+2 CHEMISTRY MEMORY HINTS 2015-2016

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in +2 Chemistry
Refer GEM CHEMISTRY
Materials
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+2 CHEMISTRY

MEMORY HINTS

I. Smell / Odour

- Garlic odour - P_2O_3 (or) P_4O_6 (Phosphorus trioxide)
- Garlic taste - H_3PO_3 (Phosphorus acid)
- Pungent odour - PCl_5 (Phosphorus penta chloride)
- Rotten Fish - Phosphine (PH_3)
- Fish like odour - Amines
- Foul Smell - Carbylamine, (methyl iso cyanide) (CH_3NC)
- Foul smell of Rancid butter - Butric Acid (C_3H_7COOH)
- Fruity odour - Ester
- Pungent odour & fumes in moist air - Acetyl chloride (CH_3COCl)
- Pungent Odour & no fumes in moist air - Acetic anhydride $(CH_3CO)_2O$
- Mustard like odour - Methyl isothio cyanate (CH_3NCS)
- Smell of Jasmine (or) Fragrance of Jasmine - Benzyl acetate ($C_6H_5CH_2OCOCH_3$)
- Treatment of asthma and whooping cough - Benzyl benzoate
- Smell of bitter almonds - Nitro benzene ($C_6H_5NO_2$) (or) Benzaldehyde (C_6H_5CHO)
- 'Carbolic acid'-odour - Phenol (C_6H_5OH)
- Hypnotic as hypnone - acetophenone (or) methyl phenyl ketone ($CH_3COC_6H_5$)

II. Common Name		**Chemical Name**
▪ Trimer of acetaldehyde	-	Paraldehyde
▪ Dimer of benzaldehyde	-	Benzoin
▪ Polymer of formaldehyde	-	Paraformaldehyde
▪ Oil of bitter almonds	-	Benzaldehyde (C_6H_5CHO)
▪ Oil of winter green	-	Methyl salicylate
▪ Oil of mirbane	-	Nitro benzene ($C_6H_5NO_2$)
▪ Mustard oil	-	Methyl isothiocyanate (CH_3NCS)
▪ Chloral	-	Trichloro acetaldehyde CCl_3CHO
▪ Urotropine	-	Hexamethylene tetramine $(CH_2)_6N_4$
▪ Supercooled liquid	-	Glass
▪ Wood spirit	-	Methyl alcohol (CH_3OH)
▪ Grain alcohol	-	Ethyl alcohol (C_2H_5OH)
▪ Reducing sugar	-	Glucose, Lactose
▪ Non-Reducing sugar	-	Fructose, Sucrose
▪ Optically inactive amino acid	-	Glycine
▪ Calamine	-	$ZnCO_3$ (Zinc carbonate)
▪ Philosophers wool	-	ZnO (Zinc oxide)
▪ Lunar Caustic	-	$AgNO_3$ (Silver nitrate)
▪ Blue vitriol	-	$CuSO_4.5H_2O$ (Copper sulphate penta hydrate)
▪ Purple of cassius	-	Colloidal gold
▪ Purple of cassius	-	Gold with colloidal stannic hydroxide

- Dibasic acid - Phosphorus acid (H_3PO_3)
- Tribasic acid - Phosphoric acid (H_3PO_4)
- Tetrabasic acid - Pyrophosphoric acid ($H_4P_2O_7$)
- Agua regia - 3 part con. HCl + 1 part con. HNO_3
- State functions - S, $\triangle S$
- Path functions - q, δq
- Sodalime - CaO + NaOH
- Bordeaux Mixture - $CuSO_4$ + $Ca(OH)_2$ (or) Copper Sulphate + lime
- Galena - PbS
- Litharge - PbO
- Red lead - Pb_3O_4
- Brim stone - Sulphur
- Phosgene - Carbonyl chloride (Cl–CO–Cl)
- Chloro picrin - Trichloro nitro methane (CCl_3NO_2)
- Coinage metals - Cu, Ag, Au
- Laughing gas - N_2O (Nitrous Oxide)
- Aspirin - Acetyl Salicylic acid
- Freon - Dichloro difluro methane (CF_2Cl_2)
- Blister copper - 98% copper + 2% impurities
- Matte - Cuprous sulphide + Ferrous sulphide [Cu_2S + FeS]
- Methylated (or) denatured spirit - Ethanol with 5% Methanol
- Phenyl carbinol - Benzyl alcohol

- Benzoin (for throat infection) - Dimer of benzaldehyde
- Benzhydrol - Diphenyl carbinol
- Father of co-ordination Chemistry - Werner
- Mohr's salt - $FeSO_4 (NH_4)_2 SO_4.6H_2O$
- Potash Alum - $K_2SO_4.Al_2(SO_4)_3.24H_2O$

III. Reagent		**Composition**
▪ Dehydrating Agent	-	P_2O_5 (or) P_4O_{10}
▪ Fenton's Reagent	-	$FeSO_4 + H_2O_2$
▪ Bayer's Reagent	-	Cold dilute alkaline $KMnO_4$
▪ Lucas Reagent	-	anhydrous $ZnCl_2$ + Con. HCl
▪ Tollen's Reagent	-	Ammoniacal silver nitrate
▪ Fehling's solution	-	Sodium Potassium Tartarate in $CuSO_4$ solution
▪ Schiff's reagent	-	Benzilidene ($C_6H_5CH=NC_6H_5$)
▪ Hypnone	-	acetophenone ($CH_3COC_6H_5$) (or) Methyl phenyl ketone
▪ Nitrating Mixture	-	Con.HNO_3 + Con.H_2SO_4
▪ Formalin	-	Aqueous solution of 40% formaldehyde
▪ Glycerose	-	Glyceraldehyde + dihydroxy ketone

IV. Compounds		**Example**
▪ Aldol	-	3-hydroxy butanal
▪ α-hydroxy ketones	-	Benzoin
▪ Aromatic alcohol	-	Benzyl alcohol

- Dihydric alcohol - Ethylene glycol
- Trihydric alcohol - Glycerol
- Hygroscopic liquid - Glycol, Glycerol
- Antifreeze in automobile engine - Glycol, Glycerol
- Urinary antiseptic - Urotropine, Benzoic acid, salicylic acid
- Soil sterilizing agent - Chloropicrin CCl_3NO_2
- Dihydric phenol - Catechol, Resorcinol, Quinol
- Trihydric phenol - Pyrogallol, Hydroxy quinol, Phluroglucinol
- Simple Ether - Dimethyl ether (CH_3OCH_3)
- Mixed Ether - Ethyl methyl ether ($CH_3OC_2H_5$)
- Phenolic Ether - Anisole ($C_6H_5OCH_3$)
- Unsaturated aliphatic aldehyde - Acrolin (or) Acrylic aldehyde (CH_2=CH–CHO)
- Unsaturated aromatic aldehyde - Cinnamaldehyde (C_6H_5CH=CH CHO)
- Unsaturated aromatic acid - Cinnamic acid (C_6H_5CH=CHCOOH)

