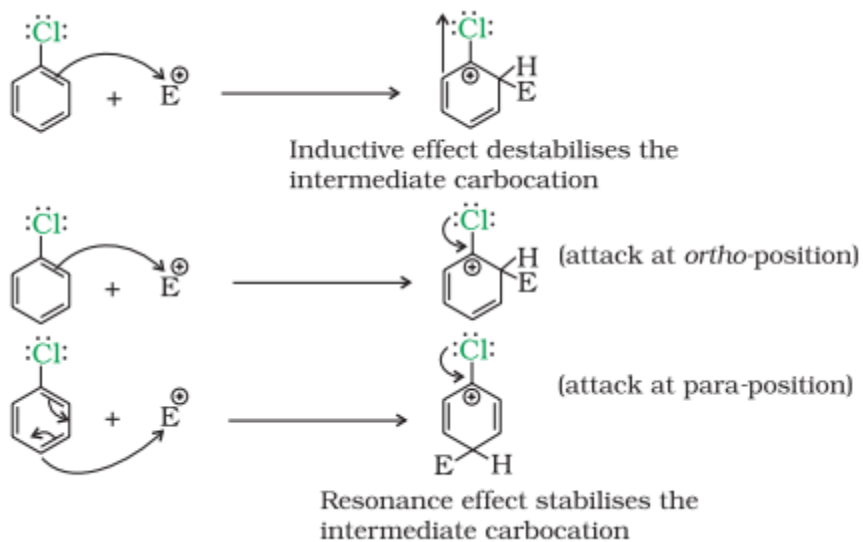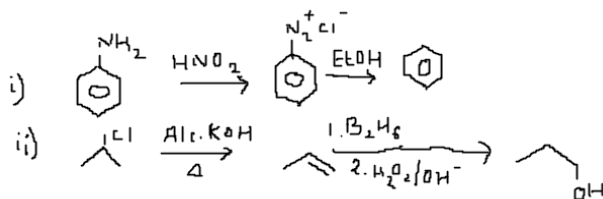1 I- B,II-D Or A , III- B, IV-D

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.

Inductive effect destabilises the
intermediate carbocation

(attack at *ortho*-position)

(attack at para-position)

Resonance effect stabilises the
intermediate carbocation

Or

18. P=Molefraction of water X P^o and $[P^0-P]/P^0$ = Molefraction of Urea

$P^o = 23.8$ mm
$w_2 = 50$g, M_2 (urea) $= 60$g mol^{-1}
$w_1 = 850$ g, M_1 (water)$= 18$g mol^{-1}
To find: P_s and $(P^o - P_s)/P^o$
Solution: Applying Raoult's law,

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

$$\therefore \quad \frac{P^o - P_s}{P^o} = \frac{50/60}{850/18 + 50/60}$$

$$= \frac{0.83}{47.22 + 0.83} = 0.017$$

Putting $P^o = 23.8$ mm, we have

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

$\Rightarrow \quad 23.8 - P_s = 0.017 P_s$
or, $\quad 1.017 P_s = 23.8$
or, $\quad P_s = \mathbf{23.4}$ **mm**

19.(i) $[Co(NH_3)_6]^{3+}$ because Ammonia is a strong field ligand and it will pair up electron to have d^2sp^3 hybridisation in $[Co(NH_3)_6]^{3+}$, but sp^3d^2 hybridisation occur in $[Ni(NH_3)_6]^{2+}$

(ii)$K_2[Zn(OH)_4]$-Potassium tetrahydroxozincate

OR

(i)The geometry of $[Ni(CO)_4]$- Tetrahedral
(ii)Spin only magnetic moment of $[NiCl_4]^{2-}$ ion. n=2, unpaired electron hence $[n(n+2)]^{1/2}$

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

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

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

OR

For a first order reaction; $t = \dfrac{2\cdot303}{k} \log \dfrac{a}{a-x}$

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

$$t_{99\%} = \dfrac{2\cdot303}{k} \log \dfrac{100}{1} = \dfrac{2\cdot303}{k} \log 10^2$$

$$= \dfrac{2\cdot303 \times 2}{k} = \dfrac{4\cdot606}{k}$$

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

$$t_{90\%} = \dfrac{2\cdot303}{k} \log \dfrac{100}{10} = \dfrac{2\cdot303}{k} \log 10 = \dfrac{2\cdot303}{k}$$

