XII CBSE - BOARD - MARCH - 2016

CODE (56/ 2 /S) SET - 2

Date: 09.03.2016

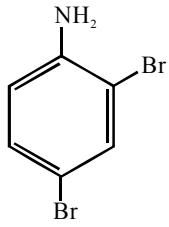
CHEMISTRY - SOLUTIONS

1. $Zn + \underset{\text{conc.}}{4\,HNO_3} \longrightarrow Zn(NO_3)_2 + 2\,H_2O + \underset{\textit{Nitrogendioxide}}{2\,NO_2}$ **[1 Mark]**

Topic:p-Block; Sub-Topic:Chemcial property of HNO_3, action of metals _ L-2_Target-2016_ XII-CBSE Board Exam__Chemistry

2. Electrolyte solute, due to more molecular force of attraction. **[1 Mark]**

Topic:Surface chemistry_; Sub-Topic:_Colloids_ L-2_Target-2016_ XII-CBSE Board Exam__Chemistry

3. 

2,4 -dibromobenzenamine.

2,4- dibromoaniline. **[1 Mark]**

Topic:Compound containing nitrogen_; Sub-Topic:Nomenclature_ L-1_Target-2016_ XII-CBSE Board Exam__Chemistry

4. $CH_2 = CH - CH_2Cl$ will be more reactive towards, S_N1 reaction due to formation of allylic carbocation as an intermediate. **[1 Mark]**

Topic:Haloalkanes & Haloarenes; Sub-Topic: Mechanism_ L-1_Target-2016_ XII-CBSE Board Exam__Chemistry

5. Anti ferromagnetic **[1 Mark]**

Topic:Solid State; Sub-Topic:Magnetic properties_ L-1_Target-2016_ XII-CBSE Board Exam__Chemistry

6. (i) $\left[Pd(NH_3)_4\right]Cl_2$ **[1 Mark]**

(ii) Tetraammineplatinum (II) chloride **[1 Mark]**

Topic:Coordination compound; Sub-Topic:Werner's theory_ L-2_Target-2016_ XII-CBSE Board Exam__Chemistry

7. (i) The carbonyl group of aldehydes and ketones is reduced to CH_2 group on treatment with zinc amalgam and concentrated hydrochloric acid. **[1 Mark]**

$$>C=O \xrightarrow[HCl]{Zn-Hg} >CH_2 + H_2O$$

(ii) **Halogenation** : Hell - Volhard - Zelinsky (HVZ) Reaction

(1) Halogenation takes place at the $\alpha-$carbon

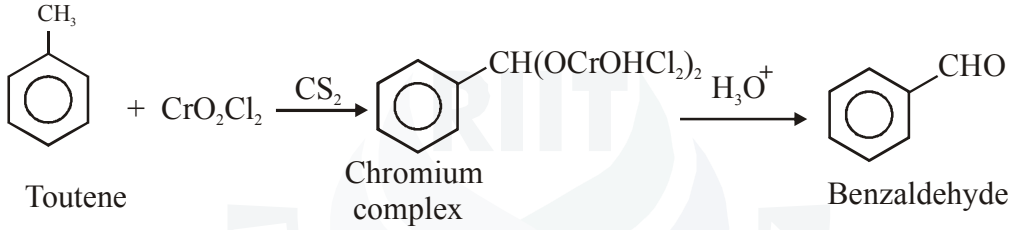
$$R-\underset{(\alpha)}{CH_2}-COOH \xrightarrow[H_2O]{X_2, Red\,P} R-\underset{\underset{X}{|}}{CH}-COOH$$

(α-Halocarboxylic acid) **[1 Mark]**

Topic:Aldehyde, ketones and carboxylic acid; Sub-Topic:Chemical properties of aldehyde/carboxylic acid_ L-1_Target-2016_ XII-CBSE Board Exam__Chemistry

OR

(i)



Toutene — Chromium complex — Benzaldehyde **[1 Mark]**

Etard reaction.

(ii)

$$CH_3-\overset{\overset{O}{\|}}{C}-Cl \xrightarrow[Pd-\,BaSO_4]{H_2} CH_3-\overset{\overset{O}{\|}}{C}-H$$ **[1 Mark]**

Topic:Aldehyde, ketone and carboxylic acid_; Sub-Topic:Preparation of aldehyde _ L-1_Target-2016_ XII-CBSE Board Exam__Chemistry

8. $2\,NH_3(g) \xrightarrow{Pt} N_2(g) + 3H_2(g)$

Rate = K

(i) Rate is only dependent on concentration.

Hence it zero order.