V. Physical Terms		**Units**
▪ Paramagnetic character	-	BM
▪ Enthalpy valve ΔH, ΔE	-	$KJ.mole^{-1}$
▪ Specific heat	-	Jg^{-1} (or) $J\ kg^{-1}$
▪ Concentration	-	$moles.\ dm^{-3}$
▪ Molar Concentration (x)	-	$mol.\ dm^{-3}$
▪ Energy of activation (E_a)	-	$Jmol^{-1}$

- Rate of reaction - mol. $dm^{-3}S^{-1}$
- Unit for order of reaction (in general) - $[(dm^3)^{n-1}\ mol^{1-n}]sec^{-1}$
- Half life period for first order-reaction - min (or) seconds
- Entropy (cgs) - cal $deg^{-1}\ mol^{-1}$ (or) eu
- Entropy (SI) - $JK^{-1}\ mol^{-1}$ (or) EU
- General formula for unit of Kc- $(mol.dm^{-3})^{\Delta ng}$
- Rate constant for I order - s^{-1} (or) min^{-1} (or) $time^{-1}$
- Rate constant for zero order- mole. $dm^{-3}\ s^{-1}$
- Quantity of current - coulombs (or) faraday
- Electro chemical equivalent- Kg. $Columb^{-1}$
- Current(I) - ampere
- Time (t) - seconds
- Resistance - ohm
- Conductance - ohm^{-1} (or) Siemens (or) mho
- Potential difference (V) - volt
- Specific Resistance (S) - Ohm – meter
- Specific Conductance (κ) - S $meter^{-1}$ (or) $ohm^{-1}\ meter^{-1}$
- Cell constant (s) - $metre^{-1}$
- Equivalent conductance (λ_c) - $ohm^{-1}\ m^2(gm.eq)^{-1}$ (or) $S.m^2\ (g.equi)^{-1}$ (or) $mho.m^2\ (gm.eq)^{-2}$
- Molar conductance (μ_c) - $S.m^2.mol^{-1}$ (or) $ohm^{-1}\ m^2.mol^{-1}$
- Ionic product of water(Kw) - $mol^2.dm^{-6}$

CONSTANTS

- 1 eV - 1.609×10^{-19}J
- Plank's constant (h) - 6.626×10^{-34} Kg. m^2 sec^{-1}
- Plank's constant (h) - 6.626×10^{-34} J S
- Mass of electron - 9.1×10^{-31} Kg
- 1 MeV - 10^6 eV
- 1 amu - 931 MeV
- 1 Faraday - 96495 coloumbs = 1 mole electrons

SHAPES

- PCl_3 - Pyramidal
- PCl_5 - Trigonal bipyramidal
- AX-ICl - Linear
- AX_3-ClF_3 - Trigonal bipyramidal (without lone pair T-shaped)
- AX_5-IF_5 - Octahedral (without lonepair square pyramidal)
- AX_7-IF_7 - Pentagonal bipyramidal
- XeF_2 - Linear
- XeF_4 - Square Planar
- XeF_6 - Distorted octahedral
- $[Ni(NH_3)_4]^{2+}$ - Tetrahedral
- $[Ni(CN)_4]^{2-}$ - Square planar
- $[Cu(NH_3)_4]^{2+}$ - square planar
- $[Fe(CN)_6]^{4-}$ - Octahedral

REACTIVITY SERIES

- Order of bond dissociation energy (based on bond order) $N_2 > O_2 > F_2$
- Order of bond length (based on bond order) $Li_2 > O_2 > N_2$
- Electronegativity order for H-bond $\Rightarrow$ F > O > N
- Order of strength of Hydrogen bond is

  H – F ... H > H – O ... H > H – N ... H
- Order of bond strength

  ionic bond > covalent bond > hydrogen bond > dipole-dipole, van der Walls force.
- Order of Ionisation energy

  s > p > d > f
- Order of electron affinity.

  I < Br < F < Cl (or) Cl > F > Br > I
- Screening effect of various orbital

  s > p > d > f
- Order of oxidising power of halogens

  $F^- > Cl^- > Br^- > I^-$
- Acidic character of HX

  HF < HCl < HBr < HI
- The order of size of Ln^{3+} ions (Lanthanide ions)

  $La^{3+} > Ce^{3+} > ... > Lu^{3+}$
- Order of reactivity of alcohols with sodium

  Primary > Secondary > Tertiary (or) 1° > 2° > 3°
- Strength of acidity of alcohol

  Primary > Secondary > Tertiary (or) 1° > 2° > 3°

- Reactivity of alcohols with Lucas test

  Tertiary > Secondary > Primary (or) 3° > 2° > 1°

- Strength of the acid

  $CH_3CH_2COOH < CH_3COOH < HCOOH < ClCH_2COOH$

- Increasing order of acidity

  $CH_3COOH < CH_2ClCOOH < CHCl_2COOH < CCl_3COOH$

- The acid strength order of substituted phenols

  p-nitro phenol > m – nitro phenol > phenol > cresol

- Basic strength of amines (steric effect)

  $(CH_3)_2NH > CH_3NH_2 > NH_3$ (or) 2° amine > 1° amine > ammonia

  (or) $NH_3 < CH_3NH_2 < (CH_3)_2NH$

- order of basic strength of amine

  2° amine > 1° amine > 3° amine

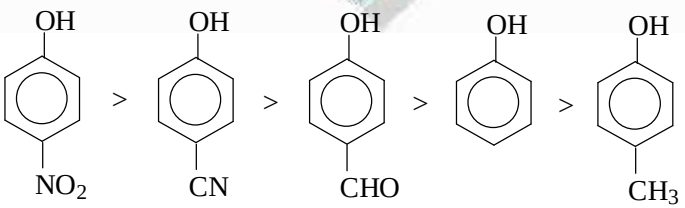
- Increasing order of basic strength of amines