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

$$\dfrac{t_{(99\%)}}{t_{(90\%)}} = \dfrac{4\cdot606}{k} \times \dfrac{k}{2\cdot303} = 2.$$

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

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

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

$$x \quad p_t \quad 0.5$$

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

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

At $t = 100$ s; $p_t = 0.512$ atm
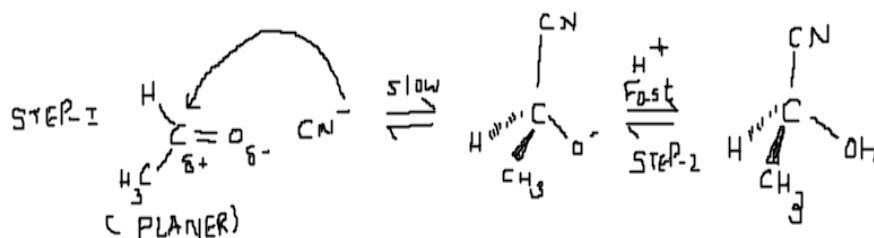
$$P_{N_2O_5} = 1.5 - 2 \times 0.512 = 0.476 \text{ atm}$$
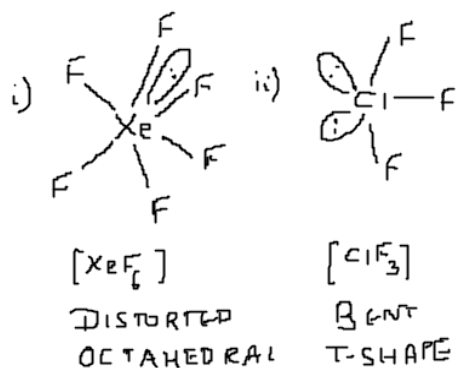
Using equation (4.16)

$$k = \dfrac{2.303}{t} \log \dfrac{p_i}{p_A} = \dfrac{2.303}{100s} \log \dfrac{0.5 \,\text{atm}}{0.476 \,\text{atm}}$$

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

22.

23.

$$[XeF_6] \qquad [ClF_3]$$

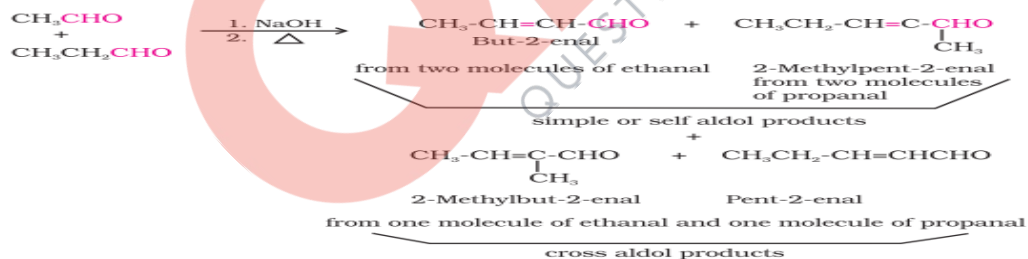DISTORTED OCTAHEDRAL   BENT T-SHAPE

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*.
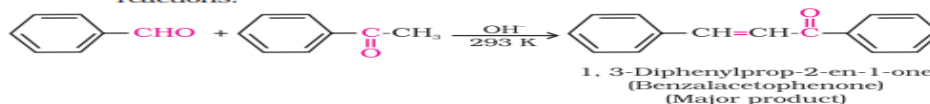
The intermediate substituted benzal chloride is hydrolysed in the presence of alkali to produce salicylaldehyde.
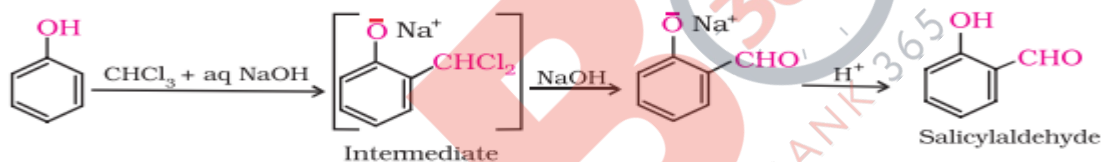
(iii)Cross Aldol Reaction

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 × (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 inte electronic repulsion take place , which result 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.
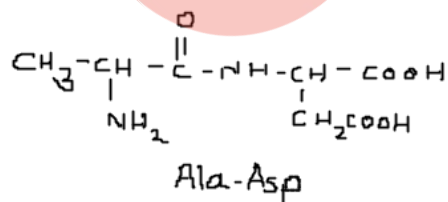
28.

