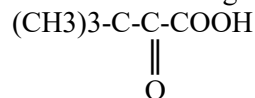


---

## Chemistry 12<sup>TH</sup>

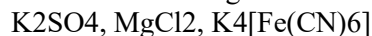
Q.1 Bond enthalpy of fluorine is lower than that of chlorine, why?

Q.2 Give the IUPAC name of the following compound:



Q.3 On increasing temperature, activation energy of a reaction decreases, why?

Q.4 Which of the following is most effective electrolyte in the coagulative of AgI/Ag+sol?



Q.5 Write the reaction when glucose is heated with excess of HI.

Q.6 Which Xe compound has distorted octahedral shape?

Q.7 What is the denticity of co-ordination compound used for the treatment of lead Poisoning?

Q.8 An alkoxide is a stronger base than hydroxide ion. Justify.

Q.9 (a) State the law which helps to determine the limiting molar conductivity of weak electrolyte.

(b) Calculate limiting molar conductivity of CaSO<sub>4</sub> (limiting molar conductivity of calcium and sulphate ions are 119.0 and 160.0 S cm<sup>2</sup>mol<sup>-1</sup> respectively).

Q.10 Rate constant K for first order reaction has been found to be 2.54 x 10<sup>-3</sup> sec<sup>-1</sup>. Calculate its three-fourth life.

**OR**

A first order gas reaction A<sub>2</sub>(g) + B<sub>2</sub>(g) → 2A(g) + 2B(g) at the temperature 400°C has the rate Constant K = 2.0 x 10<sup>-4</sup> sec<sup>-1</sup>. What percentage of A<sub>2</sub>B<sub>2</sub> is decomposed on heating for 900 seconds.

Q.11 Do the following conversions:

(i) Methyl bromide to acetone. (ii) Benzyl chloride to 2-phenyl acetic acid.

Q.12 How will you distinguish between the following pairs of compounds:

(i) Chloroform and carbon tetra chloride. (ii) Benzyl alcohol and chlorobenzene.

Q.13 For a chemical reaction variation in rate with conc. is shown below:

What is the order of the reaction? What are the units of rate constant K for the reaction?

Q.14 Give the electronic configuration of d-orbitals of K<sub>3</sub> [Fe(CN)<sub>6</sub>] and K<sub>3</sub> [FeF<sub>6</sub>] and explain why these complexes give different colour with same solution. (At. No. Of Fe = 26)

Q.15 Give reason for the following: (i) O-Toluidine is more basic than aniline.

(ii) Tertiary amines do not undergo acetylation reaction.

Q.16 Write the following name reaction: (i) Gabriel phthalimide reaction.

(ii) Hoffman bromamide reaction.

Q.17 Silver metal crystallises with a face centred cubic lattice. The length of unit cell is found to be 4.077 x 10<sup>-8</sup> cm.

Calculate atomic radius and density of silver.

(atomic mass of Ag = 108u, N<sub>A</sub> = 6.02 x 10<sup>23</sup> mol<sup>-1</sup>)

Q.18 Calculate packing efficiency in ccp structure.

**Q.19 Manu and his father went to a shop to purchase a battery for their inverter. Shopkeeper showed them two types of batteries, one with lead plates and the other with cadmium plates. The battery with cadmium plates was more expensive than the lead battery. Manu's father wanted to purchase lead battery as it was cheaper.**

**FREE** After reading the above passage, answer the following questions:

- a) As a student of chemistry, why would you suggest to Manu's father to buy the expensive cadmium plate battery. Give two reasons.  
 b) What are the values associated with the above decision?

Q.20 Give a reason for the following :

- (i) Rough surface of catalyst is more effective than smooth surface.  
 (ii) Smoke passed through charged plates before allowing it to come out of chimneys in factories.  
 (iii) Ne gets easily absorbed over charcoal than He.

Q.21 (a) Give one example of each of the following: (i) Acidic flux (ii) Basic flux (b) What happens when:

- (i)  $\text{Cu}_2\text{O}$  undergoes self reduction in a silica line converter. (ii) Haematite oxidises carbon to carbon monoxide.

**OR**

- (a) What role does cryolite play in Hall Haraoult process?  
 (b) How can alumina be separated from silica in a bauxite ore associated with silica? Give equations also.