  3° amine < 1° amine < 2° amine

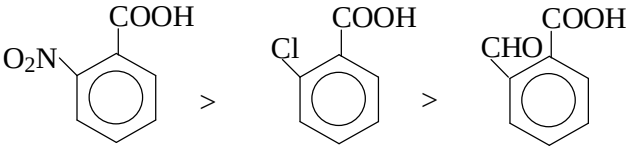
- Order of strength of hydrogen bond and boiling points of amine is

  2° > 1° > 3°

- Strength of phenols



❋ Strength of acid due to –I effect



ORGANIC CHEMISTRY

Some Important tips to identify organic compounds

Test	1^o alcohol	2^o alcohol	3^o alcohol
Victor Mayers Test	Red	Blue	Colourless
Lucas Test (appearance of turbidity)	On heatinsg	after 5-10 minutes	Immediately
With sodium metal	Liberation of H_2	Liberation of H_2	Liberation of H_2

2. Ethers

(i) Do not liberate H_2 with Sodium metal

(ii) Do not give HCl with PCl_5

3. Aldehydes

(i) Restores the red colour of the Schiff's base

(ii) Reduces Tollen's reagent

(iii) Reduces Fehling's solution (except C_6H_5CHO)

(Only acetaldehyde gives yellow precipitate with I_2 & KOH i.e., only acetaldehyde answers Iodo form test)

4. Ketones

(i) Does not restore the red colour of the Schiff's base

(ii) Does not reduce Tollen's reagent

(iii) Does not reduce Fehling solution

5. Acid

(i) Gives effervescence with Na_2CO_3 (or) $NaHCO_3$ solutions.

(ii) Gives sweet smelling ester when treated with alcohol + con.H_2SO_4

(iii) Aqeous solution of acid turns blue into red.

(iv) Except formic acid, other acids give alkane when heated with soda lime (NaOH + CaO)

6. Iodo form test

Compound having CH_3CO – (or) $CH_3CH(OH)$ group, when treated with I_2 & KOH give yellow precipitate. [C_2H_5OH, CH_3-CHO, CH_3-CO-CH_3, CH_3-CO-C_6H_5 answer Iodoform test].

II. Dehydrating agents

(i) Con H_2SO_4 (ii) P_2O_5 (iii) $KHSO_4$ (iv) dry anhydrous $ZnCl_2$

III. Oxidising Agents

1. $KMnO_4$ / NaOH (Bayer's Reagent)
2. $KMnO_4$ / Con. H_2SO_4
3. $K_2Cr_2O_7$ / Con.H_2SO_4
4. $Na_2Cr_2O_7$ / Con.H_2SO_4
5. $Cr.O_2Cl_2$
6. dil. HNO_3
7. Con.HNO_3
8. Fentons reagent ($FeSO_4$ / H_2O_2)
9. $KMnO_4$
10. Con. H_2SO_4
12. Br_2/H_2O
13. $Pb(NO_3)_2$
14. $Cu(NO_3)_2$
15. $KMnO_4$ / Na_2CO_3
16. Fehilings solution
17. Tollen Reagent
18. $OH^-/KMnO_4$
19. V_2O_5 / O_2

IV. Reducing Agents

1. Zn/dil.HCl
2. Sn/dil.HCl
3. Zn/NaOH
4. Zn/NH_4Cl
5. Raney Ni
6. Palladium / $BaSO_4$ (Stephen Reduction)
7. Na/Hg / H_2O
8. Zn/Hg + con.HCl (Clemmenson Reduction)
9. Na/C_2H_5 OH
10. NH_2–NH_2/C_2H_5ONa (Wolf Kisher Reduction)
11. $LiAlH_4$
12. $NaBH_4$
13. Ni-Al/NaOH
14. Zn/dil HCl
15. H_2/Pt
16. Pd/$BaSO_4$ (Rosemund Reduction)
17. Cu/SiO_2
18. $SnCl_2$/HCl
19. $NaHSO_3$
20. Zn/$CaCl_2$

IMPORTANT FORMULAE

1. De-Broglie equation - $\lambda = \frac{h}{mv}$ (or) $\lambda = \frac{h}{p}$

2. Energy (J) - Potential difference (V) × Charge of electron (C)

3. Kinetic Energy - $\frac{1}{2}mv^2$

4. Heisenberg's Uncertainity Principle - $\Delta x \times \Delta p \geq \frac{h}{4\pi}$ (or) $\Delta x \times m\Delta v \geq \frac{h}{4\pi}$

5. Energy of electron in Hydrogen atom - $E_n = \frac{-2\pi^2 me^4}{n^2h^2}$

$E_n = \frac{-1312}{n^2}$ kJ mol^{-1}

6. Bohr's quantum condition - $2\pi a = n\lambda$

7. Bond order - $\frac{1}{2}(N_b - N_a)$

8. In homonuclear diatomic molecule, covalent radius - $r(A) = \frac{d(A-A)}{2}$

9. In heteronuclear diatomic molecule, covalent radius - $r(A) + r(B) = d(A-B)$

10. Ionic radii by Pauling method - $\frac{r(C^+)}{r(A^-)} = \frac{Z^*(A^-)}{Z^*(C^+)}$

11. Effective nuclear charge - $Z^* = Z - S$

12. Pauling's electronegativity scale - $0.208\sqrt{\Delta} = X_A - X_B$

13. Mulliken's scale of electronegativity - $\frac{IE(eV) + EA(eV)}{5.6}$ (or)

$$\frac{IE(kJmol^{-1}) + EA(kJmol^{-1})}{540}$$

14. Magnetic moment - $\mu_s = \sqrt{n(n+2)}BM$

15. Radio active disintegration (I order) - $t = \frac{2.303}{\lambda}\log\frac{N_0}{N}$

16. Half life period of a radio active substance - $t_{1/2} = \frac{0.693}{\lambda}$

17. Average life of a radio active substance - $\tau = \frac{1}{\lambda}$

$$\tau = 1.44 \times t_{1/2}$$

18. The amount of energy absorbed (or) released in nuclear reaction - $Q = (m_p - m_r)\ 931\ MeV$

19. Age of fossil material (t) - $t = \frac{2.303 \times t_{1/2}}{0.693}\log\frac{\text{Amount of } C^{14} \text{ in Fresh wood}}{\text{Amount of } C^{14} \text{ in Dead wood}}$

