CHEMISTRY

IMPORTANT FORMULA

Lesson - 1

1. de Broglie equation is $\lambda = \frac{h}{mv} (or) \lambda = \frac{h}{p} p$ (momentum of the particle).
2. Photon is assumed to have **wave** character its energy is **E = hγ** (According to planck's quanturm of theory).
3. If the photon have **particle** character its energy is **E = mc^2** [According to Einstein's equation.
4. Kinetic energy of a particle = $\frac{mv^2}{2}$
5. Uncertainity principle $\Delta x.\Delta p \geq \frac{h}{4\pi}$
6. The energy of electron in an hydrogen atom is $E_n = -\frac{2\pi^2 me^4}{n^2h^2}$
7. The energy of hydrogen atom in the n^{th} orbital $E_n = \frac{-1312}{n^2} KJmol^{-1}$
8. Bond order = $\frac{N_b - N_a}{2}$

Lesson - 2

9. The radias of an homonuclear diatomic molecules is $r(A) = \frac{d(A-A)}{2}$
10. Heetronuclear diatomic molecules r(A)+r(B)=d(A-B)
11. Effective nuclear charge Z* = Z-S
12. According to pauling's scale, the electro negativities. $0.208\sqrt{\Delta} = X_A - X_B$
13. According to Mulliten's scale, the electro negativities is $E_N = \frac{IE + EA}{2}$

Lesson - 4

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

Lesson - 7

15. Equation of radio active reactions follows I order. $t = \frac{2.303}{\lambda} \log \frac{N_0}{N}$
16. The half life period of radio active substances is $t_{½} = \frac{0.693}{\lambda}$
17. Average life of radio active substance is $\tau (Tau) = 1.44 t_{\frac{1}{2}}$
18. The amount of energy absorbed (or) released during nuclear reaction is Q value, Q value=(m_p - m_r) x 931 Mev

19. The age of carbon material $t = \frac{2.303 \times t_{1/2}}{0.693} \log \frac{Amount\ of\ C \text{ in } freshwood}{Amount\ of\ C \text{ in } deadwood}$

Lesson - 8

20. In simple cubic the total no of atoms per unit cell is $\frac{N_C}{8} = \frac{8}{8} = 1$

21. The total number of atoms per unit cell in fcc is $\frac{N_C}{8} + \frac{Nf}{2} = \frac{8}{8} + \frac{6}{2} = 1 + 3 = 4$

22. The total no-of atoms per unit cell in BCC is $\frac{N_C}{8} + \frac{N_b}{1} = 1 + 1 = 2$

23. The bragg's equation is $n\lambda = 2d \sin\theta$

Lesson - 9

24. The % efficiency of heat engine = $[\frac{T_1 - T_2}{T_1}] \times 100$

25. The entropy change $\triangle s = \frac{d2}{T}$

26. The entropy of vapourisation is $\triangle s_{vap} = \frac{\triangle Hvap}{T_b}$

27. Transition of the entropy change $\triangle s_{Trans} = \frac{\triangle H_{Trans}}{T_b}$

28. The relation between enthalpy and entropy $\triangle G = \triangle H - T\triangle S$

Lesson - 11

29. Rate of Reaction = $\frac{dx}{dt}$

30. Rate equation for first order reaction $K_1 = \frac{2.303}{t} \log \frac{a}{a-x}$

31. The rate constant for first order $k_1 = \frac{0.693}{ty_2}$

32. Half life period first order reaction t_{y_2} = $\frac{0.693}{K_1}$

33. The rate constant for acid presence ester hydrolysis $K_1 = \frac{2.303}{t} \log_{10} \frac{(v_\alpha - v_0)}{(v_\alpha - v_t)}$

34. Arrhenices equation $K = Ae^{-Ea/RT}$

35. The Relationship between degree of dissociation between λc and $\lambda\alpha$ $\alpha = \frac{\lambda c}{\lambda\alpha}$
36. Degree of dissociation for a weak acid $K_a = \alpha^2 c$
37. Degree of dissociation for a weak base $K_b = \alpha^2 c$
38. Electro chemical equivalent Z = mit
39. Ohm's law I = V/R.
40. Resistance $R = \varphi(I / a)$
41. Specific resistance K = (1/R) x (l/a)
42. Equivalent conductance $\lambda_c = K \times V$
43. Molar conductance $\mu_c = K \times V$
44. $P^H = -\log_{10}[H^{-1}]$
45. Henderson equation for acid Buffer $PH = pK_a + \log \frac{[\text{Salt}]}{[\text{Acid}]}$
46. Henderson equation for Basic Buffer $PH = pK_b + \log \frac{[\text{Salt}]}{[\text{Base}]}$

One mark questions:-

Choose the correct answer

INORGANIC CHEMISTRY

1.ATOMIC STRUCTURE – II

1. If $En = \frac{-313.6}{n^2}, E$ if the value of Ei = -34.84 to which value 'n' corresponds. 3
2. Who explained Dual character of an electron? de-Broglie
3. de-Broglie equation? $\lambda = \frac{h}{mv}$
4. The value of bohr radius for hydrogen atom? 0.529×10^{-8}cm
5. Which of the following particle having same kinetic energy would have the maximum de-Broglie wave length? β-particle
6. If the energy of an electron in the second bohr orbit of H-atom is -E, what is the energy of the electron is the Bohr's first orbit? -4E.