Q.22 Write balanced chemical equations for the following reactions.

- (a) Hypophosphorous acid is added to  $\text{AgNO}_3$  solution.  
 (b) Chlorine gas is passed through hot and concentrated solution of sodium hydroxide.  
 (c)  $\text{Xe F}_2$  undergoes hydrolysis.

Q.23 (i) Draw the structure of sulphuric acid.

- (ii) A sparkless current is passed through oxygen to prepare ozone. why?  
 (iii) Bleaching action of sulphur is a temporary action .Comment.

Q.24 (i) Give one structural difference between amylose and amylopectin

- (ii) Name the protein and its shape present in oxygen carrier in human body.  
 (iii) Name two fat storing tissues in human body.

Q.25 Define the following by giving one example of each:

- (i) Antiseptics (ii) Antioxidants (iii) Narcotic analgesics

Q.26 (a) Write the names of the monomers of polymer used for making unbreakable crockery. .

- (b) write the reaction of preparation of neoprene.  
 (c) Arrange the following polymers in decreasing order of intermolecular forces.  
 PVC, Nylon 66, Natural rubber.

Q.27 Write the mechanism for preparation of ethanol from ethene.

Q.28 (a) What is the freezing point of 0.4 molal solution of acetic acid in benzene in which it dimerises to the extent of 85%. Freezing point of benzene is 278.4k and its molar heat of fusion is 10.042kj mol<sup>-1</sup>.

(b) Explain the following:

- (i) Solution of chloroform and acetone is an example of maximum boiling azeotrope.  
 (ii) A doctor advised a person suffering from high blood pressure to take less quantity of common salt.

**OR**

(a) Calculate the boiling point of a solution containing 0.61g of benzoic acid in 5 g of  $\text{CS}_2$  .Assuming 84% dimerisation of acid. The boiling point and  $K_b$  of  $\text{CS}_2$  are 46.2 0C and 2.3 K Kg mol<sup>-1</sup> respectively.

(b) State Raoult's law for the solution containing non-volatile solute. Give its mathematical expression also.

Q.29 Account for the following : (i) Transition elements show highest oxidation state in their oxides than fluorides.

- (ii) Cu has positive electrode potential in the first transition series.  
 (iii) Ionisation enthalpy of lanthanides is higher than actinides.  
 (iv) Potassium dichromate is a good oxidising agent in acidic medium.  
 (v) Actinides show more number of oxidation states than lanthanides.

**OR**

(a) Compare non transition and transition elements on the basis of their  
 (i) Variability of oxidation states (ii) stability of oxidation states.

(b) Give chemical reactions for the following observations:

- (i) Potassium permanganate is a good oxidising agent in basic medium.  
 (ii) Inter convertibility of chromate ion and dichromate ion in aqueous solution depends Upon pH of the solution. (iii) Potassium permanganate is thermally unstable at 513K.

Q.30. (a) Give names of the reagents to bring about the following transformations:

- i) Ethanoic acid to ethanol ii) Propane-1-ol to propanal iii) Pent-3-en-2-ol to pent-3-en-2-one  
 iv) Sodium benzoate to benzene

- Arrange the following in the uncreasing order of:
- i) Methanal, Propanal, Butanone, Ethanal, Propanone (nucleophilic addition reaction)
  - ii) Formaldehyde, Acetone, Acetaldehyde (reactivity towards HCN)
  - iii) Acetophenone, p-tolualdehyde, p-nitrobenzaldehyde, Benzaldehyde (nucleophilic addition reaction)

**OR**

- (a) Bring out the following conversions:
  - (i) 4-nitrotoluene to 2-bromobenzoic acid.
  - (ii) Ethylcyanide to 1- phenyl propanone.
- (b) Give a reason for the following :
  - (i) Chloroacetic acid is more acidic than acetic acid.
  - (ii) Carboxylic acids have higher boiling point than alcohols.
  - (iii) 4-nitrobenzoic acid is more acidic than 4-methoxy benzoic acid.