Molecularity = 2 **[1 Mark]**

(ii) rate = mol L^{-1} s^{-1} **[1 Mark]**

Topic:Chemical Kinetics; Sub-Topic:Rate of Chemical Reaction _ L-1_Target-2016_ XII-CBSE Board Exam__Chemistry

9 (i) Mercury cell. (Hg - cell) **[1/2 Mark]**

(ii) Fuel cell **[1/2 Mark]**

(iii) Lead storage cell (Pb- cell) **[1/2 Mark]**

(iv) Dry cell **[1/2 Mark]**

Topic:Electrochemistry; Sub-Topic:Electrochemical cell _ L-1 _Target-2016_ XII-CBSE Board Exam__Chemistry

10. (i) $MnO_2 \xrightarrow[\text{oxidisedwithairorKNO}_3]{\text{Fused withKOH}} \underset{\substack{\text{Manganateion}\\(\text{green coloured})}}{K_2MnO_4(A)}$

$K_2MnO_4 \xrightarrow[\text{alkaline solution}]{\text{Electrolytic oxidation in}} \underset{\text{Permangate ion purple}}{KMnO_4(B)}$ **[1 Mark]**

(ii) When (B) compound heated.

i.e. $2KMnO_4 \xrightarrow{\Delta} K_2MnO_4 + MnO_2 + O_2$ **[1 Mark]**

Topic: d and f-block_; Sub-Topic:Some important compounds of transition elements_ L-1 _Target-2016_ XII-CBSE Board Exam__Chemistry

11. $2Cr(s) + 3Fe^{2+}(0.01M) \rightarrow 2Cr^{3+}(0.01M) + 3Fe(s)$

$E_{cell} = 0.261V$

$E^o_{cell} = ?$

Nernt equation : $E_{cell} = E^o_{cell} - \frac{RT}{nF}\ln\frac{\left[Cr^{3+}\right]^2}{\left[Fe^{2+}\right]^3}$ **[1 Mark]**

$0.261 = E^o_{cell} - \frac{0.059V}{6}\log\frac{[0.01]^2}{[0.01]^3}$

$0.261 = E^o_{cell} - 9.833\times10^{-3}\times\log\frac{(0.01)^2}{(0.01)^3}$ **[1 Mark]**

$0.261 = E^o_{cell} - 0.019$

$E^o_{cell} = 0.280V$ **[1 Mark]**

Topic:Electrochemistry; Sub-Topic:Nernst Equation_ L-1_Target-2016_ XII-CBSE Board Exam__Chemistry

12. (i) Van Arkel method for refining of zirconium

$\underset{\text{Crude metal}}{Zr} + 2I_2 \longrightarrow \underset{(\text{Volatile Compound})}{ZrI_4}$

$ZrI_4 \xrightarrow[1800\ K]{\text{Electrical Heating}} \underset{\text{Pure Metal}}{Zr} + 2I_2$ **[1 Mark]**

(ii) Leaching Process **[1 Mark]**

(iii) Lime stone = $CaCO_3$ it act as flux in the extraction iron.

Flux is added in process so as to removes silicate impurity of ore as slag. **[1 Mark]**

Topic:General principle of isolation of elements; Sub-Topic:Purification _ L-1 _Target-2016_ XII-CBSE Board Exam__Chemistry

13. (i) Silica gel **[1 Mark]**

(ii) H_3PO_4

According to Hardy-Schulze rule, greater the valence of the floceulating ion added, the greater is its power of cause precipitation.

$H_3 \rightarrow 3H^+ + PO_4^{3-}$

$H_2SO_4 \rightarrow 2H^+ + SO_4^{2-}$

$PO_4^{3-} > SO_4^{2-}$

The coagulation of a positive sol, the flocculation power order. **[1 Mark]**

(iii) Proteins **[1 Mark]**

Topic:Surface chemistry; Sub-Topic:Adsorption/Colloid_L-1_Target-2016_ XII-CBSE Board Exam__Chemistry

14. $\log K = 14.2 - \frac{1.0 \times 10^4 K}{T}$ .....(1)

order of reaction = 1st

Ea = ? K = ?