7. The energy of electron in an atom is given by $E_n = \frac{-2\pi^2 me^4}{n^2h^2}$
8. The bond order of oxygen molecule? 2
9. The hybridization in SF_6 molecule? sp^3d^2
10. The intramolecular hydrogen bonding is present in? O-nitrophenol.

2. PERIODIC CLASSIFICATION – II

1. The value of C-C distance found experimentally in a saturated hydrocarbon? 1.54Å.
2. On moving down the group the radius of an ion increases.
3. Effective nuclear charge (Z*) can be calculated by using the formula Z*=Z-S
4. Carbon having more nuclear charge than boron.
5. Comparing the ionization energy of fluorine with carbon fluorine has higher ionization energy.
6. Which has the maximum ionization energy? Noble gases.
7. The electron affinity of an atom inversely proportional to its size.
8. Which has higher electron affinity value? Chlorine.
9. The scale which is based on an empirical relation between the energy of a bond and the electrogativites of bonded atom? Pauling scale.
10. Electron affinity is expressed in KJ mol^{-1}
11. The bond length of cl_2 molecule? 1.98 Å
12. The order of ionization energy? S>p>d>f.
13. Across the period, electron affinity Increases.
14. Noble gases have ……electron affinity. Zero
15. When $X_A >> X_B$, A-B bond is Ionic.

P – BLOCK ELEMENTS

1. Among B, Al, Ge, In which of the following dose not belong to group 13? Ge
2. Among C, Si, Ge, Sn which of the following is most abundant in earth's crust? Si

3. An element which was burnt in most limited supply of air to give oxide A which on treatment with water gives an acid B. Acid B on heating gives acid C which gives yellow precipitate with $AgNo_3$ solution A is P_2O_3
4. The compound with garlic odour is P_2O_3.
5. The shape of PCl_5 is trigonal bipyramidal.
6. The compound used as smoke screen PH_3
7. Which shows only negative oxidation state? Fluorine.
8. One can draw the map of building on a glass plate by HF
9. Among the halogen acid the weakest acid is HF.
10. Halogens belongs to the group number? 17.
11. The noble gasses are un reactive because they have stable electronic configuration.
12. The shape of XeF_4 is square planar.
13. Among XeF_6, XeF_4, XeO_3, ArF_6 which is not known? ArF_6.
14. The lightest gas which is non-inflammable? He.
15. Which of the following has highest first ionization energy? He.

d-BLOCK ELEMENTS

1. The general electronic configuration of d-block element is $(n-1)d^{1-10}ns^{1-2}$
2. Formation of coloured ions is possible when compounds contain unpaired electrons.
3. Paramagnetism is common in d-block elements.
4. The colour of $Ti(H_2O)_6^{3+}$ ions is due to d-d transistion.
5. The electronic configuration of chromium is $3d^5 4s^1$
6. Paramagnetics is the property of unpaired electrons.
7. d-block elements form coloured ions because they absorb some energy from d-d transition.
8. The correct electronic configuration of copper atom is $3d^{10}4s^1$
9. Copper is extracted from copper pyrites

10. Silver salt used is photography is AgBr.
11. Sodiumthiosulphate is used in photography because of its complexing behaviour.
12. Excess of sodium hydroxide reacts with zinc to form Na_2Zno_2.
13. Which of the following compounds will give positive chromyl chloride test C_6H_5Cl
14. Among Ni^{2+}, Fe^{2+},Co^{2+},Cu^{+} which of the ions will give colourless aqueous solution Cu^{+}
15. Among Na_2CuCl_4, $Na_2C\ dI_4$, $K_4[Fe(CN)_6]$, $K_3[Fe(CN)_6]$ which of the following compounds is not coloured $Na_2cd\ I_4$.
16. In the extraction of Cu, the reaction which does not takes place in the Bessemer converter is $2CuFeS_2+O_2 \rightarrow Cu_2S + FeS + SO_2$
17. Correct statement: Mercury is a liquid metal.
18. The wrong statement regarding $K_2Cr_2O_7$ It reduces ferric sulphate to ferrous sulphate.
19. For a transistion metal, the effective magnetic moment in BM is given by the formula $\sqrt{n(n+2)}$ BM
20. The correct statement in respect of d-block elements is

    a)They are all metals. b)They show variable valency.

    c)They form coloured ions and complex salts.

    d)All above statement are correct.
21. Which compound is formed when excess of KCN is added to an aqueous solution of copper sulphate $Cu_2(CN)_2+(CN)_2$.
22. Among Mg^{+2},Ti^{3+},V^{3+},Fe^{2+} which of the following has the maximum number of unpaired electrons Fe^{2+}
23. The incorrect statement Argentite and culpric ores are oxides.
24. The chemical composition of slag formed during the smelting process in the extraction of copper is $FeSiO_3$
25. The transition element with low atomic number? Scandium.
26. Which transition element show highest oxidation state? Os.

