

ANSWER

1 I- B, II- D Or A , III- B, IV- D

2 V- B, VI- A , VII- A , VIII- B OR D

3- D

4- D Or C

5. D

6. C OR A

7. B OR C

8. C OR B

9. C

10- C

11- D

12- D

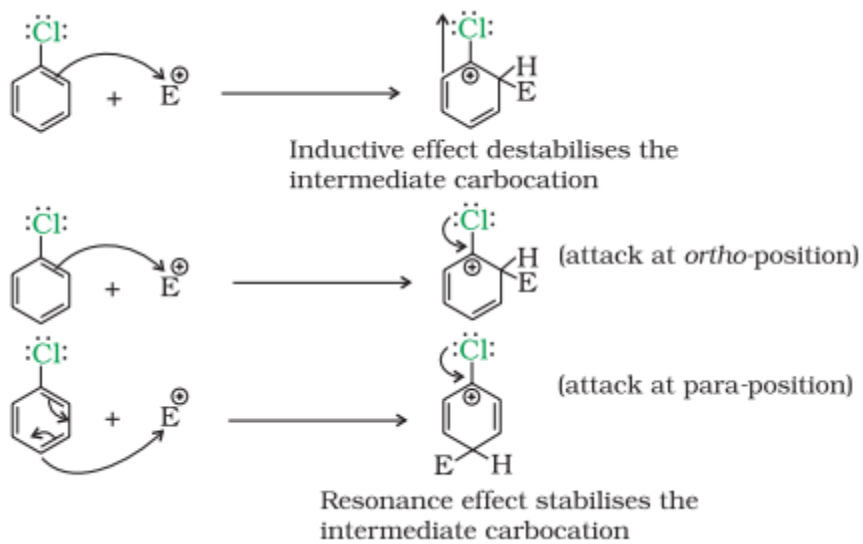
13- A

14- C OR D

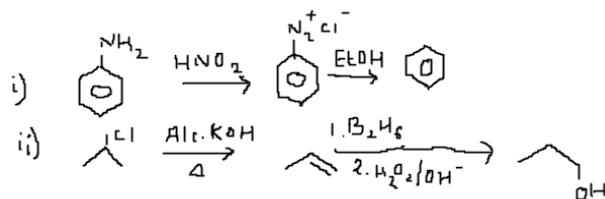
15- A

16- D

17.



Or



18. $P = \text{Molefraction of water} \times P^0$ and $[P^0 - P]/P^0 = \text{Molefraction of Urea}$

$$P^0 = 23.8 \text{ mm}$$

$$w_2 = 50 \text{ g}, M_2 (\text{urea}) = 60 \text{ g mol}^{-1}$$

$$w_1 = 850 \text{ g}, M_1 (\text{water}) = 18 \text{ g mol}^{-1}$$

To find: P_s and $(P^0 - P_s)/P^0$

Solution: Applying Raoult's law,

$$\frac{P^0 - P_s}{P^0} = \frac{n_2}{n_1 + n_2} = \frac{w_2 / M_2}{w_1 / M_1 + w_2 / M_2}$$

$$\begin{aligned} \therefore \frac{P^0 - P_s}{P^0} &= \frac{50 / 60}{850 / 18 + 50 / 60} \\ &= \frac{0.83}{47.22 + 0.83} = 0.017 \end{aligned}$$

Putting $P^0 = 23.8 \text{ mm}$, we have

$$\frac{23.8 - P_s}{P_s} = 0.017$$

$$\Rightarrow 23.8 - P_s = 0.017 P_s$$

$$\text{or, } 1.017 P_s = 23.8$$

$$\text{or, } P_s = 23.4 \text{ mm}$$

19.(i) $[\text{Co}(\text{NH}_3)_6]^{3+}$ because Ammonia is a strong field ligand and it will pair up electron to have d^2sp^3 hybridisation in $[\text{Co}(\text{NH}_3)_6]^{3+}$, but sp^3d^2 hybridisation occur in $[\text{Ni}(\text{NH}_3)_6]^{2+}$

(ii) $\text{K}_2[\text{Zn}(\text{OH})_4]$ -Potassium tetrahydroxozincate

OR

(i) The geometry of $[\text{Ni}(\text{CO})_4]$ - Tetrahedral

(ii) Spin only magnetic moment of $[\text{NiCl}_4]^{2-}$ ion. $n=2$, unpaired electron hence $[n(n+2)]^{1/2}$

$$= [8]^{1/2} \text{ BM}$$

$$20. \text{rate} = k[\text{A}]^2[\text{B}] = 2.0 \times 10^{-6} (0.1)^2 \times 0.2 = 4 \times 10^{-9} \text{ Ms}^{-1}$$