Half life given = 200 min

$\ln K = \ln A - \frac{Ea}{RT}$ or $\log K = \log A - \frac{Ea}{2.303\ RT}$

Comparing equation (1) **[1 Mark]**

$$\frac{Ea}{2.303RT} = \frac{1.0 \times 10^4 K}{T}$$

$Ea = 2.303 \times R \times 1.0 \times 10^4 \left(R = 8.314\ Jk^{-1}\,mol^{-1}\right)$

$= 2.303 \times 8.314 \times 1.0 \times 10^4 = 19.147 \times 10^4 = 1.914 \times 10^2\ KJ\,mol^{-1}$ **[1 Mark]**

$K = \frac{0.693}{t_{1/2}} = \frac{0.693}{200\,min} = 3.465 \times 10^{-3}\ min^{-1}$

$K = 5.775 \times 10^{-5}\ sec^{-1}$ **[1 Mark]**

Topic:Chemical kinetics_; Sub-Topic:Temperature dependence of rate of a reaction_ L-2_Target-2016_ XII-CBSE Board Exam__Chemistry

15. FCC $\therefore Z = 4$

Edge length = a = 400 pm $= 400 \times 10^{-10}$ cm

Density = 7g cm^{-3}

volume of unit cell = $(400 \times 10^{-10})^3$

$= (4 \times 10^{-8})^3$

$= 6.4 \times 10^{-23} cm^3$ **[1 Mark]**

volume of 208 g of the element $= \dfrac{\text{mass}}{\text{density}} = \dfrac{208\,g}{7.0\,g\,cm^{-3}} = 29.71 cm^3$

Number of unit cell in the volume $= \dfrac{29.71 cm^3}{6.4 \times 10^{-23}\,cm^3 / \text{unit cell}} = 4.642 \times 10^{23}$ unit cell **[1 Mark]**

Since each FCC contain 4 atoms

$\therefore$ total number of atom in 208 g $= 4(\text{atoms/unit}) \times 4.642 \times 10^{23}$ unit cell

$= 1.857 \times 10^{24}$ atoms **[1 Mark]**

Topic:Solid state; Sub-Topic:Calculation involving unit cell dimensions_ L-1_Target-2016_ XII-CBSE Board Exam__Chemistry

16. $[CoF_6]^{3-}$

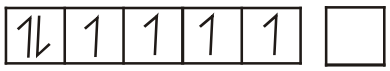
atomic number of Co = 27

oxidation state of Co = $x + 6(-1) = -3$

$x = +3$

Electronic configuration of Co = $3d^7 4s^2$

After lossing $3e^-$ = $3d^6 4s^o$



[1/2 Mark]

Flourine 'F' is weak field ligand

$\therefore$ no pairing of electron take place.

(a) Hybridisation of $[CoF_6]^{3-} = sp^3d^2$ **[1/2 Mark]**

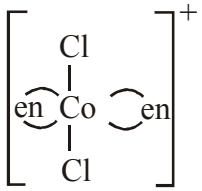
Magnetic character $= \sqrt{n(n+2)}$ BM

$\boxed{n = 4}$

$\mu = \sqrt{4(4+2)} = 4.898$ BM **[1/2 Mark]**

Spin of the complex = high spin complex. **[1/2 Mark]**

(b) $\left[Co(en)_2 Cl_2\right]^{+1}$



Geometrical isomer $\left(\text{trans of } \left[Co\ Cl_2 (en)_2\right]^+\right)$ **[1 Mark]**

Topic:Coordination compound; Sub-Topic:Valence Bond theory/Isomerism in coordination compound _ L-1_Target-2016_ XII-CBSE Board Exam__Chemistry

17. (i) α – D – Gluco pyranose, α – D – Gluco pyranose **[1 Mark]**

(ii) Vitamin B_6 **[1 Mark]**

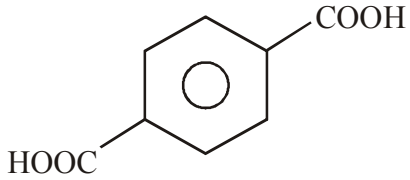
(iii) Fibrous protein = Keratin, myosin

Globular protein = insulin, albumins **[1 Mark]**

Topic:Biomolecules; Sub-Topic:Classification of Carbohydrade/Vitamins_ L-1_Target-2016_ XII-CBSE Board Exam__Chemistry

18. (i) The role of t-butyl peroxide in the polymerisation of ethane – act as free radical generating initiator. (Catalyst) **[1 Mark]**

(ii) Monomer $\begin{matrix} CH_2-OH \\ | \\ CH_2-OH \end{matrix}$ Ethylene glycol



Benzene - 1, 4-di carboxylic acid. **[1 Mark]**

(iii) Increasing order of intermolecular forces in polymer :

Buna-N < PVC < Nylon-6 **[1 Mark]**

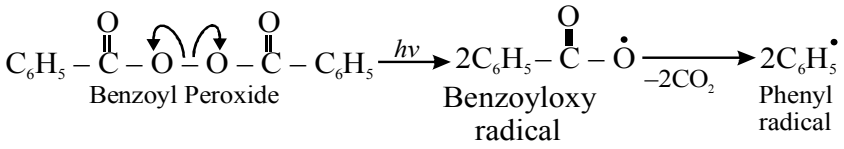
OR

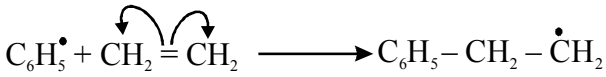
Free radical polymerization of ethene

A free-radical initiator like benzoyl peroxide, acetyl peroxide, t-butyl peroxide etc. is used to initiate the mechanism.