20. Relation between $t_{1/2}$ and $t_{x\%}$ -

$t_{90\%} = 3.33 \times t_{1/2}$

$t_{99\%} = 6.67 \times t_{1/2}$

$t_{99.9\%} = 10 \times t_{1/2}$

$t_{99\%} = 2t_{90\%}$

21.

	sc	bcc	fcc
Number of atoms per unit cell	$\frac{N_c}{8} = 1$	$\frac{N_c}{8} + \frac{N_b}{1} =$ 1 + 1 = 2	$\frac{N_c}{8} + \frac{N_f}{2} =$ 1 + 3 = 4

22. Bragg's equation - $n\lambda = 2d \sin\theta$

23. Percentage efficiency of a heat engine - $\eta = \left(\frac{T_1 - T_2}{T_1}\right) \times 100$

24. Entropy change - $\Delta S_{rev} = \frac{\Delta q_{rev}}{T(k)}$

$\Delta S_{trans} = \frac{\Delta H_{trans}}{T_{trans}}$

25. Trouton's Rule - $\Delta S_{vap} = \frac{\Delta H_{vap}}{T_b} = 21 \text{ cal } K^{-1} \text{ mol}^{-1}$

26. Gibb's free energy - $G = H - TS$

27. Gibb's free energy change - $\Delta G = \Delta H - T\Delta S$

28. Network done - $-\Delta G = W - P\Delta V$

29. Equilibrium constant - $K_c = \frac{K_f}{K_r}$

30. Relation between K_p and K_c - $K_p = K_c (RT)^{\Delta n_g}$

31. K_p & K_c relation with respect to Δn_g -

$\Delta n_g = 0$	$\Delta n_g > 0$	$\Delta n_g < 0$
$K_p = K_c$	$K_p > K_c$	$K_p < K_c$

32. For the formation equilibrium of HI - $K_c = \frac{4x^2}{(a-x)(b-x)}$; $K_p = K_c$

33. For the dissociation equilibrium of PCl_5 - $K_c = \frac{x^2}{V(a-x)}$; $K_p = \frac{x^2P}{a^2-x^2}$

For 1 mole of PCl_5

$K_c = \frac{x^2}{(1-x)V}$; $K_p = \frac{x^2P}{1-x^2}$

34. For a first order reaction rate constant - $k_1 = \frac{2.303}{t}\log\frac{a}{a-x}$

35. Half-life period for the first order reaction - $t_{1/2} = \frac{0.693}{k_1}$

36. Ostwald's dilution law - $K_a = \frac{\alpha^2 c}{1-\alpha}$
applicable for weak electrolyte)
(The dissociation constant of weak acid)

37. The dissociation constant of a weak acid- $K_a = \alpha^2 c$
(If α is too small)

38. Degree of dissociation of weak acid - $\alpha = \sqrt{\frac{K_a}{c}}$

39. Debye-Huckel-Onsager conductance equation for strong electrolyte - $\lambda_c = \lambda_\infty - (A + B\lambda_\infty)\sqrt{c}$

40. Mass of substance liberated at the electrode - $m = ZIt$

$m = ZQ$

41. Ohm's law - $V = IR$ (or) $I = \frac{V}{R}$

42. The quantity of electricity required for the deposition of 1 mole of substance - nF (n = valency)

43. Resistance (R) - $R = \rho\frac{l}{a}$

44. Specific Resistance - $\rho = R \times \frac{a}{l}$ ohm m

45. Specific conductance - $\frac{1}{\rho} = \frac{1}{R} \times \frac{l}{a}$ (or) $\kappa = \frac{1}{R} \times \frac{l}{a}$ $ohm^{-1}\ m^{-1}$

(or) $\kappa = \frac{\text{Cell constant}}{\text{Resistance}}$

46. Equivalent conductance - $\lambda_c = \kappa V$

$\lambda_c = \frac{\kappa \times 10^{-3}}{N}$ $ohm^{-1}\ m^2\ g\ equiv^{-1}$

$\lambda_c = \frac{\kappa \times 10^{3}}{N}$ $ohm^{-1}\ cm^2\ g\ equiv^{-1}$

47. Molar conductance - $\mu_c = \kappa V$

$$\mu_c = \frac{\kappa \times 10^{-3}}{M} \text{ ohm}^{-1} \text{ m}^2 \text{ mol}^{-1}$$

$$\mu_c = \frac{\kappa \times 10^{3}}{M} \text{ ohm}^{-1} \text{ cm}^2 \text{ mol}^{-1}$$

48. Degree of dissociation of weak electrolyte - $\alpha = \frac{\lambda_c}{\lambda_\infty}$

49. According to Kohlraush's law -

(i) Equivalent conductance at infinite dilution - $\lambda_\infty = \frac{1}{n^+}\lambda_{\infty^+} + \frac{1}{m^-}\lambda_{\infty^-}$

(ii) Molar conductance at infinite dilution - $\mu_\infty = \gamma^+\mu_{\infty^+} + \gamma^-\mu_{\infty^-}$

50. $pH = -\log[H^+]$, $pK_a = -\log K_a$, $[H^+] = \text{Antilog } (-pH)$

$pOH = -\log[OH^-]$ $pK_b = -\log K_b$, $[OH^-] = \text{Antilog } (-pOH)$

51. Ionic product of water - $K_w = [H_3O^+]\,[OH^-]$

$$K_w = 1 \times 10^{-14} \text{ mol}^2 \text{ dm}^{-6}$$

52. Relation between pH and pOH - $pH + pOH = 14$

$$pH + pOH = pK_w$$

53. (i) For weak acid - $[H^+] = \alpha.C = \sqrt{K_a.c} = \frac{K_a}{\infty}$

(ii) For weak base - $[OH^-] = \alpha.C = \sqrt{K_b.c} = \frac{K_b}{\infty}$

54. For strong acids and strong bases, the hydrogen ion concentration

(i) If concentration of the solution is in normality then - $[H^+]$ = normality of the acid

For 0.1 N H_2SO_4 $[H^+]$ - 0.1 mol dm^{-3}

(ii) If concentration of solution is in molarity, then - $[H^+]$= basicity $\times$ molarity of the acid