Now if $[\text{A}] = 0.04 \text{ M}$ then $[\text{B}] = 0.17 \text{ M}$ and new Rate = $5.44 \times 10^{-10} \text{ Ms}^{-1}$

OR

For a first order reaction ; $t = \frac{2.303}{k} \log \frac{a}{a-x}$

1st case : $a = 100\%$; $n = 99\%$; $(a-x) = (100 - 99) = 1\%$

$$t_{99\%} = \frac{2.303}{k} \log \frac{100}{1} = \frac{2.303}{k} \log 10^2$$

$$= \frac{2.303 \times 2}{k} = \frac{4.606}{k}$$

2nd case : $a = 100\%$; $x = 90\%$; $(a-x) = (100 - 90) = 10\%$

$$t_{90\%} = \frac{2.303}{k} \log \frac{100}{10} = \frac{2.303}{k} \log 10 = \frac{2.303}{k}$$

Dividing eqn. (ii) by eqn. (i),

$$\frac{t_{(99\%)}}{t_{(90\%)}} = \frac{4.606}{k} \times \frac{k}{2.303} = 2.$$

21.

Let the pressure of $N_2O_5(g)$ decrease by $2x$ atm. As two moles of N_2O_5 decompose to give two moles of $N_2O_4(g)$ and one mole of $O_2(g)$, the pressure of $N_2O_4(g)$ increases by $2x$ atm and that of $O_2(g)$ increases by x atm.

	$2N_2O_5$ g	$2N_2O_4$ g	O_2 g
Start $t = 0$	0.5 atm	0 atm	0 atm
At time t	$(0.5 - 2x)$ atm	$2x$ atm	x atm

$$p_t = p_{N_2O_5} + p_{N_2O_4} + p_{O_2}$$

$$= (0.5 - 2x) + 2x + x = 0.5 + x$$

$$x = p_t - 0.5$$

$$p_{N_2O_5} = 0.5 - 2x$$

$$= 0.5 - 2(p_t - 0.5) = 1.5 - 2p_t$$

$$\text{At } t = 100 \text{ s; } p_t = 0.512 \text{ atm}$$

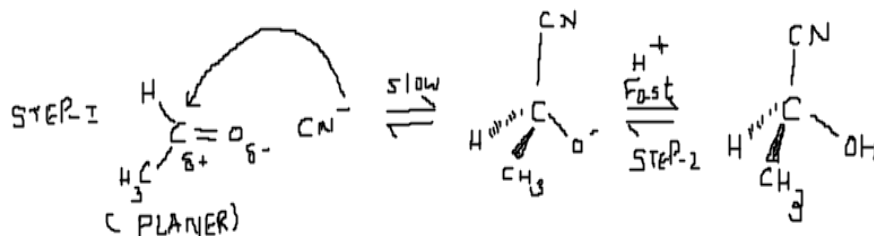
$$p_{N_2O_5} = 1.5 - 2 \times 0.512 = 0.476 \text{ atm}$$

Using equation (4.16)

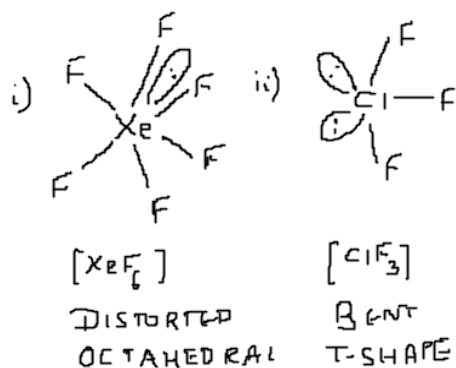
$$k = \frac{2.303}{t} \log \frac{p_t}{p_0} = \frac{2.303}{100 \text{ s}} \log \frac{0.5 \text{ atm}}{0.476 \text{ atm}}$$

$$= \frac{2.303}{100 \text{ s}} \times 0.0216 = 4.98 \times 10^{-4} \text{ s}^{-1}$$

22.



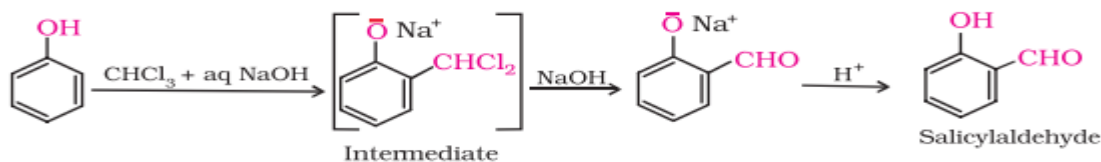
23.