Lesson – 5

f – BLOCK ELEMENTS

1. The electronic configuration of lanthanides is $[Xe]4f^{1-14}5d^{0-1}6s^2$
2. The electronic configuration of Actinides is $[Rn]5f^{0-14}6d^{0-2}7s^2$
3. The lanthanide contraction is responsible for the fact that Zr and Hf have the same oxidation state.
4. The most common oxidation state of lanthanides is +3
5. The Lanthanides are extracted from Monazite.
6. The elements in which the extra electron enters (n-2)f orbitals are called f block elements.
7. The Lanthanide contraction is due to imperfect shielding of 4f electron.
8. Ceria is used in gas lamp materials.
9. CeO_2 is used in gas lamp materials.
10. Alloy of Lanthanides are called as Mish-metals.
11. Metallo thermic process involving Lanthanides are called as Lanthanido-thermic process.
12. Actinides form oxocations.
13. Maximum oxidation state exhibited by Lanthanides is +4.
14. Lanthanides are separated by Fractional crystallisation.
15. The electronic configuration of Gadolenium is $[Xe]4f^7 5d^1 6s^2$

Lesson – 6

COORDINATION COMPOUNDS AND AND BIO COORDINATION COMPOUNDS

1. An example for double salt $K_2SO_4.Al_2(So_4)_3 24H_2O$
2. An example of a complex compound having coordination number 4 $[Cu(NH_3)_4]Cl_2$
3. The geometry of $[Cu(NH_3)_4]^{2+}$ complex ion square plannar
4. An example of a chelating ligand is en
5. The geometry of complex ion $[Fe(CN_6)]^{4-}$ is octahedral

6. The oxidation number of nickel in the complex ion $[NiCl_4]^{2-}$ is +2.
7. Which is not an anionic complex? $[Cu(NH_3)_4]Cl_2$
8. The geometry of $[Ni(CN)_4]^{2-}$is square planar
9. An example of an ambidentate ligand is NO_2^-
10. $[FeF_6]^{4-}$ is paramagnetic because F^- is a weaker ligand.
11. In $[Fe^{11}(CN)_6]^{4-}$,the central metal ion is Fe^{2+}
12. The coordination number of Ni (II) in $[Ni(CN)_4]^{2-}$ is 4
13. The name of $[Pt^{IV}(NH_3)_2Cl_2]^{2+}$is Diamminedichloroplatinum (IV) ion.
14. For a compound $K_4[Fe(CN)_6] \rightarrow 4K^+ + [Fe(CN)_6]^{4-}$ the complex ion is $[Fe(CN)_6]^{4-}$
15. A metal ion from the first transition series forms an octahedral complex with magnetic moment of 4.9 BM and another octahedral complex which is diamagnetic. The metal ion is Fe^{2+}
16. Paramagnetic moment is expressed in BM.
17. The type of isomerism found in the complexes $[Co(NO_2)(NH_3)_5]So_4$ and $[Co(So_4)(NH_3)_5]NO_2$ Ionisation.
18. Valence bond theory does not explain magnetic property of complex compound.

Lesson – 7
NUCLEAR CHEMISTRY

1. The phenomenon of radioactivity was discovered by Henry Becquerel.
2. The most penetrating radiations are γ Rays.
3. In the nuclear reaction, $_{92}U^{238} \rightarrow_{82} Pb^{206}$ the number of α & β particles emitted are 8α, 6β
4. Which one of the following particles is used to bombared $_{13}Al^{27}$ to give $_{15}P^{30}$ and neutron α particles.
5. The reaction $_5B^8 \rightarrow_4 Be^8$ takes place due to positron decay.
6. Radio activity is due to unstable nucleus.
7. In the following radio active decay, $_{92}X^{232} \rightarrow_{89} Y^{220}$ how many α ana β particles are ejected . 3α and 3β.

8. $_{92}U^{235}$ nucleus absorbs a neutron and disintegrates into $_{54}Xe^{139}$, $_{38}Sr^{94}$ and X. What will be the product? 3 Neutrons.
9. Which of the following is used as neutron absorbss in the nuclear reactor? Cadmium.

Lesson – 8

SOLID STATE – II

1. The nmber of chloride ions that surrounds the central Na^+ ion in Nacl crystal is 6.
2. The Braggs equation is $n\lambda = 2d\ sin\theta$
3. A regular three dimensional arrangement of identical points in space is called space lattice.
4. The smallest repeating unit in space lattice which hen repeated over and again results in the crystal of the given substance is called Unit cell.
5. The crystal structure of CsCl is bcc.
6. An example for the Frenkel defect is AgBr.
7. Semiconductors which exhibit conductivity due to the flows of excess negative electrons are called n – type semiconductors.
8. In the Bragg's equation for diffraction of X-Rays, 'n' represents order of reflection.
9. The number of close neighbours in a body centred cubic lattice of identical sphere is 8.
10. The crystal which are good conductors of electricity and heat are Metallic crystals.
11. In a simple cubic cell, each point on a corner is shared by 8 unit cell.
12. The ability of certain ultra cold substances to conduct electricity without resistance is called superconductor.
13. The total number of atoms per unit cell in bcc is 2.
14. Rutile is TiO_2.
15. Semiconductors are used as rectifiers, transistors, solar cells, all the above.
16. An example of metal deficiency defect FeS.