**Solutions**

1. Relatively large electron-electron repulsion among the lone pairs of F<sub>2</sub> molecule but they are much closer to each other in Cl<sub>2</sub> molecule.
2. 3,3-Di methyl-2-oxobutanoic acid.
3. Temperature and activation energy are inversely proportional to each other.
4. K<sub>4</sub>[Fe(CN)<sub>6</sub>] 1
5. CHO-(CHOH)<sub>4</sub>CH<sub>2</sub>OH + HI (excess)  $\xrightarrow{\Delta}$  n-hexane (C<sub>6</sub>H<sub>14</sub>)
6. XeF<sub>6</sub>
7. Name is Ethylenediamine tetraacetate and denticity is 6.
8. Due to the presence of an alkyl group higher electron density is found on alkoxide ion.
9. (a) Kohlrausch law of independent migration of ions: The limiting molar conductivity of an electrolyte can be represented as the sum of the individual contribution of the anions and cations of the electrolyte.
- (b)  $\Lambda^0_m(\text{CaSO}_4) = \lambda^0_{\text{Ca}^{2+}} + \lambda^0_{\text{SO}_4^{2-}}$   
 $= 119.0 \text{ S cm}^2 \text{ mol}^{-1} + 106.0 \text{ S cm}^2 \text{ mol}^{-1}$   
 $= 225.0 \text{ S cm}^2 \text{ mol}^{-1}$ .

10.

$$K = \frac{2.303}{t} \log \frac{a}{a-x}$$

$$t = \frac{2.303}{k} \log \frac{a}{a-x}$$

[a = 1, x = 3/4]

$$t^{3/4} = \frac{2.303}{2.54 \times 10^3} \log \frac{1}{1-3/4}$$

$$t^{3/4} = 0.9066 \times 10^3 \times 0.6021$$

$$t^{3/4} = 5.46 \times 10^2 \text{ sec}$$

**OR**

$$K = \frac{2.303}{t} \log \frac{a}{a-x}$$

$$2.0 \times 10^{-4} (\text{sec}^{-1}) = \frac{2.303}{900} \log \frac{a}{a-x}$$

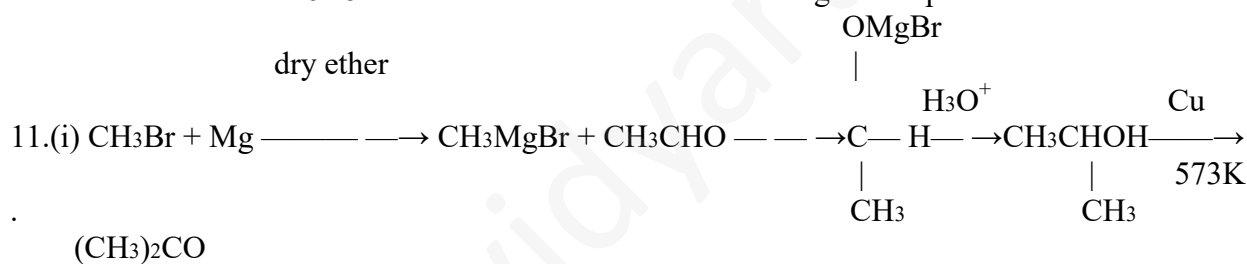
$$\log \frac{a}{a-x} = \frac{2.0 \times 10^{-4} \times 900}{2.303} = 0.0781$$

taking antilog  $\frac{a}{a-x} = \text{antilog}(0.0781) = 1.197$

$$a = 1.197a - 1.197x$$

$$x = \frac{0.197}{1.197} a = 0.1645a$$

Where  $a = 100$ , then  $x = 0.1645 \times 100 = 16.45$   
 i.e 16.45 % of initial concentration has changed into products.



12. (a) On heating chloroform and carbon tetrachloride with aniline and ethanolic potassium hydroxide separately chloroform forms pungent smelling isocyanide but carbon tetra chloride does not form this compound.

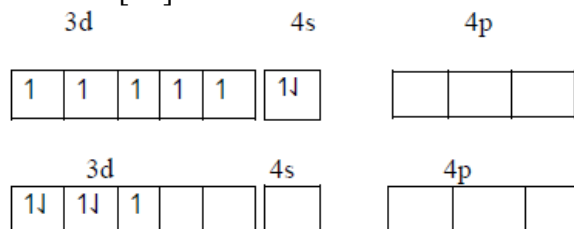
(b) On adding sodium hydroxide and silver nitrate to both the compounds benzyl chloride forms white precipitate but chlorobenzene does not form white precipitate.

