XII HSC - BOARD - MARCH - 2017

Date: 08.03.2017

CHEMISTRY (55) - SOLUTIONS

SECTION - I

Q. 1

(i) (b)

Babitt Metal

Topic:Solution Colligative Properties; Sub-Topic:Solutions of Solid _L-1_Target-2017_ XII-HSC Board Test___Chemistry

(ii) (a)

Density, viscosity

Does not depend on amount of matter present in system.

Topic:Thermodynamics; Sub-Topic:Intensive Properties _L-1_Target-2017_ XII-HSC Board Test___Chemistry

(iii) (d)

$\left[Fe(H_2O)_5\ NO\right]^{2+}$

$NO_3 + 2Fe^{2+} + 2H^+ \longrightarrow NO + 3Fe^{3+} + 2H_2O$

$\left[Fe(H_2O)_6\right]^{2+} + NO \longrightarrow \left[Fe(H_2O)_5(NO)\right]^{2+} + H_2O$

Topic:p-block; Sub-Topic:Nitric Acid _L-1_Target-2017_ XII-HSC Board Test___Chemistry

(iv) (c)

Zone of fusion

Topic:Extraction of Metals ; Sub-Topic:Extraction of Fe_L-1_Target-2017_ XII-HSC Board Test___Chemistry

(v) (b)

A ions at the centre of face contribute $\frac{1}{2}$ part

In fcc six faces, No of 'A' ions $= \frac{1}{2} \times 6 = 3$

'B' ions accupying at corners $= \frac{1}{8} \times 8 = 1$

ions ratio

$A:B$

$3:1$

$= A_3B_1$

Topic:Solid State; Sub-Topic:Unit Cell_L-1 _Target-2017_ XII-HSC Board Test___Chemistry

(vi) (b)

$$Al^{+3} + 3e^- \longrightarrow Al\left(27\,g\,mol^{-1}\right)$$

$$3\ F \longrightarrow 27\,g/mol^{-1}$$

$$1.5F \longrightarrow \frac{27}{3}\times 1.5 = 13.5\,gm$$

Topic:Electrochemistry; Sub-Topic:Faraday's Law_L-1_Target-2017_ XII-HSC Board Test___Chemistry

(vii) (b)

$$A \longrightarrow product$$

$$R = k[A]^x$$

If rate of reaction double when the concentration of 'A' increased by a factor of 4.

$$2R = k[4A]^x$$

$$\frac{2R}{R} = \frac{k[4A]^x}{k[A]^x}$$

$$\frac{2}{1} = \left[\frac{4A}{A}\right]^x$$

$$\frac{2}{1} = \left[\frac{4}{1}\right]^x$$

$$\left[\frac{4}{1}\right]^{\frac{1}{2}} = \left[\frac{4}{1}\right]^x$$

$$x = \frac{1}{2}$$

$$x = 0.5$$

Topic:Chemical Kinetics; Sub-Topic:Rate Law_L-1 _Target-2017_ XII-HSC Board Test___Chemistry

Q.2

(i) The galvanic cell in which two energy of combustion of fuels is directly connted into electrical energy. Called fuel cell

Reaction of cell:

Oxidation at anode : At anode hydrogen gas is oxidized to H_2O. **[1 M]**

$$2H_2(g) + 4OH^-_{(aq)} \longrightarrow 4H_2O(\ell) + 4e^-$$

Reduction at cathode (+) **[1 M]**

The electrons released at anode travel to cathode through the external circuit.

Here $O_2(g)$ is reduced to OH^-

$$O_{2(g)} + 2H_2O(\ell) + 4e^- \longrightarrow 4OH^-$$

Topic: Electrochemistry; Sub-topic:Fuel Cell_ L- 1_ Target-2017_ XII-HSC Board Test___Chemistry.

(ii) For the first order reaction $A \rightarrow$ products the integrated rate law is given as follows:

$$k = \frac{2.303}{t} \log_{10} \frac{[A]_0}{[A]_t} \quad \text{.....(1)} \qquad \textbf{[1/2 M]}$$

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

$[A]_t$ = concentration of the reactant at time t.

At $t = t_{\frac{1}{2}}$, $[A]_t = \frac{[A]_0}{2}$

Equation (1) becomes

$$k = \frac{2.303}{t_{\frac{1}{2}}} \log_{10} \frac{[A]_0}{[A]_{0/2}} \qquad \textbf{[1/2 M]}$$

$$t_{\frac{1}{2}} = \frac{2.303}{k} \log_{10} 2 \qquad \textbf{[1/2 M]}$$

$$t_{\frac{1}{2}} = \frac{2.303}{k} \times 0.301$$

$$\boxed{t_{\frac{1}{2}} = \frac{0.693}{k}} \qquad \textbf{[1/2 M]}$$

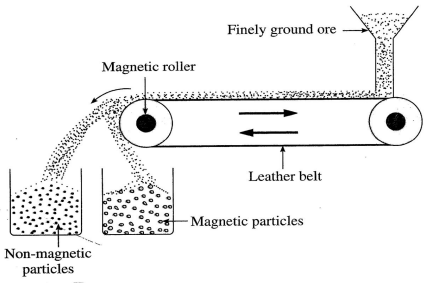
From the above equation the half life of a first order equation is readily calculated from the rate constant and vice versa.

Topic: Chemical Kinetics;Sub-Topic:Integrated Rate Law_L-1_Target-2017_ XII-HSC Board Test___Chemistry.

(iii) (a) This method is based on the differences in magnetic properties of ore and gangue.

(b) Either ore or gangue must have magnetic properties, which is attracted by a magnet and get separated.

(c) When the finely powdered ore is dropped over the moving belt at one end, the magnetic portion of the ore is attracted and forms one heap near to the roller while non-magnetic gangue falls away and forms another heap. Hence ore can be separated from the impurities. [1 1/2 M]



[1/2 M]

Topic: General principles and processes of isolation of elements; Sub-Topic:Concentration of ore _L-2_Target-2017_ XII-HSC Board Test___Chemistry.

