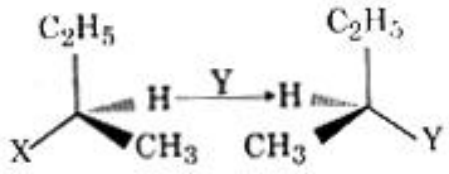
Ans 1. $2Pb(NO_3)_2\ (s) \longrightarrow 2PbO\ (s) + 4NO_2(g) + O_2(g)$

NO_2 gas dimeriz on cooling

$2\,NO_2 \longrightarrow N_2O_4$

Ans 2. (i)



Reaction (i) is SN^2 Reaction

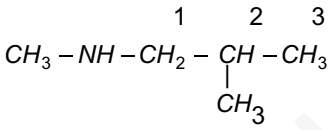
because is this Reaction Inversion of configuration occur.

Ans 3. Colloidal solution are stable due to random motion (Brownian motion) of Colloidal particles.

Ans 4. $ZnO \xrightarrow{heating} Zn^{+2} + \frac{1}{2}O_2 + 2e^-$

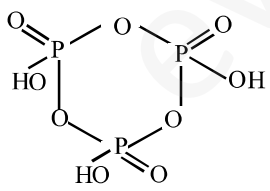
Zinc oxide is white in colour at room temp. On heating it loses oxygen and turn yellow.

Ans 5.

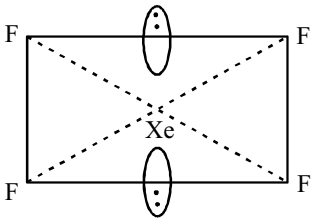


N-methyl-2-methyl Propanamine

Ans 6. (i) ($H\,PO_3$)



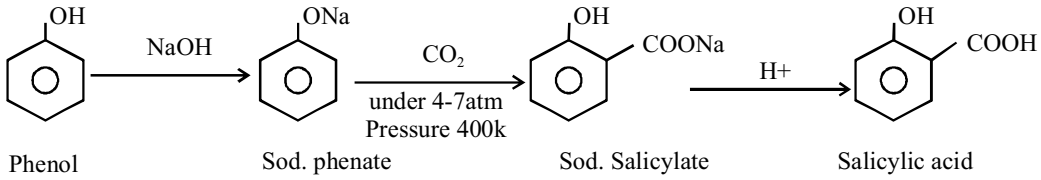
(ii) XeF_4



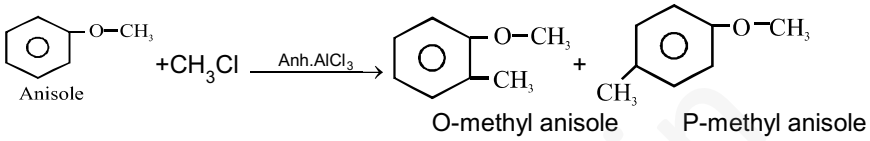
Ans 7. (i) osmotic pressure

(ii) Minimum boiling azeotropes are show positive deviation from Raoult Law.
Examples ⇒ mixture of water + Ethanol

Ans 8. (i) Kolbe Reaction :- On Reacting sodium salt of phenol with carbon dioxide gas, salicylic acid (2-hydroxy benzoic acid) is formed.

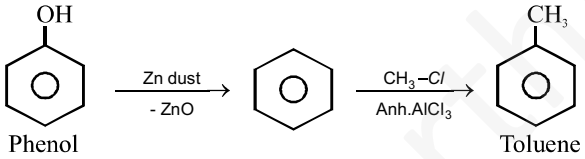


(ii) Friedal - Carft acetylation of anisole on Reacting alkyl halide [Ex. CH_3Cl] in presence of Anhydrous $AlCl_3$ with anisole, ortho-Methyl anisole and para methyl anisole is formed as product.

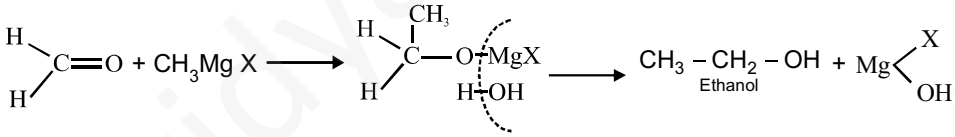


Or

(i) Phenol to toluene :



(ii) Forma ldehyde to Ethanol



Formaldehyde Methyl megnesium halide

Ans 9. (i) When 2 chlorine atoms are removed from coordination sphere, 2 moles of AgCl precipitated out. So the formula of complex will be : $[Ni(H_2O)_6]Cl_2$