For 0.1 M H_2SO_4 - $[H^+] = 2 \times 0.1 = 0.2$ mol dm^{-3}

55. Henderson equation (or) pH of buffer solution

(i) For acid buffer - $pH = pK_a + \log \frac{[salt]}{[acid]}$

(ii) For basic buffer - $pOH = pK_b + \log \frac{[salt]}{[base]}$

56. The emf of a cell - $E_{cell} = E_R - E_L$

57. emf of the cell - $E = E° - 2.303 \frac{RT}{nF} \log K$

$E = E° - \frac{0.0591}{n} \log K$

58. Standard free energy change - $\Delta G° = -nF E^{\circ}_{cell}$

COLOURS

1.	Pb_3O_4	-	Red
2.	CuO & CuS	-	Black
3.	Cu_2O	-	Red
4.	Na_2CrO_4, K_2CrO_4 & CrO_4^{2-}	-	Yellow
5.	Sc^{3+}, $Ti^{4+}(3d^0)$	-	colourless
6.	$Ti^{3+}(3d^1)$	-	Purple
7.	$V^{3+}(3d^2)$	-	Green
8.	V^{2+}, Cr^{3+} $(3d^3)$	-	Violet
9.	$Mn^{3+}(3d^4)$	-	Violet
10.	$Mn^{2+}(3d^5)$	-	Pink
11.	$Fe^{3+}(3d^5)$	-	Brown
12.	$Fe^{2+}(3d^6)$	-	Green
13.	$Co^{2+}(3d^7)$	-	Pink
14.	$Ni^{2+}(3d^8)$	-	Green
15.	$Cu^{2+}(3d^9)$	-	Blue
16.	$Cu^{+}(3d^{10})$	-	Colourless
17.	$Zn^{2+}(3d^{10})$	-	Colourless
18.	ZnO	-	White cloud (or) Philosopher's wool
19.	$K_2Cr_2O_7$	-	Red orange crystals
20.	$CuSO_4$	-	White
21.	$CuSO_4.5H_2O$	-	Blue
22.	$Cu(OH)_2$	-	Pale blue precipitate
23.	Cu_2I_2	-	White

24. AgBr - Pale yellow
25. AgI - Yellow
26. U^{3+} - Red
27. U^{4+} - Green
28. UO_2^{2+} - Yellow
29. $[Co(NH_3)_5Br]SO_4$ - Red violet
30. $[Co(NH_3)_5SO_4]Br$ - Red
31. $[Cr(H_2O)_4Cl_2]Cl.2H_2O$ - Dark green
32. $[Cr(H_2O)_5Cl]Cl_2.H_2O$ - Ash green
33. $[Cr(H_2O)_6]Cl_3$ - Violet
34. $[Co(NH_3)_5ONO]Cl_2$ - Red colour
35. As_2S_3 - Yellow
36. $Fe(OH)_3$ - Red
37. Cu^{2+} - Blue
38. Ni^{2+} - Green

	Acid Medium	**Base Medium**
Methyl orange	Violet	Yellow
Methyl Red	Red	Yellow
Phenol Red	Yellow	Red
Phenolphthalein	Colourless	Pink

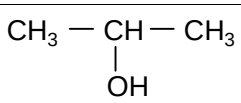
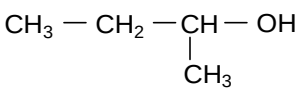
39. Cr^{VI} $\rightarrow$ Cr^{III}
(Yellow orange) (Green)
40. Victor Mayer test (RBC) - 1° alcohol - Red
2° alcohol - Blue
3° alcohol - Colourless

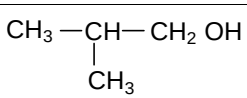
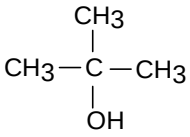
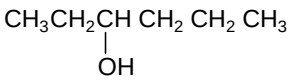
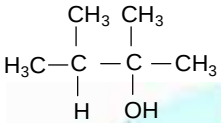
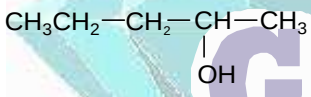
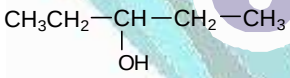
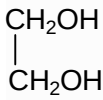
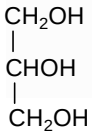
41. Phenol + Neutral ferric chloride solution - Violet
42. 2,4,6-tribromo phenol - White colour precipitate
43. $(CH_3)_2$ N – N = O - Yellow oil
44. p-hydroxy azobenzene - Red dye

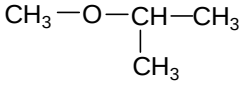
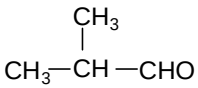
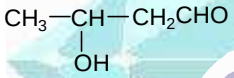
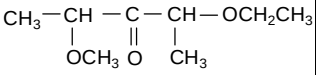
REACTION TYPE	REAGENTS / CONDITIONS
Bouveault Blanc Reduction	Na / C_2H_5OH
Cannizaro Reaction	OH^-
Dow's Process	623 K, 300 atm
Schottan Baumen reaction	NaOH
Kolbe's reaction	CO_2, 400 K, 4 – 7 atm, HCl
Riemer – Tiemann reaction	$CHCl_3$, NaOH
	CCl_4, NaOH
Lederer – Mannasse reaction	NaOH
Rosenmund Reduction	Pd / $BaSO_4$ ($BaSO_4$ – catalytic poison)
Stephen's reaction	$SnCl_2$ / HCl, hydrolysis
Clemmension Reduction	Zn / Hg / HCl
Wolf – Kishner Reduction	N_2H_4 / C_2H_5OH
	N_2H_4 / C_2H_5ONa
Claisen (or) Claisen Schimidt reaction	NaOH
Perkins reaction	Sodium acetate
Knoevenagal reaction	Pyridine
Fredal Crafts reaction	anhydrous $AlCl_3$
HVZ reaction	Br_2 / PBr_3, H_2O
Tollens test	Ammonia cal Silver Nitrate