(iv) The ratio of lowering of vapour pressure (Δp°) to the vapour pressure of pure solvent is called relative lowering of vapour pressure. **[1/2 M]**

$p = p^o(1-x_2)$ Or, $p = p^o - p^o x_2$ Or, $x_2 = \frac{p^o - p}{p^o}$ **[1 M]**

$$\frac{n_2}{n_1+n_2} = \frac{p^\circ - p}{p^\circ}$$

If $n_2 < n_1$

$\therefore$ equation becomes

$$\frac{n_2}{n_1} = \frac{p^\circ - p}{p^\circ}$$

Where n_2, n_1 are no of moles of solute and solvent respectively.

$\therefore$ We can write

$$\frac{W_2 \times M_1}{M_2 \times W_1} = \frac{p^\circ - p}{p^\circ}$$ **[1/2 M]**

Where W_2, W_1 are the mass of solute and solvent respectively.

M_2, M_1 are the molecular mass of solute and solvent respectively.

Thus, Raoult's law can also be stated as – The relative lowering in vapour pressure of an ideal solution, containing non-volatile solute is equal to the mole fraction of the solute at a given temperature.

Topic: Solution and Collegative Properties ; Sub-Topic:Colligative Properties_L-2_Target-2017_ XII-HSC Board Test___Chemistry.

(v) Enthalpy may be defined as the total heat content of a system, which includes the sum of the internal energy (U) and pressure volume type of energy (PV). **[1 M]**

If work is done by the system internal energy of the system decreases. **[1 M]**

Topic: Thermodynamics; Sub-Topic:1st Law of Thermodyanamics_L-1_Target-2017_ XII-HSC Board Test___Chemistry.

(vi) Nitrogen does not form Pentahalides because Nitrogen belongs to 2nd period and the elements belongs to 2nd period can expand their covalency upto 4 only as they have s and p orbital only. No d-orbital present. **[2 M]**

Topic: p-block elements_; Sub-Topic:Group-15_L-1_Target-2017_ XII-HSC Board Test___Chemistry.

(vii) Packing efficiency in simple cubic (scc) crystal :

In this unit cell, there are 8 atoms at 8 corners.

Since each corner atom in unit cell = $1/8^{th}$ of the atom.

Total number of atoms in unit cell = $1/8 \times 8 = 1$ atom.

If a is the edge length of cubic unit cell and r is the radius of an atom then,

$r = a/2$ or $a = 2r$ **[1/2 M]**

Volume of unit cell = $a^3 = (2r)^3 = 8r^3$

Volume of 1 atom = $4/3\ \pi r^3$

Packing fraction

$$= \frac{\text{Volume occupied by 1 atom}}{\text{Volume of unit cell}} = \frac{4\pi r^3}{3 \times 8r^3} = \frac{\pi}{6} = 0.524$$ **[1 M]**

$\therefore$ Packing efficiency = $0.524 \times 100 = 52.4\%$ **[1/2 M]**

Topic: Solid State; Sub-Topic:Packing Efficiency_L-1_Target-2017_ XII-HSC Board Test___Chemistry.

(viii) (a) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^4$ **[1 M]** (b) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2\ 3d^{10}\ 4p^6$ **[1 M]**

Topic:p-block element; Sub-Topic:Electronic configuration-_L-1 _Target-2017_ XII-HSC Board Test___Chemistry.

Q.3

(i) Preparation of phosphine

a) $Ca_3P_2 + 6HCl \rightarrow 3CaCl_2 + 2PH_3 \uparrow$ **[1 M]**

(b) $2AlP + 3H_2SO_4 \rightarrow Al_2(SO_4)_3 + 2PH_3 \uparrow$ **[1 M]**

(c) $PH_4I + KOH \rightarrow KI + PH_3 + H_2O$ **[1 M]**

Topic:P- block__Sub Topic: Phosphorus__Level: 1_ _Target-2017_ XII-HSC Board Test___Chemistry.

(ii) Given : 0.05 M NaOH ; $R = 31.6\,\Omega$;

Cell constant $= 0.367\,cm^{-1}$

Calculate the molar conductivity of NaOH $(\wedge m)$

Conductivity $(k) = \frac{b}{R}$; b = Cell constant $\left(\frac{l}{a}\right)$ **[1/2 M]**

$k = \frac{0.367cm^{-1}}{31.6\,\Omega}$ **[1/2 M]**

Molar conductivity $(\wedge) = \frac{1000k}{C}$ **[1/2 M]**

$= \frac{1000 \times 0.367cm^{-1}}{0.05 \times 31.6\,\Omega}$ **[1 M]**

$= \frac{367cm^{-1}}{0.05(mol/L) \times 31.6\,\Omega}$

$\wedge = 232.27\,\Omega^{-1}cm^2mol^{-1}$ **[1/2 M]**

Topic:Electrochemistry_Sub Topic:Electrolytic Cell_Level:1_Target-2017_ XII-HSC Board Test___Chemistry.

(iii) **Given**

$\Delta CH°C_2H_5OH_{(l)} = -1368$ kJ

$\Delta CH°C_2H_{4(g)} = -1410$ kJ **[1 M]**

Calculate $\Delta H°$ for the reaction between ethene and water to form C_2H_5OH.

The required equation is

$CH_2 = \underset{(g)}{CH} + H_2O_{(l)} \rightarrow CH_3—CH_2—OH_{(l)}$ $\Delta H°=?$ **[1/2 M]**

(i) $C_2H_5\underset{(l)}{OH} + 3O_{2_{(g)}} \rightarrow 2CO_{2_{(g)}} + 3H_2O_{(l)}$ $\Delta H° = -1368$ kJ

(ii) $C_2H_{4_{(g)}} + 3O_{2_{(g)}} \rightarrow 2CO_{2_{(g)}} + 2H_2O_{(l)}$ $\Delta H° = -1410$ kJ

To get required equation, reverse equation (i) and add to equation (ii). **[1/2 M]**

(i) $2CO_{2(g)} + 3H_2O_{(l)} \rightarrow C_2H_5OH + 3O_{2(g)}$	$\Delta H° = +1368$ kJ
(ii) $C_2H_{4(g)} + 3O_{2(g)} \rightarrow 2CO_{2(g)} + 2H_2O_{(l)}$	$\Delta H° = -1410$ kJ
$C_2H_{4(g)} + 1H_2O_{(l)} \rightarrow C_2H_5OH$	$\Delta H° = -42$ kJ

[1 M]

$\Delta H° = -42$ kJ is not the enthalpy of formation of liquid ethanol because the reaction does not involve the formation of liquid ethanol from its constituents elements.