(ii) Hexaamine nickle (II) Chloride

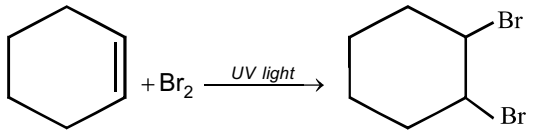
Ans 10. $2NH_3(g) \xrightarrow{Pt} N_2(g) + 3H_2(g)$

(i) Order of Reaction = Zero order

molecularity = 2

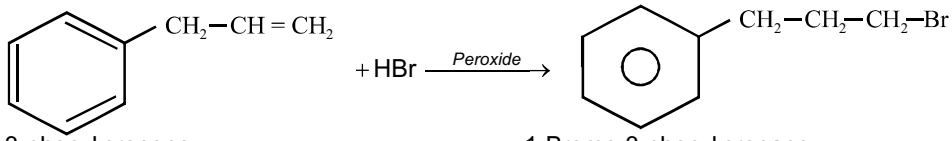
(ii) unit of k = mol l^{-} sec^{-}

Ans 11. (i)



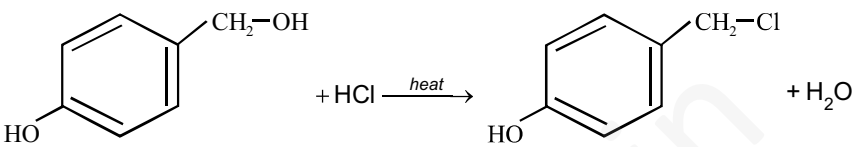
Cyclo hexene — 1,2-di bromo Cyclohexane

(ii)



3-phenyl propene — 1-Bromo-3-phenyl propane

(iii)



2-Chloromethyl Phenol

Ans 12. Volume of unit cell $= a^3$ [a = edge length)

$= (400\ Pm)$

$= (400 \times 10^{-12}\ m)^3$

$= (400 \times 10^{-10} cm)^3$

$= 64 \times 10^{-24}\ cm^3$

Volume of 208 g of the Element

$$= \frac{mass}{density} = \frac{208\ g}{7g\ cm^{-3}} = 29.71\ cm^3$$

Number of unit cells in this volume $= \frac{vol\ of\ given\ amount}{vol\ of\ one\ unit\ cell}$

$$= \frac{29.71}{64 \times 10^{-24}} = 0.46 \times 10^{24}$$

Since each f.c.c unit cell contain 4 atoms therefore, total number of atoms in 208 g

$= 4 \times 0.46 \times 10^{24}$

$= 1.84 \times 10^{24}$ atoms

Ans 13. (a) In phenol the lone pair of e^- on oxygen involves in delocalization not available freely for the protonation, where as in ethanol the e^- lone pairs on oxygen atom are not dellocalized, so they avoilable for protonation.

(b) Due to the presence of H-bond in ethanol, intermolecular force of attractions are more in ethanol rather than alcohol.

(c) Bacause in case of anisole, methyl phenyl oxinium ion $C_6H_5-\overset{\oplus}{\underset{\underset{H}{|}}{O}}-CH_3$ is formed by protonation of ether. The bond between O-CH_3 is weaker than the bond between O-C_6H_5 because the carbon of phenyl group is Sp^2 hybridised and there is partial double bond character. Therefore the attack by I^- ion breaks O-CH_3 bond to form CH_3-I.

Ans 14. (i) The open chain structure fails to Explain the following reaction's

(a) Despite having aldehyde (–CHO), glucose does not react with sodium bisulphite ($NaHSO_3$)

(b) Glucase does not give 2, 4–DNP Test and schiff test.

(c) The pentaacetate of glucose does not react with hydroxylamine. This indicates the absence of free–CHO group.

(ii) Phosphodiaester linkage present in Nucleic acids.

(iii) Example of fat soluble vitamine ⇒ Vitamine A, D, E, K

Examples of water soluble vitamine ⇒ Vitamine B and C

Ans 15. weight of solute (w) = 2g

molar mass (M_W) = 142 g/mol

weight of solvent (w) = 50 g

K_b = 0.52 K kg mol

For Complete Ionization

i = n

$Na_2SO_4 \Rightarrow i = 3$

So Elevation in Boiling point $\Delta T_b = i \times \frac{w \times K_b}{M_W \times W} \times 1000$

$$\Delta T_b = 3 \times \frac{2}{142 \times 50} \times 1000 \times 0.52$$

$$\Delta T_b = 0.43$$

So boiling of solution = Boiling point of solvent + Elevation in B.P

= 100°C + 0.43 ⇒ 100.43°C

Ans 16. (i) Chromatography

(ii) Some time, it is possible to separate two sulphide ores by adjusting proportion of oil to water or by using depressants.