13. (i) Order of reaction is zero.

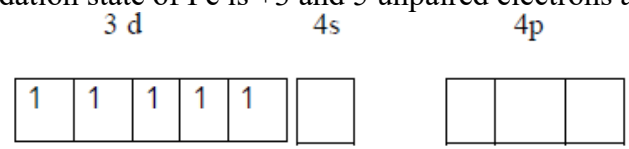
(ii) units of rate constant is mol L<sup>-1</sup> s<sup>-1</sup>

14. Oxidation state of Fe in K<sub>3</sub>[Fe(CN)<sub>6</sub>] is +3

Configuration of Fe<sup>3+</sup> is [Ar]3d<sup>5</sup>



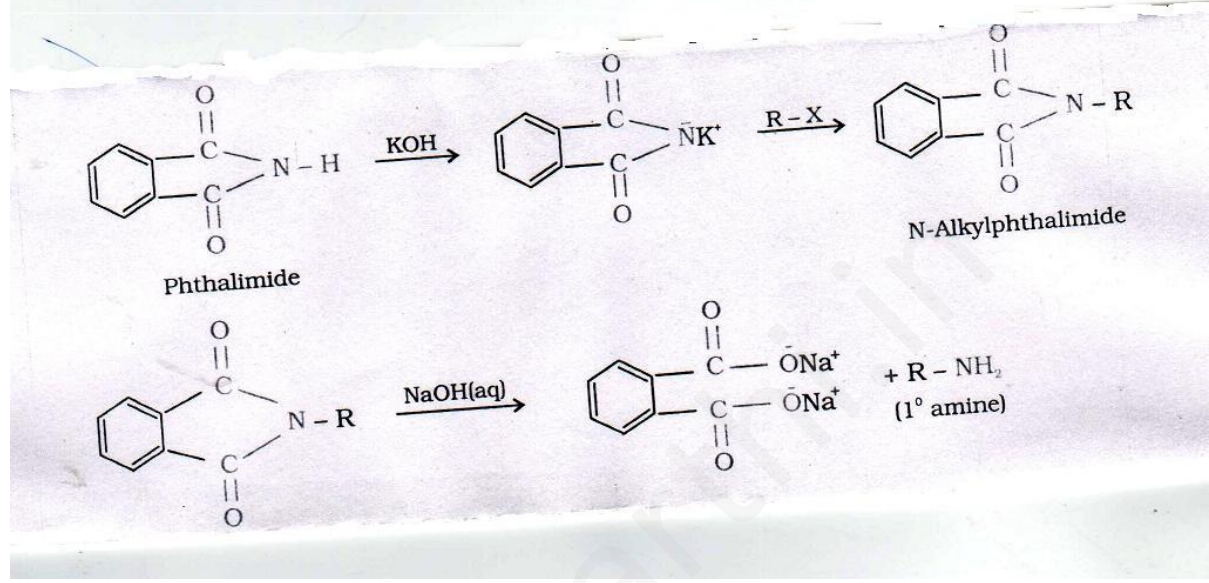
has 5 unpaired electrons in 3d orbital which get paired leaving behind one unpaired electron only. In  $K_3[FeF_6]$  oxidation state of Fe is +3 and 5 unpaired electrons are there in 3d orbitals.



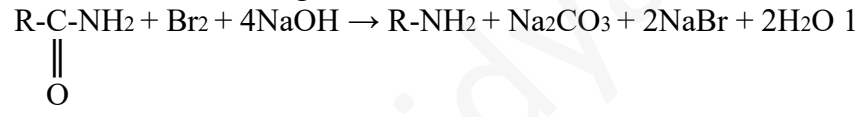
Because of the presence of different no. of unpaired electrons these impart different colour of same solution.

- 15.(i) Ortho toluidine is more basic than aniline due to the presence of electron releasing methyl group (+I effect) electron density at nitrogen of  $NH_2$  in o-toluidine increases.  
 (ii) Due to the absence of replaceable hydrogen atom at nitrogen.