Topic:Thermodynamics; Sub-Topic:Hess's Law _L-1 _Target-2017_ XII-HSC Board Test___Chemistry.

(iv) **Given:** $A = 4 \times 10^{13}\ \text{sec}^{-1}$, $E_a = 98.6\ kJ\ mol^{-1}$ **[1/2 M]**

At work temperature will its half life period be 10 minutes.

$R = 8.314\ Jk^{-1}\ mol^{-1}$

$$t_{\frac{1}{2}} = \frac{0.693}{k}$$ **[1/2 M]**

$$k = \frac{0.693}{t_{\frac{1}{2}}} = \frac{0.693}{10} = 0.0693$$

$$k = 0.0693 = 6.93 \times 10^{-2}$$ **[1/2 M]**

$$\log k = \log A - \frac{E_a}{2.303\,RT}$$ **[1/2 M]**

$$\log\left(6.93 \times 10^{-2}\right) = \log\left(4 \times 10^{13}\right) - \frac{98.6}{2.303 \times 8.314 \times T}$$ **[1/2 M]**

$$5.149 \times \frac{1}{T} = 13.6020 + 1.1593$$

$$T = 0.348\,K$$ **[1/2 M]**

Topic:Chemical Kinetics; Sub-Topic:Arrhenius Equation_L-2 _Target-2017_ XII-HSC Board Test___Chemistry.

Q.4

Faraday's First Law of Electrolysis: It states that the amount of substance that undergoes oxidaion or reduction at each electrode during electrolysis is directly proportional to the amount of electricity that passes through the cell.

$W \propto Q$ **[1 M]**

Topic:Electro chemisitry; Sub-Topic:Faraday's Law _L-1 _Target-2017_ XII-HSC Board Test___Chemistry.

Uses of Sulphuric acid: **[1 M]**

(a) It is regarded as king of chemicals. It is used in the manufacture of dyes, fertilizers (ammonium, sulphate, super phoshate), detergents, explosive (T.N.T nitroglycerine, green cotton) etc.

(b) Sulphuric acid is used in the preparation of other important chemicals like HNO_3, HCl, H_3PO_4, Na_2CO_3, sulphates, alums, ether etc.

(c) In lead storage batteries (containing sulphuric acid) involve the following reaction:

$$PbO_2 + Pb + 2H_2SO_4 \longrightarrow 2PbSO_4 + 2H_2O$$

(d) Sulphuric acid is commonly used as a laboratory reagent.

Uses of Chlorine: **[1 M]**

(a) As bleaching agent in textile and paper industry
(b) For the sterilization of municipal supply water
(c) In the extraction of metals like gold and platinum
(d) In the manufacture of bleaching powder

Topic:p-block elements; Sub-Topic:Group 16, 17_L-1 _Target-2017_ XII-HSC Board Test___Chemistry.

	Crystalline solid	**Amorphous solids**
1.	They have definite characteristic geometrical shape	1. They have irregular shape.
2.	They have long range order of regular pattern of arrangement of constituent particles	2. They have short range order of regular pattern of arrangement of constituent particles.
3.	They are true solids.	3. They are pseudo solids or supercooled liquids.
4.	They have sharp melting points	4. They do not have sharp melting points.
5.	They are anistropic in nature.	5. They are isotropic in nature.
6.	They have definite heat of fusion.	6. They do not have definite heat of fusion

[2 M]

Topic:Solid State; Sub-Topic:Types of Solid_L-1 _Target-2017_ XII-HSC Board Test___Chemistry

Given: Mass of substance $= 1.8 \times 10^{-3}\ kg$

Osmotic Pressure $\pi = 0.52\ atm.$

Temperature $= 280\ K$

Molar mass of substance = ?

$\pi = C\,RT$ **[1/2 M]**

$$\pi = \frac{n_2}{v} RT = \frac{W_2}{M_2 \times V} RT$$

$$M_2 = \frac{1.8 \times 10^{-3}\ kg \times 0.0821\ atm\ L\,k^{-1}\ mol^{-1} \times 280\,K}{0.52\ atm \times 1 dm^3}$$ **[1 M]**

$M_2 = 79.573\ g\ mol^{-1}$ **[1/2 M]**

Topic:Solution and Colligative Properties; Sub-Topic:Osmotic Pressure _L-1 _Target-2017_ XII-HSC Board Test___Chemistry

OR

(a) **Leaching :** It is a (chemical) process used in the concentration of an ore by extracting soluble material from an insoluble solid by dissolving in a suitable solvent. This method is used in the concentration process of ores of A1,Ag,Au,etc. **[1 M]**

Topic:General Principle of Extraction of Metal; Sub-Topic:Concentration of Ore _L-1 _Target-2017_ XII-HSC Board Test___Chemistry

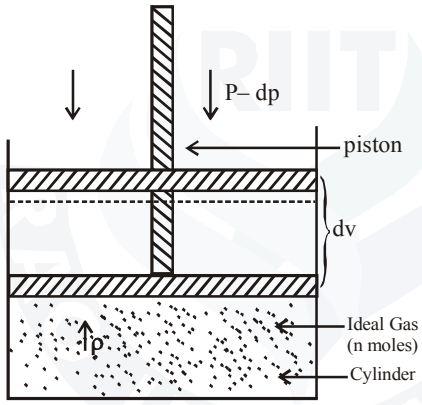
(b) **Metallurgy** : The process of extraction of metal in a pure state from its ore is called metallurgy.