For Examples, in case of an ore containging ZnS and PbS, the depressant used in NaCN. It selective prevents Zn S from coming to the froth but allow PbS to come with the forth.

(iii) $CaCO_3 \longrightarrow CaO + CO_2$

$\underset{\text{flux}}{CaO} + \underset{\text{Impurity}}{SiO_2} \longrightarrow \underset{\text{Slag}}{CaSiO_3}$

lime stone provide CaO on decomposition, CaO which work as flux to Remove Impurity of silica as slag ($CaSiO_3$)

Ans 17. (i) o/w Emulsions : – In this system water acts as dispession medium and oil act as disphersed phase. for e.g. - milk and vanishing cream.
In milk, liquid fat is dispired in water

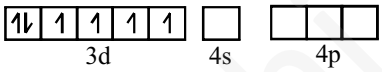
(ii) Zeta potential :- Separation of charge is a set of potential, the charges of opposite signs on the fixed and diffused parts of the double layer results in a difference in potential between these layers. This potential difference between the fixed layer and the diffused layer of opposite charges is called the zeta potential.

(iii) Multimolecular colloids :- A large number of atoms or smaller molecules of a substance aggregate together to form species having size in the colloidal range. The species thus formed are called multimolecular colloids.

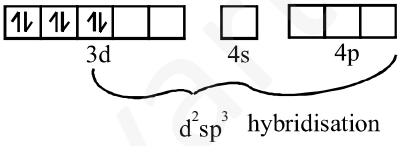
Ans 18. (a) $[Fe(CN)_6]^{4-}$ O.N. of Fe = x + 6 (–1) = – 4

x = + 2

Fe^{+2} = $1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 3d^6, 4s^\circ$



in the presence of CN –

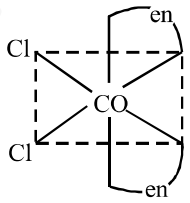


- Hybridisation – $d^2 sp^3$

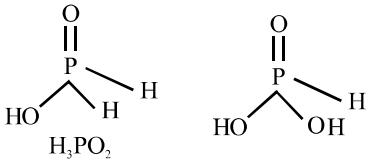
- magnetic character – all the electrons are paired because CN^- is a low spin ligand as a result it is diamagnetic is Nature

- low spin complex

(b)

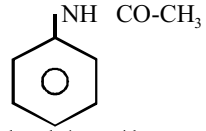


Ans 19. (a) In H_3PO_2, there are 2 P-H bonds whereas in H_3PO_3 there is only 1 P-H bond.

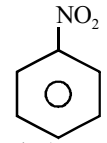


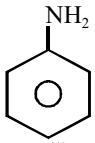
(b) This is because S-S bond is stronger than O-O bond.

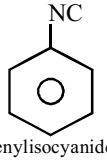
(c) due decrease in bond dissociation Enthalpy from HF to HI

Ans 20. (i) $C_6H_5-COO-\overset{\oplus}{N}H_4 \xrightarrow{\Delta} \underset{\text{Benzanaide}}{C_6H_5CONH_2} \longrightarrow \underset{\text{Aniline}}{C_6H_5-NH_2} \xrightarrow[(\text{Acetylation})]{(H_3COCl)\ Pyridine}$ 

N-phenylethanamide

(ii) $\underset{\text{Benzene diazonium Fluoroborate}}{C_6H_5\overset{\oplus}{N}_2\ BF_4^-} \xrightarrow[\Delta]{NaNO_2\,|\,Cu}$ 

Nitrobenzene $\xrightarrow{Sn\,|\,HCl}$ 

Aniline $\xrightarrow{CHCl_3+alc.KoH}$ 

phenylisocyanide

Ans 21. $2H_2O_2 \xrightarrow{\Delta} 2H_2O + O_2$

$$\log_{10}k = \log_{10}A - \frac{E_a}{2.303\,RT}$$

Given

$$\log_{10}k = 14.2 - \frac{1.0\times10^4}{T}k$$

$$\therefore \quad \frac{E_a}{2.303R} = 1.0 \times 10^4$$

(activation Energy) $E_a = 1.0 \times 10^4 \times 2.303 \times 8.314$

$= 19.14 \times 10^4$ J mol$^-$

half life ($t_{50\%}$) = 200 minutes

$$k = \frac{0.693}{t\ 50\%} = \frac{0.693}{200\times60}$$

$k = 5.78 \times 10^{-5}$ sec$^-$

(Rate constant)

Ans 22. (i) Benzoyl peroxide is free radical generater. In the presence of benzoyl peroxide phenyl free radical formed which is responsible of chain initiating step.