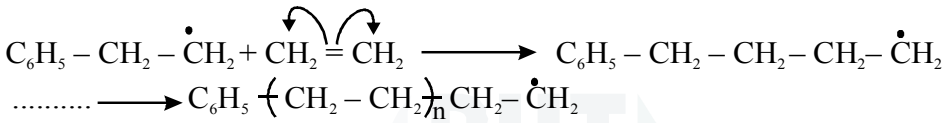
Eg. Polymerisation of ethene in presence of heat or light, using a benzoyl peroxide initiator can be shown as follows:

Step - 1 Chain-initiation

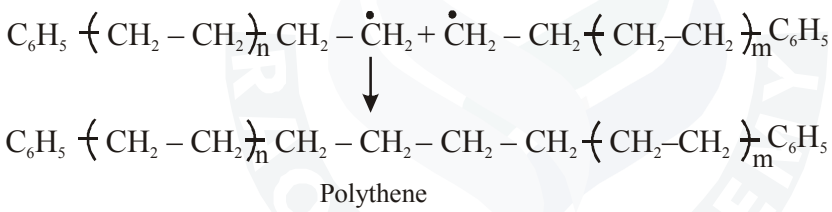




Step - 2 Chain-propagation

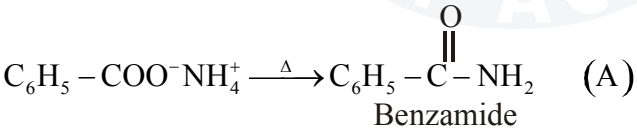


Step - 3 Chain termination

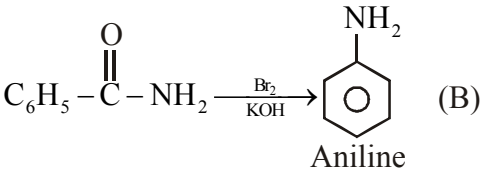


[3 Marks]

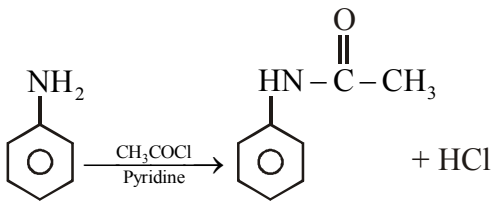
Topic:Polymers; Sub-Topic:Type of polymerization / Example of polymers_ L-2 _Target-2016_ XII-CBSE Board Exam__Chemistry

19. (i) 

[½ Mark]

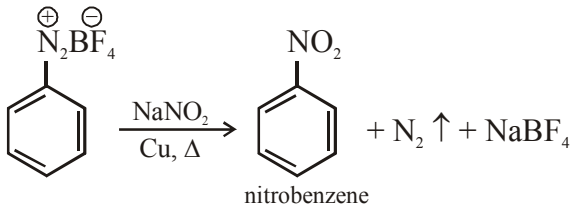


[½ Mark]

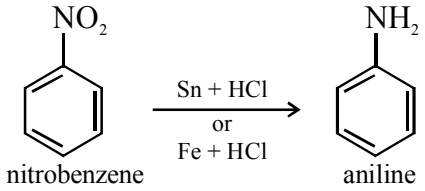


[½ Mark]

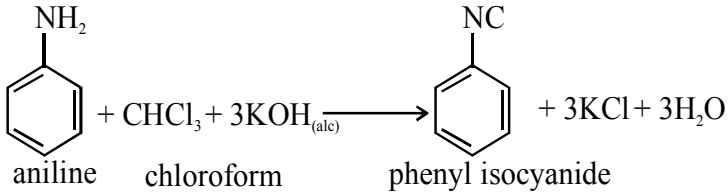
Topic: Compound Containing Nitrogen; Sub-Topic:Chemical Reaction _ L-1 _Target-2016_ XII-CBSE Board Exam__Chemistry

(ii) 

[½ Mark]



[½ Mark]



[½ Mark]

Topic: Compound Containing Nitrogen; Sub-Topic:Chemical Reaction _ L-1 _Target-2016_ XII-CBSE Board Exam__Chemistry

20. (a) In Nucleophilic addition reactions, aldehydes are more reactive than ketones due to both steric and electronic effect. Strerically nucleophile can approach more easily to carbonyl carbon in aldehyde as it carries only one bulky substituent as compared to that ketones carrying two bulky substituents. Elecctronically carbonyl carbon aldehyde is more electrophilic than in ketone.