Lesson – 9

THERMODYNAMICS – II

1. The amount of heat exchanged with the surrounding at constant temperature and pressure is called $\triangle H$

2. All the naturally occurring process proceed spontaneously in a direction which leads to decrease of free energy.
3. In an adiabatic process which of the following is there? q = 0.
4. When a liquid boils, there is an increase in entropy.
5. If $\triangle H$ for a reaction is negative, the change is spontaneous.
6. Which of the following does not result in an increase in the entropy?
   Crystallisation of sucrose from solution.
7. In which the following process, the process is always non – feasible? $\triangle H > 0, \triangle S < 0$
8. Change in Gibb's free energy is given by $\triangle G = \triangle H - T\triangle S$
9. For a reaction $2Cl_{(g)} \rightarrow Cl_{2(g)}$ the signs of $\triangle H$ and $\triangle S$ respectively are -,-

Lesson – 10

CHEMICAL EQUILIBRIUM

1. State of chemical equilibrium is dynamic.
2. If the equilibrium constants of the following reactions are $2A \rightleftarrows B$ is K_1 and $B \rightleftarrows 2A$ is K_2 then K1 = 1/K_2 In the reversible reaction $2HI \rightleftarrows H_2 + I_2$, Kp is equal to k_c.
3. In the equilibrium $N_2 + 3H_2 \rightleftarrows 2NH_3$ the maximum yield of ammonia will be obtained with the process having high pressure and low temperature.
4. For the homogeneous gas reaction at 600K $4NH_{3(g)} + 5O_{2(g)} \rightleftarrows 4NO_{(g)} + 6H_2O_{(g)}$ the equilibrium constant Kc has the unit (mol d m^{-3})
5. Two moles of ammonia gas are introduced into a previously evacuated 1.0 dm^3 vessel in which it partially dissociates at high temperature. At equilibrium 1.0 mole of ammonia remains. The equilibrium constant K_C for the dissociation is 27/16(mole $dm^{-3})^2$
6. An equilibrium reaction is endothermic if K_1 and K_2 are the equilibrium constants at T_1 and T_2 temperatures respectively and if T_2 is greater than T_1 then K_1 is less than K_2

11. CHEMICAL KINETICS - II

1. Hydrolysis of an ester by dilute Hcl is an example for pseudo first order reaction.
2. The unit of zero order rate constant is mole $liter^{-1}sec^{-1}$
3. The excess energy which a molecule must poseses to become active is known as activation energy.

4. Arrhenius equation is $K = Ae^{-Ea/RT}$
5. The term A in Arrhenius equation is called as Frequency Factor.
6. The sum of the powers of the concentration terms that occur in the rate equation is called order.
7. Reactions in which the reacting molecules react in more than one way yielding different set of products are called parallel reactions.
8. The half life period of a first order reaction is 10 minutes. Then its rate constant is $6.932 \times 10^{-2} min^{-1}$
9. For a reaction $aA \rightarrow bB$ the rate of reaction is doubled when the concentration of A is increased by four times. The rate of reaction is equal to $K[A]^{\frac{1}{2}}$
10. $2NO_2O_5 \rightarrow 4NO_2 + O_2, \frac{d[N_2O_5]}{dt} = K_1[N_2O_5], \frac{d[O_2]}{dt} = K_2[N_2O_5]$ and $\frac{d[O_2]}{dt} = K_3[N_2O_5]$, the relation between K_1,K_2 and K_3 is $2K_1 = K_2 = 4K_3$
11. For a reaction, $E_a = 0$ and $K = 4.2 \times 10^5 \text{ sec}^{-1}$ at 300K, the value of K at 310K will be $K = 4.2 \times 10^5 \text{ sec}^{-1}$

12.SURFACE CHEMISTRY

1. The migration of colloidal particles under the influence of an electric field is known as electrophoresis.
2. Which one is the correct factor that explains the increase of rate of reaction by a catalyst lowering of activation energy.
3. Fog is a colloidal solution of liquid in gas.
4. The phenomenon of Tyndall's effect is not observed in true solution.
5. The Tyndall's effect associated with colloidal particles is due to scattering of light.
6. Incase of physical adsorption, there is desorption when temperature increases.
7. Colloidal medicines are more effective because they are easily assimilated and adsorbed.
8. Oil soluble dye is mixed with emulsion and emulsion remains colourless then, the emulsion is O/W.
9. For selective hydrogenation of alkynes into alkene the catalyst used is Pd, partially, inactivated by quinoline.

10. For chemisorptions, which is wrong it forms multimolecular layers on adsorbate.
11. An emulsion is a colloidal solution of two liquids.
12. Colloids are purified by dialysis.

13. ELECTROCHEMISTRY – I

1. A process in which chemical change occurs on passing electricity is termed as electrolysis.
2. The laws of electrolysis were enunciated first by Faraday.
3. When one coulomb of electricity is passed through an electrolytic solution, the mass deposited in the electrode is equal to electrochemical equivalent.
4. Faraday's laws of electrolysis are related to equivalent weight of the electrolyte.
5. The specific conductance of a 0.01m solution of KCl is 0.0014 $ohm^{-1}cm^{-1}$ at 25^0C. Its equivalent conductance is 140 $ohm^{-1}cm^2eq^{-1}$
6. The equivalent conductivity of CH_3COOH is 0.2
7. When sodium acetate is added to acetic acid, the degree of ionization of acetic acid decreases.
8. NH_4OH is a weak base because it is only partially ionized.
9. Which one of the following formulae represents Ostwald's dilution law for a binary electrolyte whose degree of dissociation is α and concentration C. $K = \frac{\alpha^2 C}{1-\alpha}$
10. Oswald's dilution law is applicable in the case of the solution of CH_3COOH.
11. Which one of the following relationship is correct? $pH = -\log_{10} \frac{1}{[H^+]}$
12. When 10^{-6} mole of a monobasic strong acid is dissolved in one litres of solvent the pH of the solution is 6.
13. When pH of a solution is 2, the hydrogen ion concentration in moles $litre^{-1}$ is $1x10^{-2}$
14. The pH of a solution containing 0.1N NaOH solution is 13
15. The solution which is resistant to change of pH on a addition of small amounts of an acid or a base is known as Buffer solution.