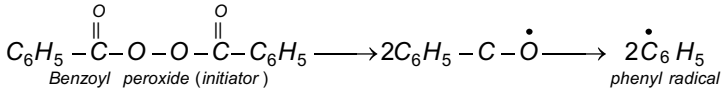
(ii) (a) $H_2N-(CH_2)_6-NH_2 \rightarrow$ (Hexamethydiamine) and adipic acid $COOH-(CH_2)_4-COOH$

(iii) Polythene < Buna–S < Nylon 6, 6

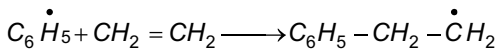
OR

Free radical mechanism : –

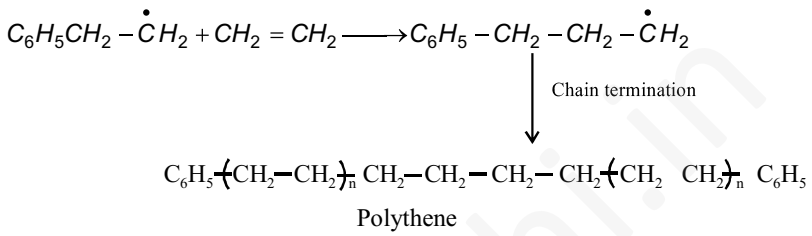
(i) Chain initiation steps –



(ii) Chain propagating step :-



(ii) Chain terminating step :-



Ans 23. (i) (a) Mr. Roy is a good friend of Mr. Awasthi, and He is a responsible person.

(b) Mr. Roy is concern about the health of his friend.

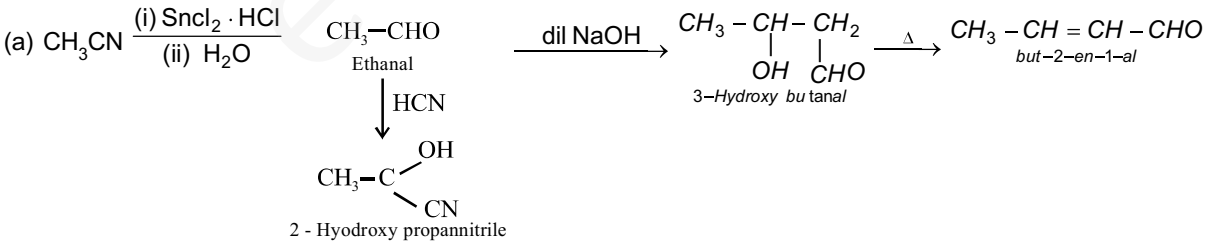
(ii) It is not advisable to take sleeping pills without consulting doctor because the main ingredient of most of the sleeping pills is barbiturates. These chemicals make you to breathe showly and less deeply.

That can be dengerous for people who have asthma or some other heart problems.

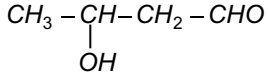
(iii) Transquillizers are drugs which are used for treatment of stress, fatigue, mild and severe mental diseases.

eg. Chlordiazepoxide and meprobamate

Ans 24.



(A) → CH_3CHO

(B) → 

(C) $\rightarrow CH_3 - CH = CH - CHO$

(D) $\rightarrow CH_3 - C(OH)(CN) - CH_3$

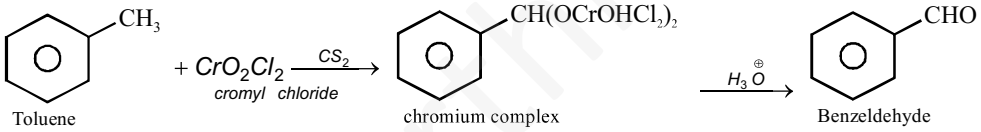
(b) (i) homologous members of same series.

(ii) homologous members of same series

(c) $CH_3COOH > CH_3CH_2OH > CH_3COCH_3$
carboxylic acids are having high boiling point due to hydrogen bonding.

OR

(a) Etard Reaction



(b) $HCHO > CH_3CHO > C_6H_5COCH_3$

(c) Because in $Cl - CH_2 - COOH$, – I effective group is present which decreases the electron density of C. that's why $Cl-CH_2-COOH$ is more acidic than CH_3COOH.