[1 Mark]

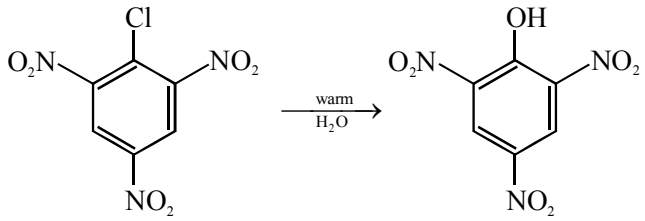
(b) Aldehydes and ketones having α-Hydrogen atom undergo aldol condensation reaction. In Benzaldehyde, the carbonyl carbon is directly attached to benzene ring hence doesn't have α-hydrogen atom.

$\therefore$ Benzaldehyde doesn't undergo aldol condensation. **[1 Mark]**

(c) Aromatic carboxylic acid like Benzoic acid do not undergo Friedel-craft reaction because the catalyst anhydrous $AlCl_3$ gets bonded to carboxyl gorup. **[1 Mark]**

Topic:Aldehyde, ketone, carboxylic acid; Sub-Topic:Nucleophilic additon reactions, Aldol condensation, Friedel-kraft reaction _ L-1_Target-2016_ XII-CBSE Board Exam__Chemistry

21. (i)



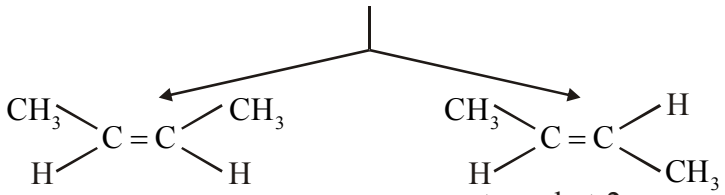
2, 4, 6-trinitrochlorobenzene 2, 4, 6-trinitrophenol

[1 Mark]

(ii) $CH_3-\underset{\underset{Cl}{|}}{CH}-CH_2-CH_3 \xrightarrow[KOH]{alcoholic} \underset{2-Butene}{CH_3-CH=CH-CH_3} + \underset{1-Butene\ (Minor)}{CH_2=CH-CH_2-CH_3}$

2-Chloro butane

(Major)



cis-but-2-ene (Major) trans-but-2-ene (Minor)

[1 Mark]

(iii) $\underset{ethylchloride}{2C_2H_5Cl} + 2Na \xrightarrow[dryether]{\Delta} \underset{butane}{C_4H_{10}} + 2NaCl$

Topic: Compound Containing Nitrogen / Halogen Derivative of Alkane; Sub-Topic: Chemical Reaction _ L-1 _Target-2016_ XII-CBSE Board Exam__Chemistry

22. (i) Although F is more electronegative than oxygen but with oxygen higher oxidation state is observed than that of fluorine because oxygen has ability to form multiple bond with metal.

[1 Mark]

(ii) $Cr(24) \longrightarrow [Ar]_{18}$ $4s^1$ $3d^5$ ↑ | ↑ | ↑ | ↑ | ↑ | ↑

$Zn(30) \longrightarrow [Ar]_{18}$ $4s^2$ $3d^{10}$ ↑↓ | ↑↓ | ↑↓ | ↑↓ | ↑↓ | ↑↓

From electronic configuration, it's evident that chromium has maximum number of unpaired electrons where as zinc has no unpaired electrons. Therefore Cr can form more metallic bond than Zinc. Zn is soft where as Cr is hard. **[1 Mark]**

(iii) Eu(67) has outermost electronic configuration as $4f^7 5d^0 6s^2$

Eu^{+2} has electronic configuration $4f^7 5d^0 6s^0$. The 4f orbital has half filled electronic configuration.

$\therefore$ It's a good reducing agent. **[1 Mark]**

Topic: d & f - block; Sub-Topic: Chemical Property_L-1 _Target-2016_ XII-CBSE Board Exam__Chemistry

23. (i) Mr. Roy was aware about the illeffects caused by excessive use of antidepressant pills. He know the value of Yoga & regular exercise for leading healthy life. **[1 Mark]**

(ii) Tranquilizers like sleeping pills are addictive. Their excessive intake causes addiction. Also causes, headache, weight gain, discomfort etc. Therefore its not advisable to take sleeping pills without consulting doctor. **[1 Mark]**