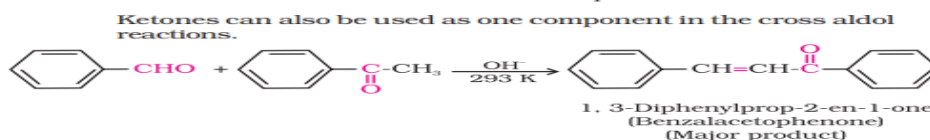
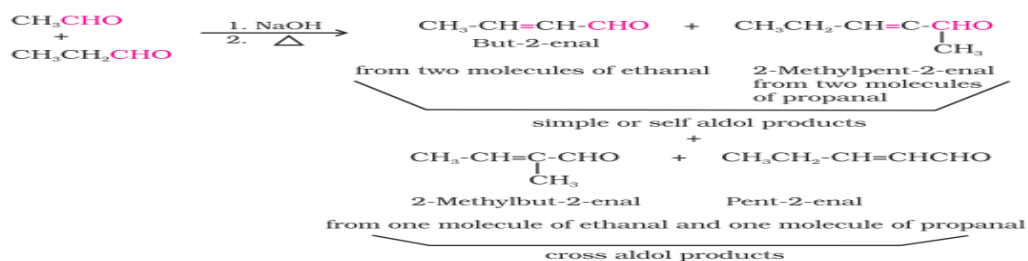
24.(i) Reimer Tieman reaction

On treating phenol with chloroform in the presence of sodium hydroxide, a -CHO group is introduced at *ortho* position of benzene ring. This reaction is known as *Reimer - Tiemann reaction*.

The intermediate substituted benzal chloride is hydrolysed in the presence of alkali to produce salicylaldehyde.



(iii) Cross Aldol Reaction



25.

The number of tetrahedral voids formed is equal to twice the number of atoms of element B and only 2/3rd of these are occupied by the atoms of element A. Hence the ratio of the number of atoms of A and B is $2 \times (2/3):1$ or 4:3 and the formula of the compound is A_4B_3 .

26.(i) They have similar properties and their radius are within 15% of each other.

(ii) Because Cu(II) has more negative hydration energy than Cu(I), which more than compensates for the second ionization enthalpy of Cu.

(iii) Because of small size and high electronegativity oxygen and fluorine can oxidize the metal to its highest oxidation state.

OR

(i) After d^5 configuration interelectronic repulsion takes place, which results in a slight increase of radii

(ii) Due to lanthanide contraction

(iii) Due to lanthanide contraction

27.i) Aniline < ethanamine < 2-ethylethanamine (Basic character in gaseous phase)

ii) Ethanoic acid < Benzoic acid < Formic acid (Acidic property)

iii) N, N-dimethylmethanamine < N-methylmethanamine < Methanamine (Solubility in water)

OR

i) Foul smell is given by ethanamine by Carbylamine test but not by N-methylethanamine

ii) First benzaldehyde is produced then 3-bromobenzaldehyde

iii) Butan-1-ol is more acidic due to high polarity of O-H bond.

28.

$$FCC : \sqrt{2} a_1 = 4 r_1$$

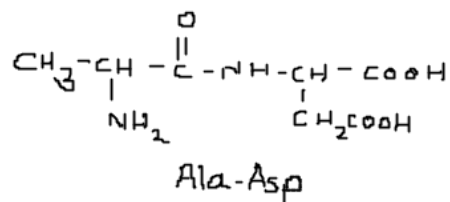
$$BCC : \sqrt{3} a_2 = 4 r_2$$

$$\therefore \frac{r_1}{r_2} = \frac{\sqrt{2} \times 4}{\sqrt{3} \times 2} = \frac{2\sqrt{2}}{\sqrt{3}}$$

29. (i) Acidic- Aspartic, Basic- Lysine, Amphoteric- Alanine

(ii) $\text{CH}_3\text{CH}(\text{NH}_4^+)(\text{COO}^-)$

(iii)



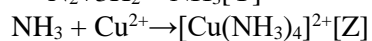
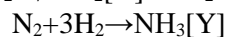
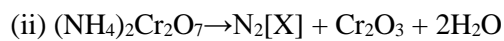
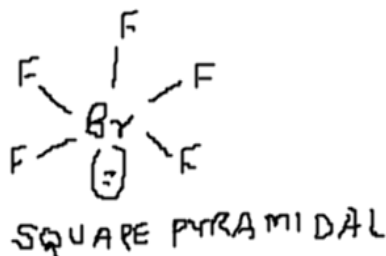
30. (i). $\text{F}_2, \text{ICl}, \text{Cl}_2$

(ii) Due to small size of Nitrogen atom, there is large interelectronic repulsion between lone pair of electrons which results in weakening of bond, but P is a large size atom.