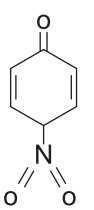
16. The Hydrogen ion concentration of a buffer solution consisting of a weak acid and its salt is given by $[H^+] = K_a \frac{[Acid]}{[Salt]}$
17. Indicators used in acid – base titration are weak organic acids or weak organic bases.
18. For the titration between oxalic acid and sodium hydroxide, the indicator used is phenolphthalein.

16. HYDROXY DERIVATIVES

1. Which has the highest boiling point? C_2H_5OH
2. Which is soluble in H_2O Alcohols.
3. Order of reactivity of alcohol towards sodium metal is primary>Secondary>tertiary
4. The boiling point of ethyl alcohol should be less than that of Formic acid.
5. Ethyl alcohol cannot be used as a solvent for CH_3MgI because CH_3MgI reacts with alcohol giving methane.
6. When alcohols are converted to alkyl chlorides by thionyl chloride in presence of pyridine the intermediate formed is alkyl chlorosulphite.
7. On oxidation of an alcohol gives an aldyhyde having the same number of carbon as that of alcohol. The alcohol is 1°alcohol.
8. A compound that gives a positive Iodoform test is 2-Pentanone.
9. The compound that reacts fastest with lucas reagent is 2-Methyl propan 2-ol
10. The ionization constant of phenol is higher than that of ethanol because phenoxide ion is stabilized through delocalization.
11. Among the following compounds strongest acid is

    (a) HC ≡ CH (b) C_6H_6 (c) C_2H_6 (d) CH_3OH Ans: CH_3OH

12. The most unlikely representation of resonance structures of P-nitrophenoxide ion is
13. P-nitrophenol is having lower Pk_a value than phenol because anion of P-nitrophenol is more stablished by resonance than that of phenol
14. The reaction of Lucas reagent is fast with $(CH_3)_3COH$
15. When phenol is distilled with Zn dust it gives bezene.
16. A compound that under goes bromination easily is phenol.



17. Isomerism exhibited by ethylene glycol is Functional isomerism.
18. Ethylene diamine is converted to ethylene glycol using nitrous acid.
19. Ethylene glycol forms terylene with terphthaleic acid.
20. 1-Proponal and 2-Proponal can be best distinguished by oxidation by heating with copper followed by reaction with Fehling solution.
21. Glycerol is used as a sweeting agent, in the manufacture of good quality soap, in the manufacture of nitro glycerine.
22. The alcohol obtained by the hydrolysis of oils and fats is glycerol.
23. The number of secondary alcoholic group in glycerol is 1.
24. The active component of dynamite is Nitro glycerine.
25. The reaction of ethylene glycol with PI_3 gives $CH_2 = CH_2$

17 – ETHERS

1. The isomerism exhibited by $C_2H_5OC_2H_5$ and $CH_3O\overset{\overset{CH_3}{|}}{C}H\text{-}CH_3$ is Metamerism.
2. Which one of the following is a simple ether? $C_2H_5OC_2H_5$
3. Diethyl ether can be decomposed with HI
4. Oxygen atom of ether is Comparatively inert.
5. According to lewis concept of acids and bases ethers are Basic.
6. Intermolecular hydrogen bonds are not present in $C_2H_5OC_2H_5$
7. When ethyl Iodide is treated with dry silver oxide it forms diethyl ether.
8. William Son's synthesis is an example for Nucleophilic substitution reaction.
9. When ether is exposed to air for sometime on explosive substances produced is peroxide.
10. Ether is formed when alkylhalide is treated with sodium alkoxide. This method is known as williamson's synthesis.

18. CARBONYL COMPOUNDS

1. The chain Isomer of 2-methyl propanal is butanol.
2. Schiff's reagent gives pink colour with acetaldehyde.
3. Isopropyl alcohol vapours with air over silver catalyst at 520K gives acetone.
4. Methyl ketones are usually characterized by the iodoform test.
5. Which of the following compounds is oxidized to give ethyl methyl ketone? 2-butanol.
6. Formaldehyde polymerises to give para formaldehyde.
7. Tollen's reagent is ammoniacal silver nitrate.
8. When acetaldehyde is heated with fehling solution it gives a precipitate of Cu_2O
9. The compound that does not under go cannizzaro reaction is acetaldehyde.
10. The formation of cyanohydrins from a ketone is an example of nucleophilic addition .
11. Hydrogen anion of benzoyl chloride in the presence of pd and $BaSo_4$ Gives benzaldyhyde.
12. From which of the following tertiary butyl alcohol is obtained by the action of methyl magnesium Iodide? CH_3COCH_3
13. During reduction of aldehydes with hydrazine and C_2H_5ONa the product formed is R - CH_3
14. Aldol is 3 – hydroxy butanal.
15. In the reduction of acetaldehyde using $LiAlH_4$ the hydride ion acts as nuclephile.
16. Which of the following statement is wrong? Aldehydes and ketones undergo nucleophilic substitution.
17. A cyanohydrin of a compound X on hydrolysis gives Lactic acid. The X is CH_3CHO
18. The IUPAC name of CH_3-C=CH-C-CH_3 is 4-methylpent-3-en-2-one.

$$\begin{array}{cc} | & || \\ CH_3 & O \end{array}$$

19. Which of the following does not give Iodoform test? Benzophenone.
20. The compound which does not reduce fehling solution is Benzaldehyde.