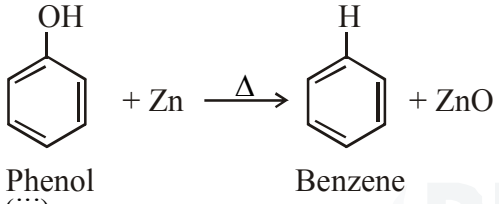
(iii) Tranquilizers are substances used for treatment of stress, fatigue, mild & severe mental diseases are called tranquilizer. e.g. : Valium, Serotonin. **[2 Mark]**

Topic: Value Based Question; Sub-Topic: Tranquilizers _ L-1_Target-2016_ XII-CBSE Board Exam__Chemistry

24. (a) (i)

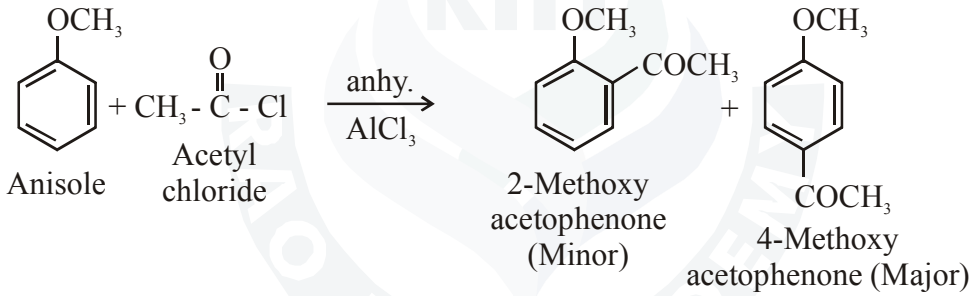
$$CH_3 = CH - CH_2OH \xrightarrow{PCC} CH_2 = CH - CHO$$ **[1 Mark]**

(a) (ii)



[1 Mark]

(a) (iii)

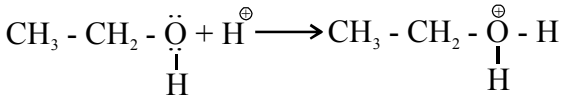


[1 Mark]

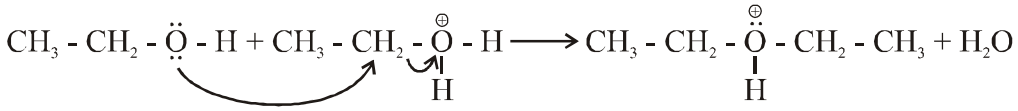
(b) $2CH_3CH_2OH \xrightarrow{Conc.H_2SO_4/413K} CH_3CH_2 - O - CH_2CH_3$

Mechanism : Formation of ether involves SN^2 mechanism.

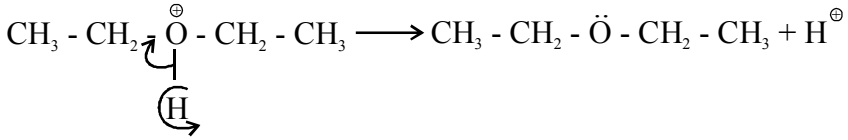
Step - 1 : Protonation of alcohol :



Step - 2 : Attack of nucleophilic alcohol :



Step - 3 : Loss of proton :

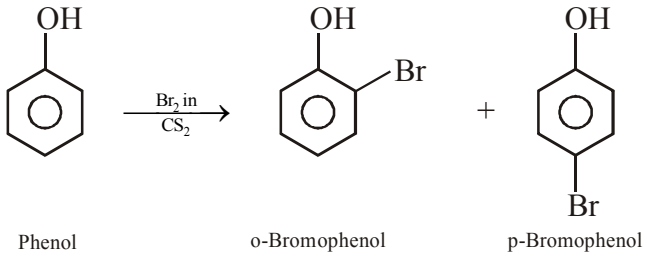


[2 Mark]

Topic:Alcohol, Phenols & Ethers ; Sub-Topic: Reaction & Preperation of Alcohol, Phenols & Ether_ L-2_Target-2016_ XII-CBSE Board Exam__Chemistry