16.(i) Gabriel phthalimide reaction



(b) Hoffmann bromamide degradation reaction



17. Given  $a = 4.077 \times 10^{-8}$  cm,  $Z = 4$ ,  $M = 108$  g mol<sup>-1</sup>  $N_A = 6.022 \times 10^{23}$

$$\rho = \frac{Z \times M}{a^3 \times N_A} = \frac{4 \times 108 \text{ g/mol}}{(4.077 \times 10^{-8})^3 \times 6.022 \times 10^{23}} = 6.22 \text{ g/cm}^3$$

$$r = \frac{a}{2\sqrt{2}} = \frac{4.077 \times 10^{-8} \text{ cm}}{2\sqrt{2}} = 1.44 \times 10^{-8} \text{ cm}$$

18. For ccp structures  $a = \frac{4r}{\sqrt{2}} = 2\sqrt{2}r$  or  $r = \frac{a}{2\sqrt{2}}$

$$\text{Packing efficiency} = \frac{\text{Volume occupied by four spheres in the unit cell} \times 100}{\text{Total volume of the unit cell}} \%$$

$$= \frac{4 \times \frac{4}{3} \pi r^3 \times 100}{(2\sqrt{2}r)^3} \% = \frac{(16/3) \pi r^3 \times 100}{16\sqrt{2}r^3} \% = 74 \%$$

**19. a) Harmful effects of lead on the human being as well as on the environment**

**It is wise to choose sustained long term benefit than short term gain with regard to health/money**

**Knowledge of chemistry and its relation to environment**

**b) Knowledge is useful only when put to practise, awareness of lead free petrol- legal aspect of pollution free environment. Less usage of lead batteries to keep ourselves and the environment healthy**

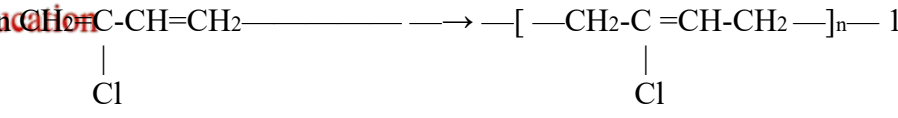
20. (i) Rough surface of a catalyst provides more surface area for adsorption.  
 (ii) So that unburnt charged carbon particles get settled between the charged plate leaving behind air free from pollutants.  
 (iii) Ne has higher critical temperature i.e stronger vander waal,s forces therefore easily adsorbed. 1
- 21 (a) Acidic flux is  $\text{SiO}_2$   
 Basic flux is  $\text{CaO}$
- (b) (i)  $\text{Cu}_2\text{O}$  undergoes self reduction to form blister copper as  $2\text{Cu}_2\text{O} + \text{Cu}_2\text{S} \longrightarrow 6\text{Cu} + \text{SO}_2$  1  
 (ii)  $\text{Fe}_2\text{O}_3 + 3\text{C} \longrightarrow 3\text{CO} + 2\text{Fe}$
- (a) Cryolite reduces melting point of alumina .  
 (b) Concentration of ore is carried out by digesting the powdered ore with a concentrated solution of  $\text{NaOH}$  at 473-523 K and 35 -36 bar pressure.  $\text{Al}_2\text{O}_3$  is leached out as sodium meta aluminate and  $\text{SiO}_2$  as sodium silicate leaving behind impurities.  

$$\text{Al}_2\text{O}_3(\text{s}) + 2\text{NaOH}(\text{aq}) + 3\text{H}_2\text{O} \rightarrow 2\text{Na}[\text{Al}(\text{OH})_4](\text{aq})$$
 The resulting solution is filtered, cooled and neutralised by passing  $\text{CO}_2$  gas through it. Then hydrated  $\text{Al}_2\text{O}_3$  gets precipitated leaving sodium silicate in the solution.  

$$2\text{Na}[\text{Al}(\text{OH})_4](\text{aq}) + \text{CO}_2(\text{g}) \longrightarrow \text{Al}_2\text{O}_3 \cdot x\text{H}_2\text{O}(\text{s}) + 2\text{NaHCO}_3(\text{aq})$$
 Sodium silicates remain in the solution and hydrated alumina is filtered , washed, dried and heated to get pure alumina ( $\text{Al}_2\text{O}_3$ ).  