[1 M]

Topic:General Principle of Extraction of Metal; Sub-Topic:Definition _L-1 _Target-2017_ XII-HSC Board Test___Chemistry

(c) **Anisotropy** : The ability of crystalline solids to change values of physcial properties when measured in different direction is called Anisotropy. **[1 M]**

Topic:Solid State; Sub-Topic:Properties of Crystalline Solid _L-1 _Target-2017_ XII-HSC Board Test___Chemistry



[1/2 M]

(a) Consider the expansion of 'n' moles of an ideal gas enclosed in a cylinder fitted with a weightless and frictionless piston at a constant temperature T.

(b) Let the pressure of the gas be P which is equal to the external pressure.

(c) Let the external pressure be reduced by an infinitesimally small amount dp so that the new external pressure becomes (P-dp).

(d) Let the corresponding small increase in volume by dv.

(e) Therefore amount of work done in the expansion of the gas, $dw = -[(p - dp)dv]$

$= -[pdv - dp.dv]$.....(i)

(f) Since dp and dv are very small, their product (dp.dv) will be much smaller and can be neglected

$\therefore dw = -pdv$ ...(ii)

(g) During expansion of the gas, if the initial volume V_1 changes to volume V_2 then total amount of work alone (W_{max}) can be obtained by integrating the work, dw between the two limits, V_1 and V_2. **[1/2 M]**

$$\therefore W_{max} = \int_{v_2}^{v_1} -dw$$ **[1/2 M]**

$$= \int_{v_1}^{v_2} -pdv \quad \text{....(iii)}$$

But pv = nRT (Ideal gas Equation for n moles of a gas)

$$\therefore p = \frac{nRT}{v}$$

Substitute pressure value in equation (iii)

$$\therefore W_{max} = \int_{v_1}^{v_2} -\frac{nRT}{v}.dv$$

$$= nRT\int_{v_1}^{v_2} \frac{dv}{v} \qquad \text{(n, R, T are constant)}$$

$$= -nRT[\log v]_{v_1}^{v_2}$$

$$= -nRT \ln \frac{v_2}{v_1}$$

$$\therefore \boxed{W_{max} = -2.303\, nRT \log \frac{v_2}{v_1}} \qquad (\ln = 2.303 \log_{10}) \quad \text{.... (iv)} \qquad \textbf{[1/2 M]}$$

Topic:Thermodynamics; Sub-Topic:Maximum Work_L-1 _Target-2017_ XII-HSC Board Test___Chemistry

Given : Boiling point of Benzene = 353.23 K

Mass of nonvaltile state = 1.80 gm

Mass of Benzene = 90 gm

Boiling point is increased 354.11 K of solution

M_2 = Molar mass of solute = ?

$\Delta T_b = K_b\, m$ **[1/2 M]**

$$T_b - T_b^o = K_b \frac{W_2}{M_2 \times W_1}$$

$$(354.11 - 353.23)\,K = 2.53\,kg\,mol^{-1} \times \frac{1.80\,g}{M_2 \times 90\,gm} \qquad \textbf{[1 M]}$$

$$0.88\ K = 2.53\,k\,kg\,mol^{-1} \times \frac{1.80\,gm}{M_2 \times 90\,gm}$$

$\boxed{M_2 = 57.5\,g\,mol^{-1}}$ i.e. molar mass of solute. **[1/2 M]**

Topic:Solution and Colligative Properties; Sub-Topic:Elevation in Boiling point_L-1 _Target-2017_ XII-HSC Board Test___Chemistry

SECTION - II

Q.5

(i) (d)

$$R-NH_2 + CHCl_3 + 3KOH \xrightarrow{(Alc.)} \underset{\text{Primary Amine}}{\downarrow}$$

$$R-NC + 3H_2O + 3KCl$$

Isocyanide

Topic:Compounds containing Nitrogen _Subtopic_reactions of amines_L-1_Target-2017_ XII-HSC Board Test_Chemistry.

(ii) (c)

$$\underset{\text{Ethyl bromide}}{\overset{\beta}{CH_3}-\overset{\alpha}{CH_2}-Br} \xrightarrow[KOH]{Alc.} \underset{\text{Ethene}}{CH_2=CH_2} \xrightarrow{HBr}$$

$$2CH_3-CH_2-Br \xrightarrow{Na/ether} \underset{\text{n-butane}}{CH_3-CH_2-CH_2-CH_3} + 2NaBr$$

Topic:Halogen derivatives of alkenes _Subtopic_Chemical properties _L-1_Target-2017_ XII-HSC Board Test_Chemistry.

(iii) (b)

Cisplatin comp. is used in treatment of cancer.

Topic:Co-ordination compound _Subtopic_Application _L-1_Target-2017_ XII-HSC Board Test_Chemistry.

(iv) (c)

$$\underset{\text{Orange colour}}{K_2Cr_2O_7} + 3SO_2 + H_2SO_4 \rightarrow K_2SO_4 + \underset{\text{Green colour}}{Cr_2(SO_4)_3} + H_2O$$

Topic:D&F - Block _Subtopic_Chemical properties of $K_2Cr_2O_7$ _L-1_Target-2017_ XII-HSC Board Test_Chemistry.

(v) (b)

Alcohol used in thermometer is ethanol.

Topic:Alcohol & Phenols _Subtopic_uses _L-1_Target-2017_ XII-HSC Board Test_Chemistry.

(vi) (d)

Vitamin of alicyclic series is vitamin A.

Topic:Biomolecules _Subtopic_Vitamins _L-1_Target-2017_ XII-HSC Board Test_Chemistry.

(vii) (c)

$$R-\underset{\underset{OH}{|}}{CH}-R' \xrightarrow{[O]} R-\underset{\underset{O}{||}}{C}-R'$$

Secondary Alcohol → Ketone

Topic:Aldehydes & ketones_Subtopic_Preparations_L-1_Target-2017_XII-HSC Board Test_Chemistry.