OR

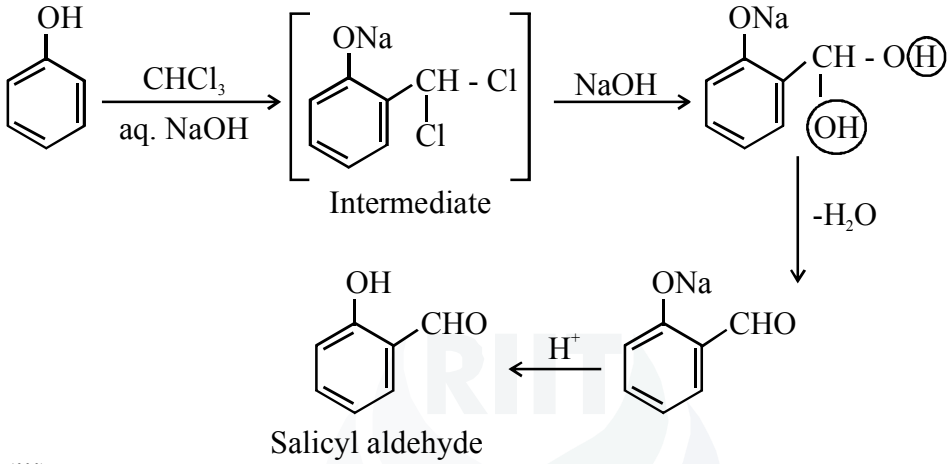
24 (a) (i)



Phenol o-Bromophenol p-Bromophenol

[1 Mark]

(a) (ii)

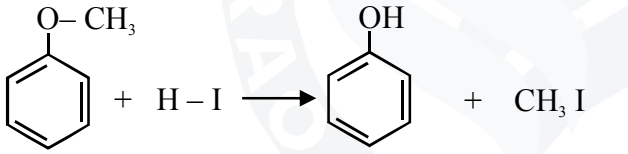


Intermediate

Salicyl aldehyde

[1 Mark]

(a) (iii)



Anisole Phenol Iodomethane

[1 Mark]

(b) (i)

Ethanol & Diethyl ether :

Ethanol react with active metal like sodium producing alkoxide and liberating H_2 gas. This reaction explains acidic nature of alcohol.

$$2C_2H_5OH + 2Na \longrightarrow 2C_2H_5ONa + H_2 \uparrow$$

Diethyl ether is relatively inert and neutral compound because of stable C–O–C linkage. Ethanol on reaction with HCl gives ethyl chloride.

$$C_2H_5OH + HCl \longrightarrow C_2H_5Cl + H_2O$$

HCl gives no reaction with diethyl ether as it doesn't cleave ether. **[1 Mark]**

(b) (ii)

Propanol and t-butyl alcohol :

(a) Propanol on oxidation gives propanal

$$CH_3CH_2CH_2OH + [O] \xrightarrow{PCC} CH_3CH_2CHO$$

t-butyl alcohol on oxidation gives propene & then gives propanone

$$CH_3-\underset{\displaystyle CH_3}{\overset{\displaystyle CH_3}{\overset{|}{\underset{|}{C}}}}-OH \xrightarrow[\Delta]{CrO_3} CH_3-\overset{\displaystyle CH_3}{\overset{|}{C}}=CH_2 \xrightarrow{[O]} CH_3-\overset{\displaystyle CH_3}{\overset{|}{C}}=O + CO_2 + H_2O$$

(b) Propanol undergoes SN^2 / E_2 reaction mechanism where as t-butyl alcohol undergoes SN^1 / E_1 reaction. **[1 Mark]**

Topic:Alcohol, Phenols & Ethers ; Sub-Topic: Reaction & Preperation of Alcohol, Phenols & Ether_ L-2_Target-2016_ XII-CBSE Board Exam__Chemistry

25. (a) mass of solute $(W_2) = 2g$ of Na_2SO_4

mole mass of solute $(M_2) = 142\,g/mol$

mass of solvent $(W_1) = 50\,g$

K_b of water $= 0.52$ k kg / mol. **[1 Mark]**

$$T_b = K_b \cdot m$$

$$T_b = 0.52 \times \frac{2}{142} \times \frac{1000}{50}$$

$$T_b = \frac{1040}{7100} = 0.146$$

$T_s - T_0 = 0.146$ **[1 Mark]**

Boiling point of solvent $(H_2O) = 100°C$

$T_s = T_0 + 0.146 = 100 + 0.146 = 100.146°C$

$= (100.14 + 273.15)$ K

$\therefore$ Boiling point of solution $= 373.29$ K **[1 Mark]**

Topic:Solutions; Sub-Topic:Colligative properties_ L-2_Target-2016_ XII-CBSE Board Exam__Chemistry

(b)

(i) **Colligative properties :** Those properties of solution which depends upon the numbre of solute particle but do not depends upon nature of solute particle is called colligative properties.

[1 Mark]

(ii) **Ideal Solution :** Solution in which

$\Delta H = 0$,

$\Delta V = 0$,

$i = 1$ is called ideal solution **[1 Mark]**

Topic:Solutions; Sub-Topic:Ideal and non-ideal solutions / Colligative property_ L-1_Target-2016_ XII-CBSE Board Exam__Chemistry

OR

(a) mass of solute $(W_2) = 2.56$ g

mass of solvent $(W_1) = 100$ g

$\Delta T_f = 0.383$ K

Mole formula of S = ?