$$\xrightarrow{1470\text{K}}$$

$$\text{Al}_2\text{O}_3 \cdot x\text{H}_2\text{O}(\text{s}) \longrightarrow \text{Al}_2\text{O}_3(\text{s}) + x\text{H}_2\text{O}(\text{g})$$
22. (i)  $\text{H}_3\text{PO}_3 + 2\text{AgNO}_3 + \text{H}_2\text{O} \longrightarrow 2\text{Ag} + \text{HNO}_3 + 2\text{H}_3\text{PO}_4$   
 (ii)  $3\text{Cl}_2 + 6\text{NaOH}(\text{conc.}) \longrightarrow 5\text{NaCl} + \text{NaClO}_3 + 3\text{H}_2\text{O}$   
 (iii)  $2\text{XeF}_2 + 2\text{H}_2\text{O} \longrightarrow 2\text{Xe} + \text{O}_2 + 4\text{H}^+ + 4\text{F}^-$
- 23(i)
- 
- (ii) Since the formation of ozone from oxygen is endothermic reaction silent electric discharge prevents its decomposition.  
 (iii) Bleaching by sulphur dioxide is temporary because of its reducing nature.
- 24 (i) Amylose is a long unbranched chain polymer -D(+) glucose.  
 Amylopectin is a branched chain polymer of -D glucose.  
 (ii) Globular protein and its shape is spherical. (iii) Liver and adipose tissue.
25. (i) Antiseptics are the chemicals applied to the living tissues either to kill or prevent the growth of microorganisms .e.g dettol.  
 (ii) Antioxidants are the compounds which retard the action of oxygen on food and reduces its rate of decomposition by oxidation.e.g BHA  
 (iii) Narcotic analgesics are the chemicals used for the relief of post operative pain.e.g morphine.
26. (i) Monomers of the polymer are melamine and formaldehyde.  
 polymerisation



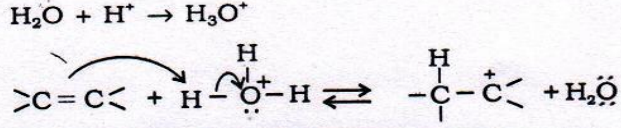
(iii) Nylon66 > Natural rubber > PVC

27.

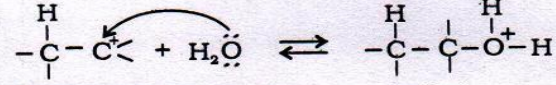
**Mechanism**

The mechanism of the reaction involves the following three steps:

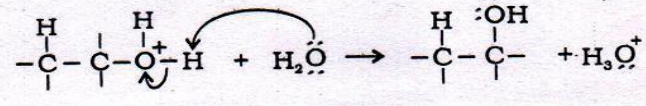
Step 1: Protonation of alkene to form carbocation by electrophilic attack of H<sub>3</sub>O<sup>+</sup>.



Step 2: Nucleophilic attack of water on carbocation.



Step 3: Deprotonation to form an alcohol.



28 :: Given, m = 0.4, T<sub>f</sub><sup>0</sup> = 278.4, ΔH<sub>fus</sub> = 10.042 KJ mol<sup>-1</sup>

$$K_f = \frac{RT_f^2 M}{1000 \times \Delta H_{\text{fus}}} = \frac{8.34 \times 10^3 \times (278.4)^2 \times 78}{1000 \times 10.042} = 5.0 \text{ K Kg mol}^{-1}$$

i = 0.575

ΔT<sub>f</sub> = iK<sub>f</sub>m = 0.575 x 5 x 0.4 = 1.15

T<sub>f</sub> = T<sub>f</sub><sup>0</sup> - ΔT<sub>f</sub> = 278.4 - 1.15 = 277.25 K

(b) i) This solution has lesser vapour pressure due to stronger interactions between chloroform and acetone molecules.

ii) Because higher quantity of NaCl will increase no. of sodium and chloride ions in the body fluid which can increase the osmotic pressure of body fluid i.e blood pressure of a person.