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

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

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

29. (i)Acidic- Aspartic, Basic-Lysine, Amphoteric- Alanine
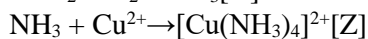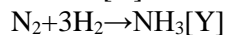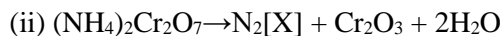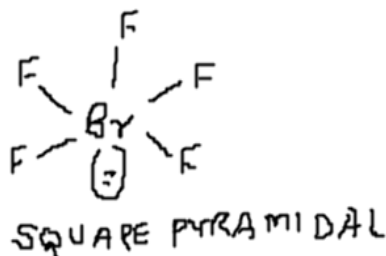(ii) $CH_3CH(NH_4)^+(COO)^-$
(iii)

Ala-Asp

30. (i).F_2,ICl,Cl_2
(ii) Due to small size of Nitrogen atom, there is large inter electronic repulsion between lone pair of electrons which results weakening of bond, but P is large size atom.
(iii)Due to presence of unpaired electron in antibonding molecular orbital in S_2 like O_2.

31.(i) a- $4Zn + 10HNO_3$(Dilute) $\rightarrow 4Zn(NO_3)_2 + 5H_2O+N_2O$

b)

SQUARE PYRAMIDAL

(ii) $(NH_4)_2Cr_2O_7 \rightarrow N_2[X] + Cr_2O_3 + 2H_2O$
$N_2 + 3H_2 \rightarrow NH_3[Y]$
$NH_3 + Cu^{2+} \rightarrow [Cu(NH_3)_4]^{2+}[Z]$

OR

(2+3)

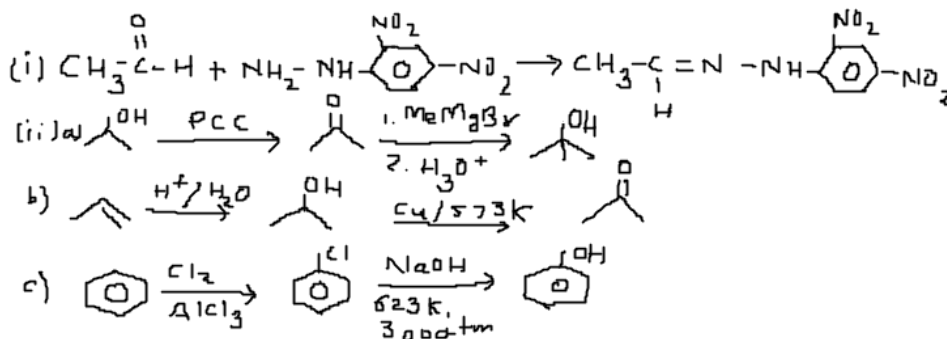a) increasing order of reducing property :

NH_3 , PH_3 , AsH_3, SbH_3 , BiH_3

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

c) X-HCl, Y-Cl$_2$, Z- NH_4Cl $NH_3 + HCl \rightarrow NH_4Cl$

32.

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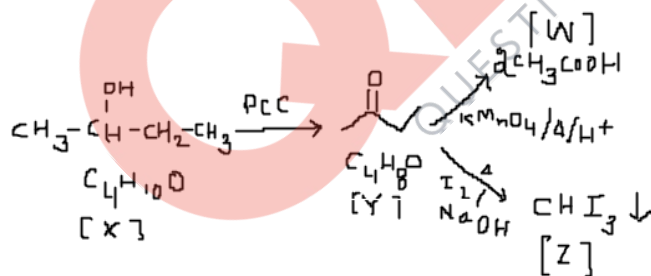
33.(i) Limiting molar conductivity is molar conductivity at infinite dilution for an electrolyte.

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

Applying Nernst equation,

$$E_{cell} = E^0{}_{cell} - \frac{0.0591}{n} \log \frac{[Ni^{2+}]}{[Ag^+]^2}$$

$$= 1.05V - \frac{0.0591}{2} \log \frac{0.160}{(0.002)^2}$$

$$= 1.05 - \frac{0.0591}{2} \log(4 \times 10^4)$$

$$= 1.05 - \frac{0.0591}{2}(4.6021)$$

$$= 1.05 - 0.14 \text{ V}$$

$$= 0.91 \text{ V}$$

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 oppositively ions besides increase in degree of dissociation for weak electrolytes.

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

(iii)

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

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

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