Q.6

(i) When an excess of ethyl alcohol is distilled with concentrated H_2SO_4 at 413 K (140^0C), diethylether is formed.

a) This reaction takes place in two steps:

Step-I: Formation of ethyl hydrogen sulphate: When excess of ethyl alcohol is heated with concentrated H_2SO_4, ethyl hydrogen sulphate is obtained.

$$C_2H_5\text{-}\boxed{OH + H}\text{-}O-SO_3H \longrightarrow C_2H_5-O-SO_3H + H_2O$$

Ethyl alcohol; Conc.sulphuric acid; Ethyl hydrogen sulphate

[1M]

Step-II: Formation of diethyl ether: Ethyl hydrogen sulphate then reacts with excess of ethyl alcohol at 413 K and forms diethyl ether.

$$C_2H_5-O\text{-}\boxed{SO_3H + OH}\text{-}C_2H_5 \xrightarrow{413K} C_2H_5-O-C_2H_5 + H_2SO_4$$

Ethyl hydrogen sulphate; Ethyl alcohol; Diethyl ether

[1M]

Topic:Alcohols, Phenols & Ethers _Subtopic_Preparation of ethers_L2_Target-2017_ XII-HSC Board Test_Chemistry.

(ii) **Hoffmann bromamide degradation:**

Primary amine can be prepared by reaction of amide with bromine and aqueous or alco holic sodium hydroxide.

$$R-\underset{\underset{O}{||}}{C}-NH_2 + Br_2 + 4NaOH \longrightarrow R-NH_2 + Na_2CO_3 + 2NaBr + 2H_2O$$

Amide; (aqueous or alcoholic); 1^0 Amine

[1M]

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

$$CH_3-CH_2-\underset{\underset{O}{||}}{C}-NH_2 + Br_2 + 4NaOH \longrightarrow CH_3-CH_2-NH_2 + Na_2CO_3 + 2NaBr + 2H_2O$$

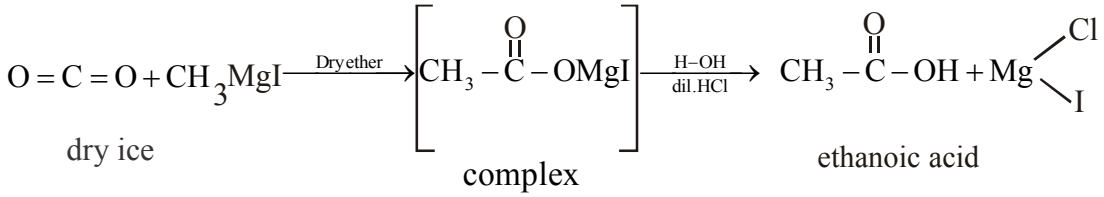
Propanamide; (aqueous or alcoholic); Ethanamine

[1M]

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

Topic:Compounds Containing Nitrogen _Subtopic_Preparation of amines_L2_Target-2017_ XII-HSC Board Test_Chemistry.

(iii) **Ethanoic acid prepared from dry ice:**

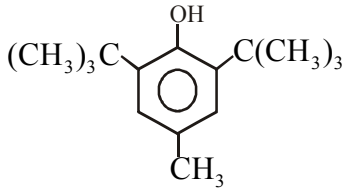


[1M]

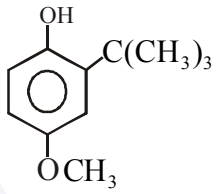
When solution of methyl magnesium iodide ether is added to dry ice, it gives complex which on acid hydrolysis gives ethanoic acid. **[1M]**

Topic:Aldehydes, Ketones & Carboxylic Acids; Sub-Topic:Preparation of Carboxylic Acid_L-1 _Target-2017_ XII-HSC Board Test___Chemistry

(iv) Butylated hydroxy toluene (BHT): Molecular formula : $C_{15}H_{24}O$ **[1M]**

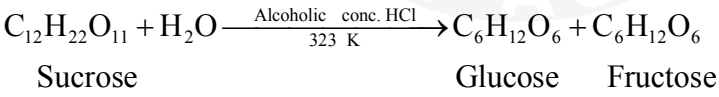


Butylated hydroxy anisole (BHA): Molecular formula : $C_{15}H_{16}O_2$ **[1M]**



Topic:Chemistry in Everyday life; Sub-Topic:Antioxidant_L-1 _Target-2017_ XII-HSC Board Test__Chemistry

(v) (a) Glucose is prepared in the laboratory by hydrolysis of sucrose with alcoholic conc. HCl solution. Sucrose is heated at about 323K or water bath for two hours, with alcoholic conc. HCl solution, after hydrolysis it gives glucose and fructose.



[1M]

(b) On cooling the reaction mixture, glucose separate out because it is less soluble in alcohol and fructose remains in the solution, Crystals of glucose are then filtered and purified by recrystallization **[1M]**

Topic:Biomolecules; Sub-Topic:Preparation of glucose_L-1 _Target-2017_ XII-HSC Board Test_Chemistry

(vi) Factors responsible for colour of a transition metal ions :

(a) The presence of incompletely filled d – orbitals in metal ions. **[1/2 M]**

(b) The presence of unpaired electrons in d – orbitals. **[1/2 M]**

(c) d – d transition of electrons due to absorption of radiation in the visible region. **[1/2 M]**

(d) Type of hybridisation in metal ion in the complex. **[1/2 M]**

(e) Geometry of the complex containing transition metal ion.

Topic: d & f - Blcok; Sub-topic:Colour_ L- 1_Target-2017_ XII-HSC Board Test_Chemistry.

(vii) **Homopolymers** : – Polymers whose repeating structural units are derived from only one type of monomer units are called homopolymers.

Ex : – Polythene (prepared by using only one type of monomer i.e. ethene)

Elastomers : The polymers that have elastic character like rubber are called elastomers.

Elastomers are soft & strechy used to make rubber bands.

Ex : – Neoprene, Vulcunized rubber etc.

Topic: Polymers; Sub-topic:Clasification_ L-1 _ Target-2017_ XII-HSC Board Test_Chemistry.

(viii) **Racemic mixture** : – A mixture of equimolar amounts of dextro & laevo rotatory forms of same optically active substance is called reacemic mixture. **[1 M]**

Topic: Halogen derivative of alkane; Sub-topic:_optical activity_L-1_Target-2017_ XII-HSC Board Test_Chemistry.