OR

$$2\text{C}_6\text{H}_5\text{COOH} \longrightarrow (\text{C}_6\text{H}_5\text{COOH})_2$$

$$\alpha = \frac{i-1}{1/n-1} = \frac{0.84}{\frac{1}{2}-1} = \frac{0.84}{-0.5} = -1.68$$

$$i = 1 - \frac{\alpha}{2} = 1 - \frac{-1.68}{2} = 1 + 0.84 = 1.84$$

Normal molar mass of benzoic acid = 122g mol<sup>-1</sup>

ΔT<sub>b</sub> = i.K<sub>b</sub> . m = 0.58 x 2.3 x 0.1 = 0.1334°C

T<sub>b</sub> = T<sub>b0</sub> + ΔT<sub>b</sub> = 46.2 + 0.1334 = 46.334°C

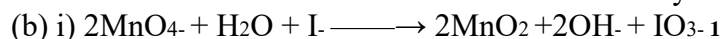
(b) Raoult's law: The relative lowering of vapour pressure of the solvent over a solution is equal to the mol fraction of non-volatile solute present in the solution.

Mathematical expression  $\chi_B = \frac{P_{01} - P_1}{P_{01}}$

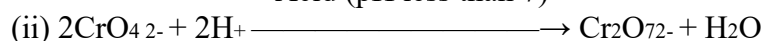
29. (i) Because oxygen forms multiple bonds with transition metals but fluorine does not form multiple bonds.  
 (ii) Cu has lower hydration enthalpy which is unable to compensate sum of first and second ionisation enthalpy.  
 (iii) 4f electrons of lanthanides is less effectively shielded by nuclear charge than 5f electrons of actinides.  
 (iv) Because dichromate ions get reduced to chromium ions in acidic medium.  
 (v) The actinides show more number of oxidation states than lanthanides because in actinides 5f, 6d and 7s levels have comparable energies.

OR

- (i) Oxidation states of transition elements differ from each other by unity. In non transition elements Oxidation states normally differ by a unit of two.  
 (ii) In transition elements higher oxidation states are favoured by heavier elements whereas in non transition elements lower oxidation state is favoured by transition elements.

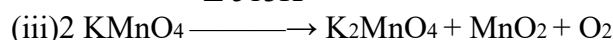


Acid (pH less than 7)



←  
Alkali (pH more than 7)

$\Delta 513\text{K}$



30. (a) (i) LiAlH<sub>4</sub>/H<sub>3</sub>O<sup>+</sup>

(ii) PCC

(iii) PCC

(iv) sodalime

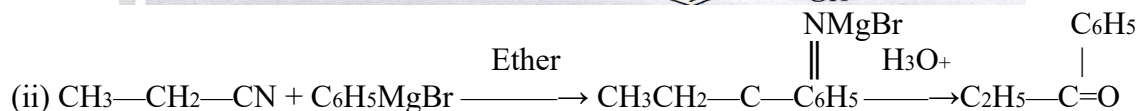
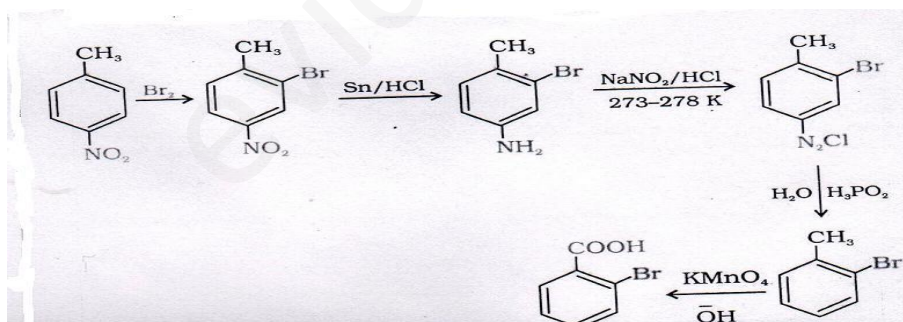
(b) (i) Butanone < Propanone < Propanal < Ethanal < Methanal.

(ii) Acetone < Acetaldehyde < Formaldehyde.

(iii) Acetophenone < p-Tolualdehyde < Benzaldehyde < p-Nitro benzaldehyde

OR

- (a) (i)



- (b) (i) Because chloroacetate ion is more resonance stabilised than acetate ion due to the presence of electron withdrawing chlorine atom (+I effect).

(ii) Due to the presence of extensive intermolecular hydrogen bonding in carboxylic acids than in alcohols molecules.

(iii) Because of -I effect of nitro group stability of benzoate ion increases in 4-nitro benzoic acid. But methoxy (+I effect) group decreases the stability of benzoate ion.