(iii) Due to presence of unpaired electron in antibonding molecular orbital in S_2 like O_2 .

31. (i) $4\text{Zn} + 10\text{HNO}_3(\text{Dilute}) \rightarrow 4\text{Zn}(\text{NO}_3)_2 + 5\text{H}_2\text{O} + \text{N}_2\text{O}$

b)



OR

(2+3)

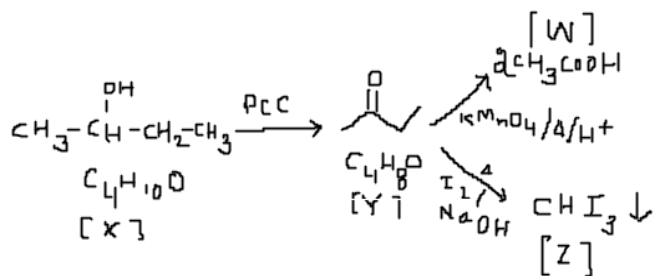
a) increasing order of reducing property :



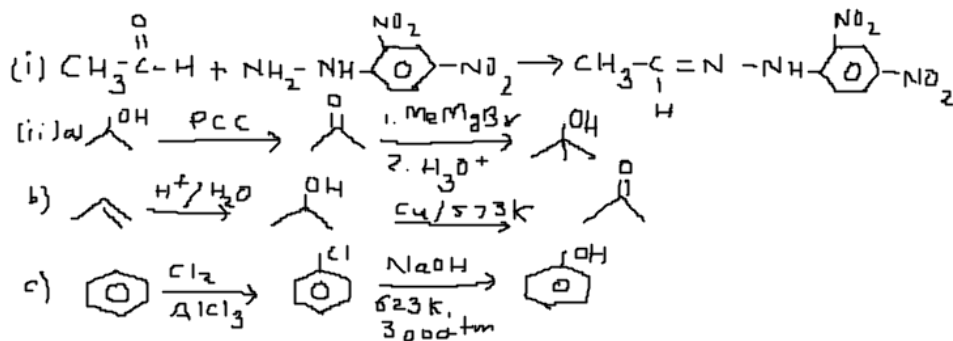
b) When SO_2 gas is passed through potassium permanganate solution, the colour of Permanganate solution get decolorised



32.



OR



33.(i) Limiting molar conductivity is molar conductivity at infinite dilution for an electrolyte.

(ii) $\text{Ni(s)} + \text{Ag}^+(0.002\text{M}) \rightarrow \text{Ni}^{2+}(0.16\text{M}) + \text{Ag(s)}$ Given that $E^0_{\text{cell}} = 1.05 \text{ V}$.

Applying Nernst equation,

$$\begin{aligned} E_{\text{cell}} &= E^0_{\text{cell}} - \frac{0.0591}{n} \log \frac{[\text{Ni}^{2+}]}{[\text{Ag}^+]^2} \\ &= 1.05\text{V} - \frac{0.0591}{2} \log \frac{0.160}{(0.002)^2} \\ &= 1.05 - \frac{0.0591}{2} \log(4 \times 10^4) \\ &= 1.05 - \frac{0.0591}{2} (4.6021) \\ &= 1.05 - 0.14 \text{ V} \\ &= 0.91 \text{ V} \end{aligned}$$

OR

a) Conductivity decreases with dilution because on dilution number of ions per unit volume that carry the current in a solution decreases on dilution.

b)(i) Molar conductivity increases on dilution because increase in dilution result increase in Volume and hence total volume of solution containing one mole of electrolyte also increases

Moreover increase in dilution result weakening of interionic interaction between oppositely ions besides increase in degree of dissociation for weak electrolytes.

(ii) Weak electrolytes are weakly dissociated but strong electrolytes are strongly dissociated, this results molar conductivity of weak electrolytes to be less than strong electrolytes at a particular concentration.

(iii)

$$A_m = \frac{\kappa}{c} = \frac{4.95 \times 10^{-5} \text{ S cm}^{-1}}{0.001028 \text{ mol L}^{-1}} \times \frac{1000 \text{ cm}^3}{\text{L}} = 48.15 \text{ S cm}^2 \text{ mol}^{-1}$$

$$\alpha = \frac{A_m}{A_m^0} = \frac{48.15 \text{ S cm}^2 \text{ mol}^{-1}}{390.5 \text{ S cm}^2 \text{ mol}^{-1}} = 0.1233$$

$$K = \frac{c\alpha^2}{(1-\alpha)} = \frac{0.001028 \text{ mol L}^{-1} \times (0.1233)^2}{1-0.1233} = 1.78 \times 10^{-5} \text{ mol L}^{-1}$$