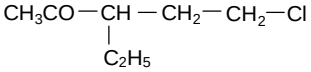
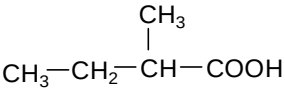
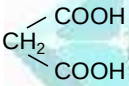
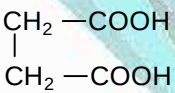
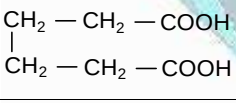
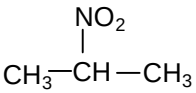
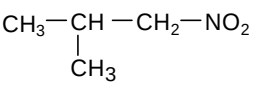
Fehling's Test	Copper Sulphate + Sodium potassium tartarate
Claisen Ester Condensation	C_2H_5ONa
Hoffman's reaction	Br_2 / KOH
Sandmayer reaction	HCl / Cu_2Cl_2, HCl / Cu_2Br_2
Gattermann reaction	Cu / HCl, Cu / HBr
Gomberg (or) Gomberg Bachmann	NaOH
Coupling reaction (dye test)	OH^-, 273 K
Phthalen Fusion reaction	H_2SO_4
Aldol condensation	NaOH
Haloform reaction	NaOH
Esterification	H^+
Trans esterification	H^+
Diazotisation	HCl
Mustard oil reaction	$HgCl_2$
Iodoform test	I_2/KOH

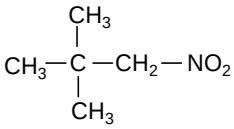
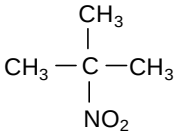
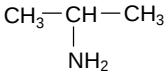
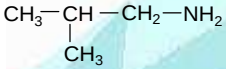
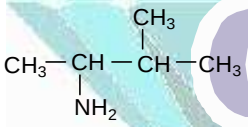
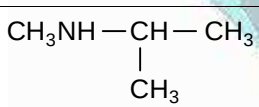
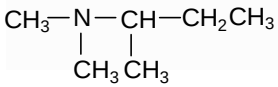
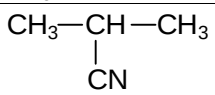
IUPAC NAMES OF ORGANIC COMPOUNDS

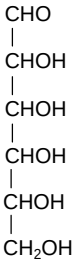
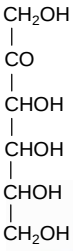
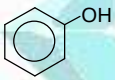
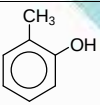
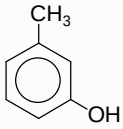
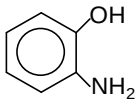
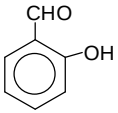
Chemical Formula	IUPAC	Common Name
Alcohol		
CH_3CH_2OH	Ethanol	Ethyl alcohol
$CH_3CH_2CH_2OH$	1-propanol	Propyl alcohol
	2-propanol	Iso propyl alcohol
	2-Butanol	sec – butyl alcohol

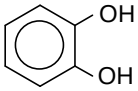
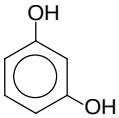
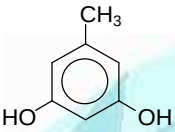
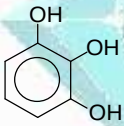
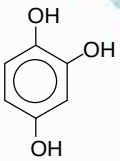
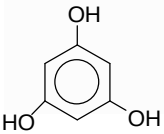
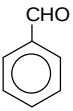
	2-methyl-1-propanol	Iso butyl alcohol
	2-methyl-2-propanol	Tertiary butyl alcohol
	3-Hexanol	–
	2,3-di methyl 2-butanol	–
$CH_3CH_2CH_2CH_2CH_2OH$	1-pentanol	–
	2-pentanol	–
	3-pentanol	–
	1,2-Ethane diol	–
	1,2,3-propanetriol	–
Ethers		
CH_3OCH_3	Methoxy methane	Dimethyl ether
$CH_3–O–C_2H_5$	Methoxy Ethane	Ethyl methyl ether
$CH_3–O–CH_2–CH_2–CH_3$	1-methoxy propane	Ethyl propyl ether

	2-methoxy propane	–
$C_6H_5OCH_3$	methoxy benzene	Anisole
$C_6H_5OC_2H_5$	ethoxy benzene	phenotole
$C_6H_5–O–C_6H_5$	phenoxy benzene	–
HCHO	Methanal	Formaldehyde
CH_3CHO	Ethanal	Acetaldehyde
	2-methyl propanal	–
$CH_2 = CH – CHO$	2-propenal	–
$CH_3 – CH = CH.CHO$	2-butenal	–
	3-hydroxy butanal	–
C_6H_5CHO	phenyl methanal	–
$C_6H_5CH = CH – CHO$	3-phenyl-2-propenal	Cinnamalde hyde
CH_3COCH_3	propanone	Dimethyl ketone (or) Acetone
$CH_3CO\ CH_2CH_3$	2-butanone	Ethyl methyl ketone
$CH_3CH_2\ COCH_2CH_3$	3-pentanone	Diethyl ketone
$CH_3\ CO\ CH_2CH_2CH_3$	2-pentanone	Methyl n-propyl ketone
$CH_3\ CO\ CH_2CH = CH_2$	4-pentene-2-one	Allyl methyl ketone
$CH_3\ CO\ C_6H_5$	Acetophenone	methyl phenyl ketone
$C_6H_5\ CO\ C_6H_5$	Benzophenone	Diphenyl ketone
	2-ethoxy-4-methoxy-3-pentanone	–

	3-ethyl- 5-chloro- 2-pentanone	–
$HCOOH$	Methanoic acid	Formic acid
CH_3COOH	Ethanoic acid	Acetic acid
CH_3CH_2COOH	Propanoic acid	–
$CH_3CH_2CH_2COOH$	Butanoic acid	Butric acid
$CH_3CH_2CH_2CH_2COOH$	Pentanoic acid	Valeric acid
	2-methyl Butanoic acid	–
	Ethane dioic acid	Oxalic acid
	Propane dioic acid	Malonic acid
	Butane dioic acid	Succinic acid
	Hexane dioic acid	Adipic acid
CH_3NO_2	Nitro methane	–
$CH_3CH_2NO_2$	Nitro Ethane	–
$CH_3CH_2CH_2NO_2$	1-Nitro propane	–
	2-Nitro propane	–
	1-Nitro-2, methyl propane	–

	1-Nitro-2, 2-dimethyl propane	–
	2-nitro-2-methyl propane	–
$CH_3–NH_2$	Amino methane	methyl-amine
	2-amino propane	isopropyl amine
$CH_3CH_2CH_2 – NH_2$	1-amino propane	n-propyl amine
	1-amino-2-methyl propane	Isobutyl amine
	2-amino-3-methyl butane	isopentyl amine
$CH_3NHCH_2CH_3$	N-methyl amino ethane	Ethyl methyl amine
	2-(N-methyl amino propane)	methyl isopropyl amine
	2-(N, N-dimethyl amino) butane	dimethyl sec. butyl amine
HCN	Methane Nitrile	hydrogen cyanide
CH_3CN	Ethane Nitrile	methyl cyanide
CH_3CH_2CN	Propane Nitrile	ethyl cyanide
	2-methyl propane nitrile (or) 2-cyano propane	Iso propyl cyanide