$\Delta T_f = K_f \cdot m$ **[1 Mark]**

$$\Delta T_f = K_f \cdot \frac{W_2}{M_2} \times \frac{1000}{W_1}$$

$$0.383 = 3.83 \times \frac{2.56}{M_2} \times \frac{1000}{100}$$

$$\frac{1}{M_2} = \frac{0.383 \times 100}{3.83 \times 2.56 \times 1000}$$

$$\frac{1}{M_2} = \frac{1}{256}$$

$M_2 = 256$ g **[1 Mark]**

$$\therefore \text{Number of atom} = \frac{\text{mole mass}}{\text{At. mass}}$$

$$= \frac{256}{32}$$

$= 8$

$\therefore$ Molecular formula $= S_8$ **[1 Mark]**

Topic:Solutions; Sub-Topic:Colligative property and Determination of molecular mass_ L-2_Target-2016_ XII-CBSE Board Exam__Chemistry

(b) (i) Exo-osmosis take place.

(ii) Endo-osmosis take place. **[2 Marks]**

Topic:Solutions; Sub-Topic:Colligative property and Determination of molecular mass_ L-1_Target-2016_ XII-CBSE Board Exam__Chemistry

26. (a) (i)

$H_2Te \longrightarrow HTe^- + H^+$

$H_2S \longrightarrow SH^- + H^+$

Conjugate base of H_2Te i.e. HTe^- is more stable than the conjugate base of H_2S i.e. SH^- due to increase atomic size. **[1 Mark]**

(a) (ii)

In PCl_5 hybridisation P atom is sp^3d where as in PCl_3 is sp^3. As % of s character in PCl_3 is more.

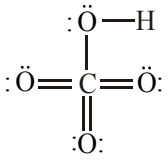
$\therefore$ PCl_3 is more covalent than PCl_5. **[1 Mark]**

(a) (iii)

Inter halogen compounds are slightly polar than pure halogen compound due to difference in electronegativity. Due to polar nature intermolecular force of attraction increases.
Therefore boiling point of interhalogen are little higher as compared to pure halogen.
[1 Mark]

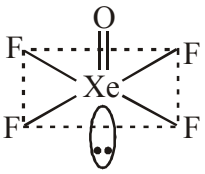
(b) (i)

$HClO_4$



[1 Mark]

(b) (ii)



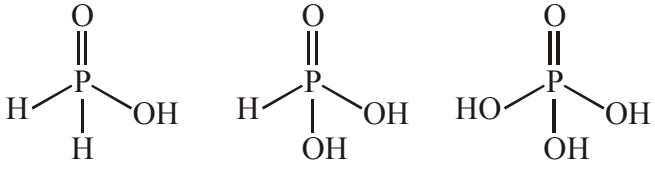
Square pyramidal **[1 Mark]**

Topic:The p-Block Element; Sub-Topic: Group 16 & Group 17 Elements_ L-1_Target-2016_ XII-CBSE Board Exam__Chemistry

OR

26. (i) $H_3PO_2 > H_2PO_3 > H_2PO_4$

Due to presence of more number of P–H bond.



[1 Mark]

(ii) Xe can easily form compound than He due to more surface area i.e. more London dispersion force.
[1 Mark]

(iii) **Low temperature :** Since the forward reaction is exothermic, therefore, low temperature will favour the formation of ammonia. However, an optimum temperature of about 700 K is necessary.

High temperature : High pressure of the order of 200 atmosphere or $200 \times 10^5 Pa$ is required to favour the forward reaction.

Presence of catalyst : The use of catalyst such as iron oxide containing a small amounts of molybdenum or potassium oxide (K_2O) and aluminium oxide (Al_2O_3) as promoter, increases the rate of attainment of equilibrium of ammonia. **[1 Mark]**

(iv) Use of Chlorine gas

(i) In the extraction of metals like platinum and gold.

(ii) In sterilisation of drinking water. **[1 Mark]**

(v) Detection of SO_2 gas

When SO_2 gas is bubbled through lime water, it becomeos milky. On passing the excess of the gas the milkiness disappears due to formation of calcium bisulphite.

$$Ca(OH)_2 + SO_2 \longrightarrow \underset{\text{Milkiness}}{CaSO_3} + H_2O$$

$$CaSO_3 + SO_2 + H_2O \longrightarrow \underset{\text{Milkiness disappears}}{Ca(HSO_3)_2}$$ **[1 Mark]**

Topic:The p-Block Elements; Sub-Topic: Group 15, Group 16, Group 17 & Group 18_ L-1_Target-2016_ XII-CBSE Board Exam__Chemistry