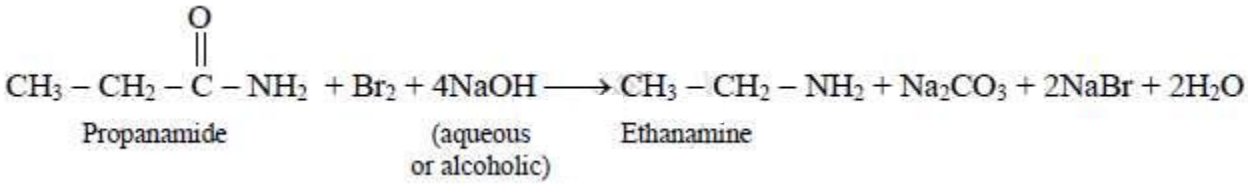
Solution 2:

Hoffmann bromamide reaction:

a) Primary amine can be prepared by reaction of amide with bromine and aqueous or alcoholic sodium hydroxide.



eg. Ethanamine is prepared by reaction of propanamide with bromine and aqueous or alcoholic sodium hydroxide.



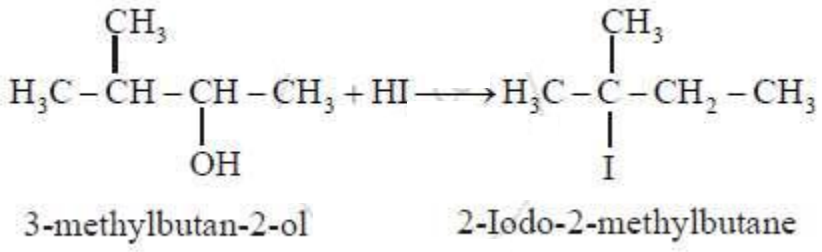
b) This reaction is known as Hoffmann bromamide degradation. It involves molecular rearrangement. An alkyl or aryl group migrates from the carbonyl carbon to the adjacent nitrogen atom.

c) This reaction is useful for decreasing the length of carbon chain by one carbon atom.

Question 8.2.ii:

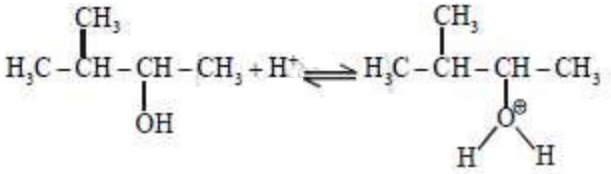
Explain the mechanism of action of hydroiodic acid on 3-methylbutan-2-ol.

Solution:

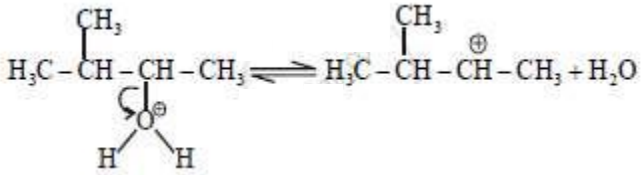


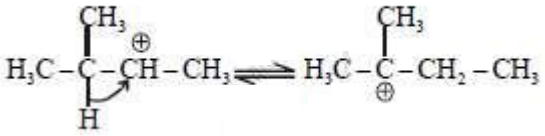
Mechanism:

Step-1:

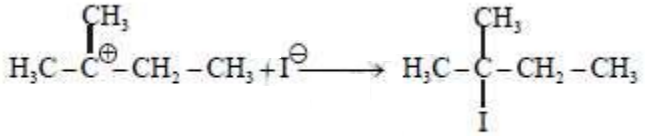


Step-2:





Step-3:



2-Iodo-2-methylbutane

Question 8.2.iii:

Mention 'two' uses of propan-2-one.

Solution: (1) Propan-2-one is used as a commercial solvent

(2) It is used in the manufacture of explosive, lacquers, paint removers, plastics, drugs, perfumes, adhesives etc.