21. $CH_3COCH_3 \xrightarrow{con.H_2SO_4}$ the product is mesitylene.
22. Which compound on strong oxidation gives propionic acid $CH_3CH_2CH_2OH$
23. The compound used in the preparation of the tranquilizer. Sulphonal is acetone.
24. Calcium acetate + Calcium benzoate gives acetophenone.
25. Bakelite is a product of reaction between phenol and methanol.

19. CARBOXYLIC ACIDS

1. Which of the following is least acidic C_2H_5OH
2. Weakest acid among the following is Acetylene.
3. Ester formation involves the reaction of an acetic acid with an alcohol.
4. Heating a mixture of sodium acetate and soda lime gives methane.
5. The acid which reduces Tollen's reagent is Formic acid.
6. The IUPAC name of $CH_3\text{-}CH_2\text{-}\overset{CH_3}{\underset{|}{C}}H\text{-}COOH$ is 2 – methyl butanoic acid.
7. The Isomerism exhibited by CH_3CH_2COOH and CH_3COOCH_3 is functional.
8. The acid that cannot be prepared by Grignard reagent Formic acid.
9. Which order of arrangement is correct in terms of the strength of the acid.
   $CH_3\text{-}CH_2COOH < CH_3COOH < HCOOH < ClCH_2COOH$
10. The compound which under goes inter molecular dehydration with P_2O_5 is Formic acid.
11. $\begin{matrix} H \\ \diagdown \\ HO \end{matrix}\!\!>\!C{=}O$ gives $\xrightarrow{160^\circ c}$ The product is $H_2 + CO_2$
12. When chlorine is passed through acetic acid in presence of red P, it forms. Trichloro acetic acid.
13. Which of the following compounds will react with $NaHCO_3$ solution to give sodium salt and CO_2? Acetic acid.
14. When propanoic acid is treated with aqueous sodium –bicarbonatate , CO_2 is liberated. The “C” of CO_2 comes from bicarbonate.
15. Carboxylic acid are more acidic than phenol and alcohol because of greater resonance stabilization of their conjugate base.
16. Among the following the strongest acid is Cl_3CCOOH

17. Which of the following compound is optically active? $CH_3CH(OH)COOH$
18. $CH_3CH(OH)COOH$ gives H_2O_2/Fe^{2+}? The product is $CH_3COCOOH$
19. The compound found in some stony deposit in kidney is Calcium oxalate.
20. Ethylene cyanide on hydrolysis using acid gives succinic acid.

20. ORGANIC NITROGEN COMPOUNDS

1. Bromo ethane reacts with silver nitrate to give $C_2H_5NO_2$
2. The Isomersism exhibited by $CH_3\text{-}CH_2\text{-}N\overset{O}{\underset{O}{<}}$ and $CH_3CH_2\text{-}O\text{-}N{=}O$ is Functional
3. In nitro alkanes $-NO_2$ group is converted to $-NH_2$ group by the reaction with Sn/HCl
4. When nitromethane is reduced with Zn dust + NH_4Cl in neutral medium, we get CH_3NHOH
5. The compound that is most reactive towards electrophilic nitration is Toluene.
6. Nitromethane condenses with acetaldehyde to give 1 – nitro – 2 –propanol.
7. Which of the following compounds has the smell of bitter almonds Nitrobenzene.
8. Nitration of nitrobenzene result is m-dinitric benzene.
9. Nitrobenzene on electrolytic reduction is with con.Sulphuric acid, the intermediate formed is $C_6H_5 - NHOH$
10. Electrophile used in the nitration of benzene is nitronium ion.
11. The reduction of $CH_3 - CH_2 - C \equiv N$ with sodium and alcohol result in the formation of $CH_3 - CH_2 - CH_2 - NH_2$
12. The basic character of amine is due to the Lone pair of electrons on nitrogen atom.
13. The organic compound that undergoes carbylamine reaction is $C_2H_5NH_2$
14. Primary amine act as Lewis acid.
15. Oxidation of aniline with acidified potassium dichromate gives p-benzo quinine.
16. Which of the following is a secondary amine? Diphenyl amine.
17. $C_6H_5NH_2 \xrightarrow{NaNO_2/HCl}$ X.Identify X. $C_6H_5N_2Cl$
18. Which of the following will not undergo diazotization benzyl amine.

19. Aniline differs from ethylamine by the reaction with nitrous acid.
20. When aqueous solution of benzene diazonium chloride is boiled the product formed is phenol.