(d) $CH_3CH_2CH = CH - CH_2 - CN \xrightarrow[(ii)\ \ H_2O]{(i)\ (i.Bu)_2AlH} CH_3 - CH - CH = CH_2 - CH_2 - CHO$

Hex – 3– en –1 – nitrile Hex – 3-en–1–al

(e) two isomers are $CH_3 - \underset{\underset{O}{\|}}{C} - CH_3$ and $CH_3 - CH_2 - CHO$

(A) $\Rightarrow CH_3 - \underset{\underset{O}{\|}}{C} - CH_3 \Rightarrow$ Ketone

(B) $\Rightarrow CH_3 - CH_2 - CHO \Rightarrow$ aldehyde

$$\underset{(A)}{CH_3COCH_3} \xrightarrow{NaOH+I_2} CH_3 - COONa + \underset{\text{Yellow ppt}}{CHI_3}$$

$$\underset{(B)}{CH_3CH_2CHO} \xrightarrow{NaOH+I_2} \text{No reaction}$$

Ans 25. (a) $E_{cell} = E^{\circ}_{cell} - \frac{0.0591}{n} \log_{10} \frac{[Product]}{[Reactant]}$

$$E^{\circ}_{cell} = E_{cell} + \frac{0.0591}{6} \log_{10} \frac{[0.01]^2}{[0.01]^3}$$

$$= 0.261 + 0.009 \log_{10} \frac{10^{-4}}{10^{-6}}$$

$$= 0.261 + 0.0098 \log_{10} 10^2 \ [\log_{10} 10 = 1]$$

$$= 0.261 + 0.0098 \times 2$$

$$= 0.261 + 0.0196$$

$$= 0.2806 \text{ V}$$

(b) Given

[$E^{\circ} (Fe^{+2} / Fe) = -0.44$ V]

$E^{\circ} (A^{2+} / A) = -2.37$ V

$E^{\circ} (B^{2+} / B) = -0.14$ V

'A' will prevent iron from corrosion, so we can coat the iron metal by element A because it is having more negative value of reduction potential then iron

OR

(a) Given

Molarity (M) = 0.001 mol / L

Conductivity = 3.905×10^{-5} 5 cm^{-1}

$\lambda^{\circ} (H^{+}) = 349.6$ 5 cm^2 mol^{-}

$\lambda^{\circ} (CH_3COO^{-}) = 40.9$ 5 cm2 mol

Molar Conductivity (λ_m) = Conductivity $\times \frac{1000}{M}$

$$= 3.905 \times 10^{-5} \times \frac{1000}{0.001}$$

$$39.05 \text{ cm}^2 \text{ mol}^{-}$$

$$\alpha = \frac{Molar\ conduc\,tance\ at\ specific\ concentration}{Molar\ conduc\,tance\ at\ inf\,inite\ ditation}$$

$$= \frac{39.05}{390.5}$$

$$\left[\begin{array}{l} \lambda^{\infty}_{CH_3COOH} = \lambda^{\infty}_{H^+} + \lambda^{\infty}_{CH_3OO^-} \\ \qquad\qquad = 349.6 + 40.9 \\ \qquad\qquad = 390.5 \end{array}\right]$$

= 0.1

= 10%

(b) Electro chemical cell :-

Cell which convert chemical Energy into Electrical Energy

If E°_{cell} [External] > E°_{cell}

(i) Electron flow from

Cathode to anode and current flow from anode to cathode.

Ans 26. (a) (i) The ability of oxygen to stabilise the high oxidation state exceeds that of fluorine.

(ii) Due to lanthanoid contraction Zr and Hf show similar properties.

(iii) Due to variable oxidation state, transition metals act as good catalyst.

(b) (i) $2\,MnO_2 + 4KOH + O_2 \xrightarrow{Fuse} 2\,K_2MnO_4 + 2H_2O$

(ii) $Cr_2O_7^{-2} + 14H^+ + 6\,I^- \longrightarrow 2Cr^{+3} + 7H_2O + 3I_2$

OR

(i) Zn $\rightarrow$ because Zn does not show variable oxidation State

(ii) Cr $\rightarrow$ chromium is having highest melting point due to high enthalpy of atomisation

(iii) Copper (Cu).

(iv) $Mn \rightarrow (Ar)\ 4s^2\ 3d^5$

$\downarrow$

$Mn^{+3} \rightarrow (Ar)\,4s^{\circ}\,3d^4$

Mn^{+3} having 4 electrons in 3d subshell, it required one electron to half filled configuration in 3d subshell it act as strong oxidising agent.