	2, 3, 4, 5, 6 – penta hydroxy hexanol	Glucose
	1,3,4,5,6 – penta hydroxy-2-hexanone	Fructose
	Hydroxy benzene	Phenol
	o-Hydroxy Toluene	o-cresol
	m-hydroxy toluene	m-cresol
	p-hydroxy toluene	p-cresol
	o-amino phenol	–
	2-hydroxy benzaldehyde	o-hydroxy benzaldehyde

	1,2 – dihydroxy benzene	Ortho dihydroxy benzene (or) catechol
	1,3-dihydroxy benzene	meta dihydroxy benzene (Resorcinol)
	1,4-dihydroxy benzene	p-dihydroxy benzene (or) p-quinol
	3,5-dihydroxy tolune	orcinol
	1,2,3-trihydroxy benzene	pyrogallol
	1,2,4-trihydroxy benzene	hydroxy quinol
	1,3,5-trihydroxy benzene	phluroglucinol
$C_6H_5CH_2OH$	phenyl methanol	Benzyl alcohol
	phenyl methanal	Benzaldehyde
$CH_3COC_6H_5$	Acetophenone	methyl phenyl ketone
$C_6H_5COC_6H_5$	Benzophenone	diphenyl ketone

USES OF INORGANIC AND ORGANIC COMPOUNDS

Potash Alum

- Purification of water, water proofing of textiles and in dyeing and paper industry.
- To arrest bleeding.

Silicones

- Insulator - water repellent - in textiles as lubricants and as polish.
- Mixed with paint for damp - resistant.
- Non-stick coating for pans and in paints and varnish.
- Used for high temperature oil bath, high vacuum pump.

Lead

- Lead pipes-telegraph and telephone wire-bullets and lead accumulators - lead champers-alloys like solder, pewter and type metal - tetra ethyl lead $Pb(C_2H_5)_4$.

Phosphorous trioxide [(P_2O_3) or (P_4O_6)]

- Dehydrating agent.

H_3PO_3-Phosphorus acid-used as Reducing Agent

H_3PO_4-Phosphoric acid

- Preparation of HBr and HI.
- Souring agent for soft drinks.
- Preparation of phosphate salt of sodium, potassium and ammonium.
- Manufacture of phosphatic fertilisers.

Phosphine-PH_3

- Smoke screens and Holme's signal.

Fluorine

- Manufacture of freons.
- CaF_2 - flux in metallurgy.
- NaF - preventing fermentation and dental cavities.
- SF_6 - insulting material in high voltage equipment.
- Teflon - to store hydrofluoric acid.
- UF_6 - separation of U^{235} and U^{238}.

Helium

- To fill balloons for metrological observations.
- Used in inflating aeroplane tyres.
- Nitrogen - oxygen mixture used by deep - sea divers.
- Mixture of oxygen and helium for treatment of asthma.
- Liquid helium - cryogenic agent.
- Used to produce super conducting magnets for NMR and MRI.

Neon

- In discharge tubes and fluorescent bulbs.
- Mixed with helium to protect electrical instruments from high voltage.
- Used in beacon lights for safety of air - navigation.
- Neon lights used in botanical gardens.

Argon

- Mixed with 28% nitrogen to fill electrical lamps.
- Used in radio valves and tubes.

Krypton and Xenon

- Used in filling incandescent metal filament electric bulbs.
- Used in discharge - tubes.

Radon

- Used in radioactive research and radio-therapy.

Copper

- Used to make electric cables, appliance, utensils, containers, calorimeters, coins.
- Used in electroplating.
- Used to make coins and jewellery.

Chromium

- In chrome plating, alloy steel manufactures (eg. Chrome steel, Chrome vanadium steel).
- Chrome nickel for armour plates.
- Chromium salts - mordants, coloured glass and pottery.
- Chromium compounds - dyeing and tanning of leather.

Zinc

- Used for galvanisation of iron sheets.
- In extraction of gold and silver.
- Zinc plates and rods in batteries and dry cell.
- Zinc dust and granulated zinc as reducing agents.

Silver

- Silver salts in silvering of mirrors and silver plating.
- AgBr in photography.
- Silver in making electrodes and medicines.
- Silver amalgam in dental filling.

Gold

- Used in coinage, jewellery, ornament vessels decorations and lettering.
- In medicine as tonic.
- Purple of cassius (gold with stannic hydroxides) in making ruby red glass and high class pottery.

Potassium dichromate

- Used in volumetric analysis, caligo printing, dyeing, photography and hardening gelatin film.
- Chrome tanning in leather industry.

Copper sulphate (or) Blue vitriol

- Used as germicide and insecticide.
- Copper sulphate and lime (Bordeaux mixture) as fungicide.
- Used in electroplating, calico printing and electrical batteries.

Silver nitrate or Lunar caustic

- As silver halides in photography.
- Used in silvering mirrors, marking inks, hair dyes, silver plating and laboratory reagent.

Zinc carbonate or Calamine

- Used in ointment for curing skin diseases.
- Used in cosmetics and pigment for rubber.

Purple of cassius or Colloidal gold

- In making ruby-red glass and high class pottery.

Lanthanides

- Pyrophoric alloy in cigarette lighter, toys flame throwing tanks and tracer bullets.

- Ceria, Thoria in gas lamp materials.
- Cerium salts in dyeing cotton, lead storage batteries and catalyst.
- Used in Lanthanido – thermic process.
- Alloy of lanthanides (Mish metal) used in heat resistant, stainless and instrumental steels.
- Mg-alloy (30% mish metal + 1% Zr) used in making jet engine parts.

Actinides

- U^{235}-fuel in nuclear power plants and in nuclear weapons.
- Plutonium-238 $\Rightarrow$ power source in long mission space probes.