IUPAC name : $CH_3-CH_2-\underset{\displaystyle CH_3}{\underset{|}{CH}}-CHO$ **[1 M]**

2-methyl-1-butanal

Topic: Aldehyde & ketones_; Sub-topic:_Nomenclature_L-1_Target-2017_ XII-HSC Board Test_Chemistry.

Q.7

(i) It is total number of electrons around the central metal ion present in a complex and calculated as the sum of electrons on the metal ion and the number of electrons donated by ligands. It can be calculated using formula,

$EAN = Z - X + Y$

where Z = Atomic number of metal.

X = Number of electrons lost during the formation of metal ion from its atom.

Y = Number of electrons donated by the ligands. **[1 M]**

(a) $K_4Fe(CN)_6$ **[1 M]**

$Z = 26; X = 2; Y = 12$

$EAN = Z - X + Y$

$= 26 - 2 + 12$

$= 36$

(b) $Cr(CO)_6$ **[1 M]**

$Z = 26; X = 0; Y = 12$

$EAN = Z - X + Y$

$= 24 - 0 + 12$

$= 36$

Topic: Co-ordination compound; Sub-topic:EAN rule_L-1_Target-2017_ XII-HSC Board Test_Chemistry.

(ii) (a) The different oxidation states shown by Fe are +2, +3, +4, +5, +6. **[1 M]**

(b) Electronic configuration of Mn^{+2} is $[Ar]3d^5$ which is half filled and hence it is more stable.

If Mn loses more or less than 2 electrons it will have incompletely filled orbital, hence Mn^{+2} is more stable i.e. oxidation state of Mn is more stable. **[2 M]**

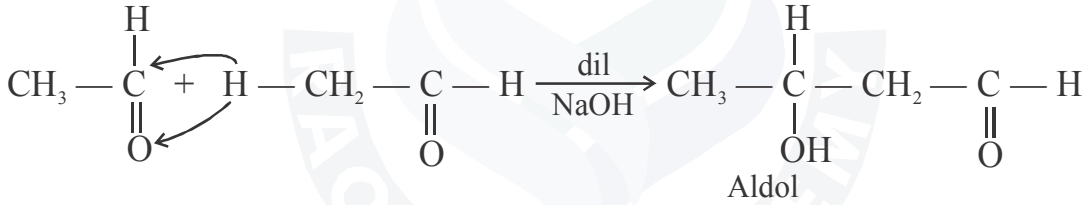
Topic: d & f - Block ; Sub-topic:oxidation state_ L- 1 _ Target-2017_ XII-HSC Board Test___Chemistry.

(iii) (a) It is a characteristic reaction of aldehydes and ketones containing active $\alpha - H$ atoms. The carbon atom adjacent to carbonyl carbon is called $\alpha - C$ and the H-atom attached to $\alpha - C$ is known as $\alpha - H$ atoms. **[1 M]**

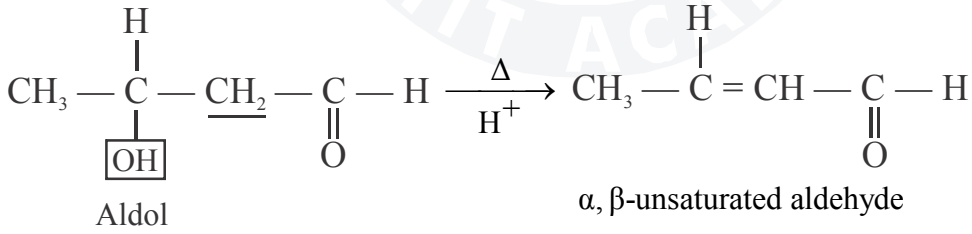
(b) When two moleccules of Aldehyde or Ketones containing active $\alpha - H$ atom are warmed in presence of dilute base or dilute acid, they undergo self condensation to given β – Hydroxy alde hyde (aldol) or β – Hydroxy ketone (ketol) resepctively. This reaction is known as aldol condensa tion. The Aldol or Ketol undergoes dehydration on heating to form unsaturated aldehyde or ketone. **[1 M]**

Eg. Aldol condensation of Acetaldehyde **[1 M]**

Step I : Addition



Step II : Condensation



Topic: Aldehyde & ketones; Sub-topic:Aldol condensation_L-1_ Target-2017_ XII-HSC Board Test_Chemistry.

(iv) (a) Nucleic acids are macromolecules composed of repeating units called nucleotides. They are so called because they come from nucleus of cell and are strongly acidic in nature. they are of two types DNA and RNA. **[1 M]**

(b) **Complex lipids :** They are esters of long chain fatty acids and can be hydrolyzed. They include triglycerides, glycolipids etc. **[1 M]**

(c) **Functions of lipids :**
(i) Phospholipids and sterols like cholestrol are major components of cell membrane.
(ii) Bile acids and steroids which aid digestion of fat in interstine. **[1 M]**

Topic: Biomolecules;Sub-topic:Nucleic acid & lipids_L-1_ Target-2017_ XII-HSC Board Test_Chemistry.

Q.8 (a)

$$C_2H_5 — NH_2 \xrightarrow[0°C - 5°C]{NaNO_2 + \text{dil HCl}} C_2H_5 — \overset{\oplus}{N} \equiv NCl^{\ominus}$$

Ethyl amine

Ethyldiazonium chloride

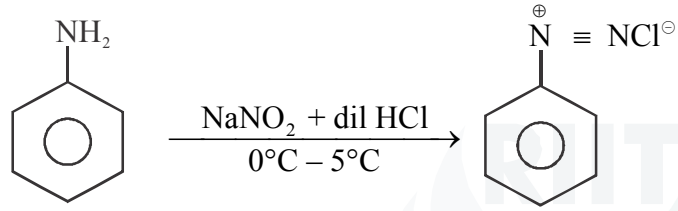
$$\downarrow H_2O$$

$$C_2H_5 — OH + N_2 + HCl$$

Ethanol

Ethyl amine reacts with $NaNO_2$ + dil HCl to give diazonium salt which decomposes and forms ethanol. **[1 M]**

(b)



Aniline

Benzene diazonium chloride

Aniline reacts with $NaNO_2$ + dil HCl to form diazonium salt. **[1 M]**

(c)

$$C_2H_5 — \underset{\displaystyle C_2H_5}{\underset{|}{N}} — H + HNO_2 \xrightarrow[0°C - 5°C]{NaNO_2 + \text{dil HCl}} C_2H_5 — \underset{\displaystyle C_2H_5}{\underset{|}{N}} — NO + H_2O$$

Diethylamine — Nitrous acid

N, N-Diethyl-N-nitroso amine

Diethylamine reacts with $NaNO_2$ + dil HCl to give N-Nitroso compound. **[1 M]**

Topic: Compounds containing nitrogen; Sub-topic:Reaction of nitrous acid_L-1_ Target-2017_XII-HSC Board Test_Chemistry.