21. BIOMOLECULES

1. Which is a mono saccharide among the following Glucose.
2. Identify the reducing sugar. Glucose.
3. Sucrose is not hydrolysed to only glucose.
4. Sucrose contains glucose and fructose linked by $C_1 – C_2$
5. Glucose is not oxidized to gluconic acid by conc.HNO_3
6. Inverson of sucrose refer to hydrolysis of sucrose to glucose and fructose.
7. Glucose forms penta acetate with acetic anhydride and sodium acetate.
8. The amino acid without chiral carbon is Glycine.
9. The building blocks of proteins are α – amino acids.
10. Which is not true of amino acid? Amino acid is insoluble in NaoH solution.
11. Two amino acids say A, B, react to give two peptide.
12. A di peptide does not have two peptide units .
13. Proteins are not sensitive to water.
14. Denaturation does not involve breaking up of H – bonding in proteins.
15. Specificity of enzyme is due to the sequence of amino acids, secondary structure, tertiary structure all the above.
16. Ultimate products of hydrolysis of proteins is amino acid.
17. Proteins are polypeptides.
18. Which of the following contains a lipid? Edible oil.
19. Which among the following contains triglyceride? Cooking oil.
20. Which contains a long chain ester? Wax.
21. An example of a fatty acid obtained from a cooking oil is stearic acid.
22. Which is not a saturated fatty acid? Glyceric acid.

23. Alkaline hydrolysis of cooking oil gives soap and Glycerol.

24. Hair and nail contains. Keratin.

25. Imporatant constitution of cell wall is cellulose.

3 Marks

1.ATOMIC STRUCTURE

1. State Heisenberg's uncertainty principle.

"It is impossible to measure simultaneously both the position and velocity of a microscopic particle with absolute accuracy (or) certainty"

$$\triangle x.\triangle p \geq h/4\pi$$

$\triangle x$ = Uncertainty is the position of the particle.

$\triangle p$ = Uncertainty is the momentum of the particle.

2. What is Bond order?

Bond order is defined as half the difference between the number of electrons is bonding molecular orbitals (Nb) and the number of electrons in the anti bonding molecular orbitals (Na) Bond oder = $\frac{1}{2}[Nb - Na]$

Na = Number of electrons in bonding molecular orbitals.

Nb = Number of electrons in anti bonding molecular orbitals.

3. Why He_2 is not formed?

The electronic configuration of Helium is $1S^2$

'He' atom = $2e^-$

He_2 molecule = $4e^-$

He_2 : $\sigma 1s^2$ $\sigma^* 1s^2$

Nb = 2, Na = 2.

Bond Order = $\frac{2-2}{0} = 0$

Reason : As the bond order for the He_2 comes out to be zero. So this molecule does not exit.

4. What are molecular Orbitals ?

In a molecule electrons are present is new orbital called molecular orbitals. Molecular orbitals are formed by combination of atomic orbitals of equal energies.

5. What did you understand by the dual character of matter?

All material particles possessed both wave character as well as particle character. The wave associated with a particle is called a matter wave . dual character of an electrons was explained by de-Broglie.

6. Differentiate wave and particle.

PARTICLE	WAVE
1. A Particle is localized in space.	1.A wave is delocalized in space.
2. Particle do not interfere.	2.Waves can interfere.
3. The total number of particle in a space is equal to their sum.	3.The resultant wave can be larger (or) smaller than the individual wave.

7. What is the significance of negative electronic energy?

The energy of an electron at infinity is arbitrarily assumed to be zero. This state is called zero energy state.

When an electron moves and comes under the influence of nucleus. It does some work and spends its energy in this process.

Thus the energy of the electron decrease and it becomes less than zero. i.e. it acquires a negative value.

8. Define Hybridization.

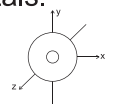
Hybridization is the concept of inter mixing of the orbitals of an atom having the same energy to give exactly equivalent orbitals with same energy, identical shape and symmetrical orientations in space.

9. What are the conditions for the effective H-bond formation?

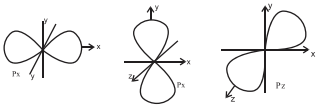
High electro negativity of the atom bonded to hydrogen atom. So that bond is sufficiently polar.

Small size of the atom bonded to hydrogen. So that it is able to attract bonding electron pair effectively.

10. Draw the structure of s, p, d orbitals.

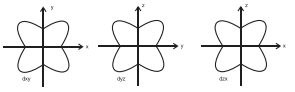
S – orbital – spherical shape. 

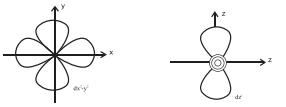
P – orbital – dumb bell shape.



d – orbital dxy, dyz, dzx – clover leaf shape lie in planes.

$dx^2 – y^2$ – clover leaf shape lie along axes.



dz^2 – dumbbell shape with a dough nut 

2.PERIODIC CLASSIFICATION – II

1. Mention the disadvantages of Pauling and Mulliken scale.

Disadvantages of Pauling's Scale:-

The disadvantage of Pauling's scale is that bond energies are not known with any degree of accuracy for many solid elements.

Disadvantages of Mulliken's Scale:-

It suffers from a serious disadvantage that electron affinities with the exception of a few elements are not reliably known.

2. Why E.A. of fluorine is less than that of chlorine?

Small size of fluorine atom.

It makes the 2p subshell more compact. This results in repulsion among electrons of the valence shell and also with electron to be added.

Due to this 'F' atom has less tendency to accept electron.