Co-ordination Compounds

- Madder dye - red colour, copper phthalocyanine-blue colour.
- Colourimetric agents $\Rightarrow$ 2,2'-bypyridal and 1,10-phenanthroline.
- Gravimetric Analysis-chelating agents-$Ni(DMG)_2$ and $Al(oxine)_3$.
- Complexometric titrations and masking agent - EDTA.
- Chemotherapy $\Rightarrow$ anti-tumour drug. eg: cis-$Pt(NH_3)_2Cl_2$.
- Synthetic detergents-chelating agent – tripolyphosphate.

Radioactive Isotopes

- Tritium($_1H^3$) - measure water content of body.
- Carbon-11 $\Rightarrow$ (Brain scan), Carbon-14 $\Rightarrow$ Radio immunology.
- Iodine-131 $\Rightarrow$ diagnosis of damaged heart muscles and hyperthyroidism.
- Mercury-197 $\Rightarrow$ kidney scan.
- Phosphorous-32 $\Rightarrow$ detection of eye tumours.
- Iron-59 $\Rightarrow$ anemia, Cobalt-60 $\Rightarrow$ treat cancer.
- Sodium-24 $\Rightarrow$ locate blood clots & circulating disorder.
- Strontium-90 $\Rightarrow$ Thickness of coatings and level of liquids in tanks.

Methyl alcohol (or) Methanol

- Industrial solvent, antifreeze in automobiles and to produce formaldehyde.
- Methylated spirit or denatured spirit used in spirit lamp and solvent for wood polish.
- Methanol used as motor fuel with petrol.

Ethyl alcohol (or) Ethanol

- In alcoholic beverage, industrial solvent, pharmaceutical preparation, preservative for biological specimens, preparation of ether, iodoform, acetaldehyade and good solvent for recrystallisation.

Glycol (or) Ethane-1,2-diol

- Used as antifreeze in automobiles radiators, coolant in aeroplane engines, an explosive, solvent and preservative.
- Preparations of synthetic fibre, terylene and dioxan.

Glycerol (or) Propane-1,2,3-trol

- To manufacture explosive (TNG), antifreeze agent - sweetening agent in beverage - moisturing creams and other cosmetics - copying inks and stamp pad inks.

Benzyl alcohol (or) phenyl carbinol (or) phenyl methanol

- Used as local anaesthetic, antiseptic in ointments and as esters in perfumery.
- As esters in perfumery (Benzyl acetate – smell of Jasmine).
- As benzyl benzoate in treating asthma and whooping cough.
- Manufactures of synthetic resins.

Phenol (or) hydroxy benzene

- Used in manufactures of dyes, drugs, plastic, explosives, pesticide, antiseptic and germicide.

Diethyl ether (or) ethoxy ethane

- Used as refrigerant, anaesthetic, solvent for extraction of organic compounds.
- Medium for preparation of Grignard reagent.

Anisole (or) Methoxy benzene (or) Methyl phenyl ether

- Used in perfumery and a staring material in organic synthesis.

Formaldehyde (or) Methanal

- 40% aqueous solutions of formaldehyde (Formalin)-preservative for biological specimen and leather tanning.
- Urotropine - medicine for urinary infection.
- To decolourise vat dyes.
- To prepare Bakelite.

Acetaldehyde (or) Ethanol

- For silvering of mirror.
- Its trimer of paraldehyde is hypnotic.
- Preparation of chloroform, acetic acid, ethanol and acetic acid.

Benzaldehyde

- In the preparations of cinnamaldehyde, cinnamic acid and mandalic acid.
- Benzoin (dimer of benzaldehyde) used as tincture benzoin for throat infection.
- In perfumery as flavouring agent.

Acetone (or) Dimethyl ketone (or) Propanone

- Laboratory and industrial solvent.
- Preparation of tranquilisers like sulphonal.
- Manufacture of cordite.

Acetophenone (or) Methyl phenyl ketone

- Used as hypnotic (hypnone) and perfumary.

Benzophenone (or) Diphenyl ketone

- Used in perfumery and in preparation of benzhydrol and diphenyl methane.

Formic acid (or) Methanoic acid

- As mordants - leather tanning - coaugulating rubber latex - stimulant for growth of yeast - antiseptic - preservative for fruits - treatment of gout - Nickel formate as hydrogenation catalyst.

Lactic acid (or) α-hydroxy propionic acid

- Tanning industry - soft drinks - silver lactate as an antiseptic and astringent - treatment of digestive disorder in children.
- Preparations of lactates, ethyl lactate as solvent.

Oxalic acid (or) Ethane dioic acid

- For removing ink stains and iron stains - as mordent in dyeing and calico printing - ink and metal polishes - redox titration.

Succinic acid (or) Butane dioic acid

- Manufactures of lacquers and dyes - laboratory reagent.

Benzoic acid

- Urinary antiseptic - sodium benzoate used as food preservative - vapours used to disinfect bronchial tube - manufacture of dyes.

Salicylic acid (or) o-hydroxy benzoic acid

- Antiseptic and disinfectant - food preservative - medicine for rheumatic pain - preparations of azo dyes- manufactures of aspirin, salol, methyl salicylate.

Acetyl chloride

- As an acylating agent - organic reagent - preparations of acetic anhydride-detection and estimation of alcoholic and amino groups.

Acetic anhydride

- As an acetylating agent for manufacture of dyes, cellulose acetate-manufacture of aspirin and some drugs.

Methyl acetate

- Good laboratory and industrial solvent.
- Used for preparations of acetoacetic ester.

Acetamide

- Preparations of methyl cyanide - leather tanning - soldering flux - plasticiser in cloth.

Nitro Alkane

- Good solvents for a large number of organic compounds such as vinyl polymers, fat, waxes and dyes used in organic synthesis.

Nitro benzene

- Used to form corresponding amino compounds.
- To prepare explosive like TNT, 1,3,5-trinitro benzene.
- Used in making dye stuffs and pharmaceuticals.

Aniline

- For preparing dyes and dye intermediates.
- For the manufacture of anti oxidants in rubber industry.
- For preparing drugs.
- For making isocyanates required for polyurethane plastics.

Nitriles

- Synthetic reagent to prepare aldehydes, acids, amides, esters, amines, etc.
- Acrylo nitrile is used to prepare synthetic polymer like PAN.
- Acetonitrile is used as a solvent for extraction, crystallisation and as reaction medium

diazonium salts

- It is a very valuable intermediate in the preparation of many class of compounds like phenols, halides, cyanides etc.
- Laboratory reagent like phenyl hydrazine can be prepared.
- To manufacture azo dyes.