Preparation of Nylon 6, 6 **[2 M]**

Step I :

Adipic acid and Hexamethylene diamine react to give Nylon salt.

$$nNH_2 - (CH_2)_6 - NH_2 + n\ HOOC - (CH_2)_4 - COOH$$

Hexamethylene diamine — Adipic acid

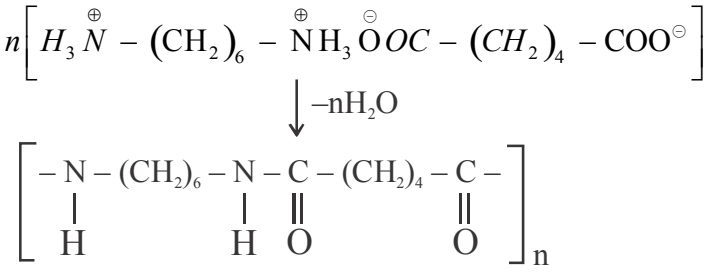
$$\downarrow$$

$$n\left[H_3\overset{\oplus}{N} - (CH_2)_6 - \overset{\oplus}{N}H_3\ \overset{\ominus}{O}OC - (CH_2)_4 - COO^{\ominus}\right]$$

Nylon salt

Step II :

Nylon salt loses H_2O to give Nylon 6, 6.



Nylon - 6, 6

Topic: Polymers_ ; Sub-topic:condensation polymers_L-1_Target-2017_XII-HSC Board Test_Chemistry.

Antacids : The chemical substances which neutralize excess of acid in gastric juices and give relief from acid indigestion, acidity, heart burns and gastric ulcers and are called antacids. **[1 M]**

Eq. Magnesium Hydroxide, Sodium bicarbonate

Topic: Chemistry in every day life; Sub-topic:Antacids_L-1_Target-2017_XII-HSC Board Test_Chemistry.

Side effects of tranquilizers :

(i) It is addictive **[1/2 M]**

(ii) It produces drowsiness **[1/2 M]**

(iii) It produces defect in memory.

Topic: Chemistry in every day life; Sub-topic:Tranquilizer_L-1_Target-2017_XII-HSC Board Test_Chemistry.

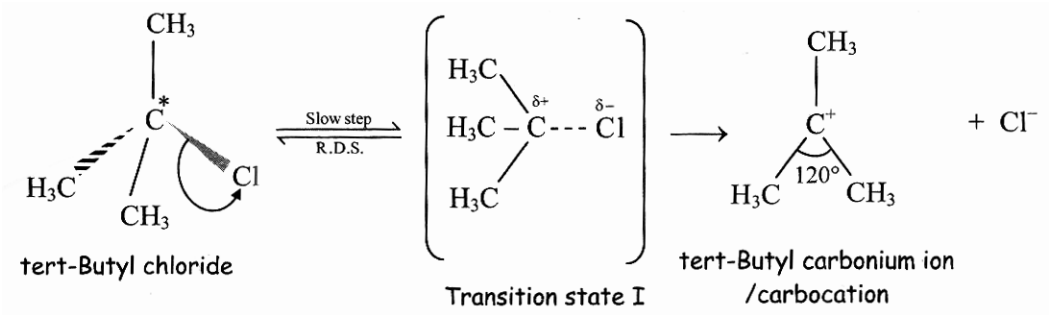
OR

Unimolecular nucleophilic substitution (SN^1) is a two step reaction process. The first step is a slow step, while the second one is a fast step. The hydrolysis reaction can be written as follows.

i) Formation of carbonium ion:

a) The C – Cl bond in tertiary butyl chloride slowly dissociates to form chloride ion (Cl^-) and tertiary butyl carbonium ion $\left[{}^{+}C(CH_3)_3\right]$.

b) This is a slow process and hence, it is a rate determining step (R.D.S).

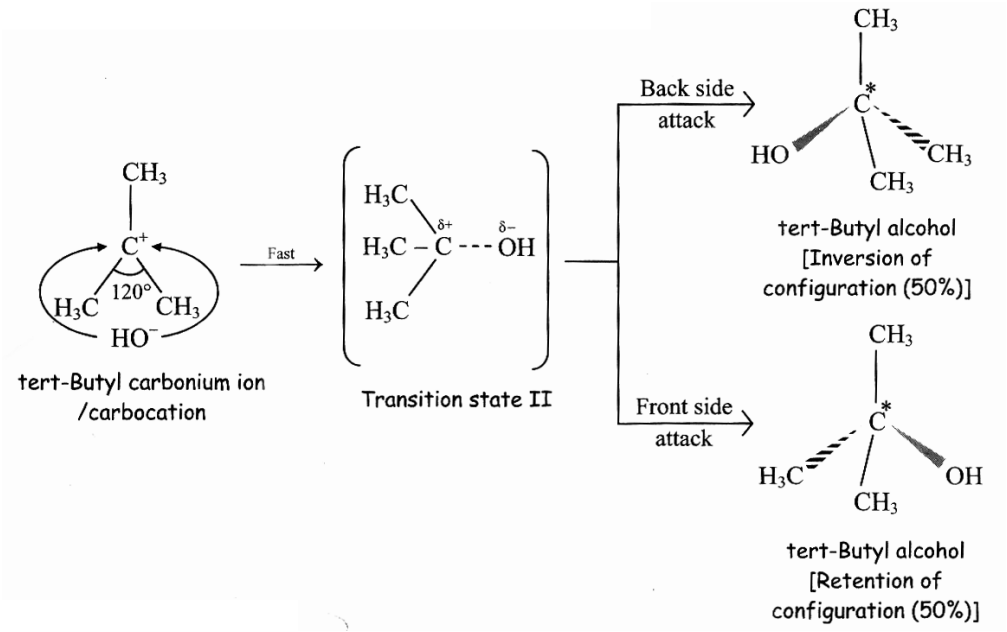


[1M]

ii) Formation of the product:

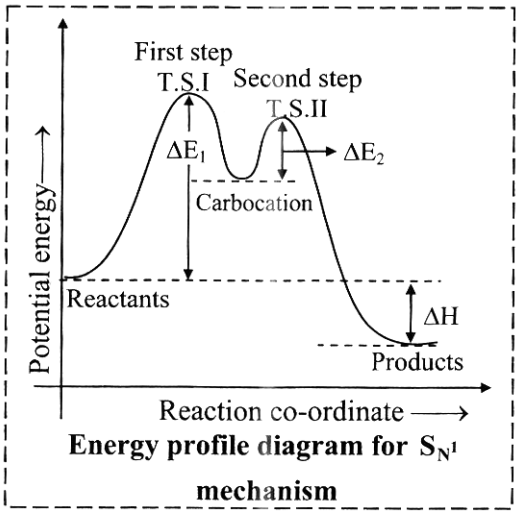
a) The second step is the attack of OH^- leading to the C – OH bond formation.

b) It is a fast process.



[1M]

iii) Energy profile diagram:



where,

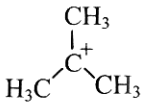
Reactants = $C(CH_3)_3Cl + OH^-$

ΔE_1 = Activation energy for T.S.I.

ΔE_2 = Activation energy for T.S. II

ΔH = Heat of reaction and

product = $C(CH_3)_3OH$

Carbocation = 

[1M]

a) The energy profile diagram of the SN^1 mechanism explains the independence of the rate reac tion on the concentration of nucleophile.

b) The first step in the SN^1 mechanism is the formation of carbocation. This step determines the rate of the overall reaction and requires larger activation energy (ΔE_1) than that of the second step (ΔE_2).

c) The second step in the SN^1 mechanism is the attack of the nucleophile on the carbocation. This step is exothermic and corresponds to a lower energy transition state.

d) The intermediate carbocation appears at a low point in the diagram.

e) The energy difference between the products and the reactants corresponds to the heat of reaction (ΔH).

f) The SN^1 reaction is accelerated by the conditions and reagents which favour the formation of carbocation. **[1M]**

Topic:Halogen Derivatives of Alkanes & Arenes_Subtopic_Nucleophilic substitution reaction_L2

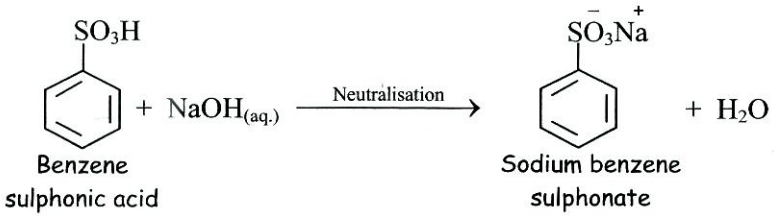
Carbolic acid (Phenol):

Phenols are organic aromatic, hydroxyl compounds, in which one or more hydroxyl $(-OH)$ groups are directly attached to the aromatic nucleus (i.e., benzene like ring). **[1M]**

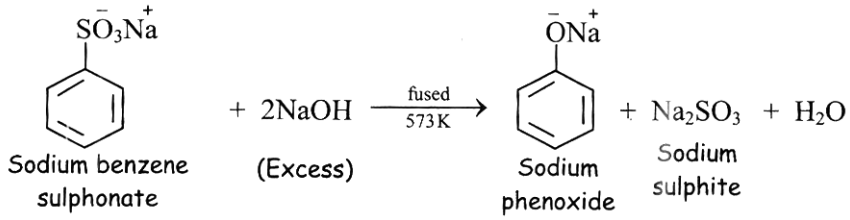
Topic:Alcohols, Phenols & Ethers _Subtopic_Defination of Phenol_L1

Preparation of Carbolic acid (Phenol) from Benzene sulphonic acid ($C_6H_6SO_3H$):

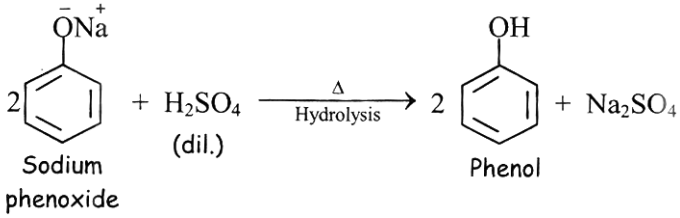
a) When benzene sulphonic acid is neutralised by aqueous sodium hydroxide (NaOH), sodium benzene sulphonate is obtained. **[1/2 M]**



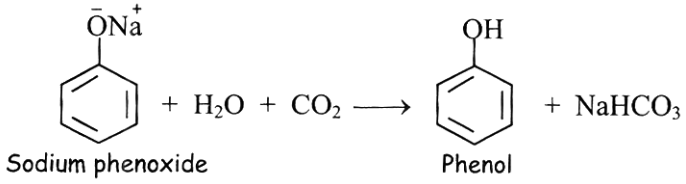
b) Dry sodium benzene sulphonate when fused with excess of sodium hydroxide at 573K, sodium phenoxide is obtained along with sodium sulphite (Na_2SO_3). **[1/2 M]**



c) sodium phenoxide when hydrolysed by heating with dilute sulphuric acid, phenol is obtained. **[1/2 M]**



When a current of carbon dioxide is passed through aqueous sodium phenoxide, phenol is obtained as product. **[1/2 M]**



Topic:Alcohols, Phenols & Ethers _Subtopic_Preparation of Carbolic acid (Phenol)_L2