3. I.E. of Be is greater than that of B. why?

Be(z=4) $1s^2\ 2s^2$ B(z = 5) $1s^2\ 2s^2\ 2px^1$

1.Beryllium has fully filled 2s subshell and it is more stable than boron.

2.Due to symmetry, more energy would be needed to remove an electron from Be, Hence 'Be' has high I.E. than 'B'

4. Compare Ionization energy of Nitrogen and Oxygen.

N = (z = 7) $1s^2$ $2s^2$ $2px^1$ $2py^1$$2pz^1$ o = (z = 8) $1s^2$ $2s^2$ $2px^2$ $2py^1$$2pz^1$

*Nitrogen has higher ionization energy than oxygen.

*Nitrogen has half filled and more stable configuration due to symmetry.

So, the more energy is required to remove an electron from nitrogen.

5. Why electron affinities Be and N are zero?

*'Be' has fully filled '2s' orbitals in their valency shell.

*Nitrogen has exactly half – filled 'p' – orbital.

*So they have attain stable electronic configuration and do not have the tendency to accept electrons.

6. Define electron affinity ?

*Electron affinity or electron gain enthalpy is the amount of energy released when an isolated gaseous atom. accepts an electron to from a monovalent gaseous anion. Unit : $KJmol^{-1}$

$Atom_{(g)}$ + Electron → $Anion_{(g)}$ + Energy

7. What are the applications of electro negativity?

Applications of electro negativity:-

Nature of Bond:-

i) $X_A = X_B$; $X_A - X_B = 0$; A-B bond is non-polar covalent bond (e.g) H_2mole cule

ii) $X_A > X_B$; A-B bond is polar covalent bond (e.g) O-H bond in H_2O

iii) $X_A >> X_B$; A-B bond is polar, ionic bond (e.g) Na^+cl^-

Percentage of ionic character in a polar covalent bond.

i) $X_A - X_B = 1.7$; 50% covalent, 50% ionic

ii) $X_A - X_B < 1.7$; less than 50% ionic, more than 50% covalent

iii) $X_A - X_B > 1.7$; more than 50% ionic, less than 50% covalent

3. P – BLOCK ELEMENTS

1. What is Plumbo solvency?

Lead is not attacked by pure water in the absence of air. But water containing dissolved air has a solvent action on it due to the formation of lead hydroxide (a poisonous substance).

This phenomenon is called Plumbo solvency.

$2Pb + O_2 + 2H_2O \longrightarrow 2Pb(OH)_2$

2. Prove that P_2O_5 a powerful dehydrating agent?

Phosphorus pentoxide extracts water from sulphuric acid..Therefore it is used as powerful dehydrating agent.

i) $H_2SO_4 \xrightarrow[-H_2O]{P_2O_5} SO_3$

ii) $2HNO_3 \xrightarrow[-H_2O]{P_2O_5} N_2O_5$

3. H_3PO_4 is triprotic acid. why?

$H_3PO_4 + NaOH \rightarrow NaH_2PO_4 + H_2O$ Sodium Di hydrogen Phosphate

$H_3PO_4 + 2NaOH \rightarrow Na_2HPO_4 + 2H_2O$ Disodium hydrogen Phosphate

$H_3PO_4 + 3NaOH \rightarrow Na_3PO_4 + 3\,H_2O$ Sodium Phosphate

4. Prove that H_3PO_3 is a di – basic acid?

It is a di-basic acid and gives salts of two types

$H_3PO_3 + NaOH \longrightarrow NaH_2PO_3 + H_2O$ Sodium di hydrogen phosphite

$H_3PO_3 + 2NaOH \longrightarrow Na_2HPO_3 + 2H_2O$ di Sodium Hydrogen Phosphite

5. Prove that H_3PO_3 is a powerful reducing agent?

Phosphorus acid is a powerful reducing agent because it has P –H bond. It reduce silver nitrate solution into silver.

$2AgNO_3 + H_3PO_3 + H_2O \longrightarrow 2Ag + H_3PO_4 + 2HNO_3$

6. Explain the action of heat on H_3PO_3, H_3PO_4

When phosphorus acid is heated, it undergoes auto oxidation and reduction to form ortho phosphoric acid and phosphine.

$4H_3PO_3 \longrightarrow 3H_3PO_4 + PH_3$

Ortho phosphoric acid — Phosphine

Ortho Phosphoric acid on heating gives pyrophosphoric acid at 523 k and meta phosphoric acid at 589 K

$2H_3PO_4 \xrightarrow{523K} H_4P_2O_7 + H_2O$

Phro phosphoric acid

$H_4P_2O_7 \xrightarrow{589K} 2HPO_3 + H_2O$

Meta Phosphoric acid

7. Write a short note on Holme's signal?

Wooden containers having a perforated bottom and a hole at the top are filled with calcium phosphide and calcium carbide. These are thrown into the sea. Water enters the container and reacts with calcium carbide and calcium phosphide to give acetylene and phosphine. Phosphine gets ignited with air and also ignites acetylene. Thus a bright red flame is produces which is accompanied by huge smoke due to the burning of phosphine. This serves as signal for ships.

$Ca_3P_2 + 6H_2O \longrightarrow 2PH_3 + 3Ca(OH)_2$

Calcium phosphide

$CaC_2 + 2H_2O \longrightarrow C_2H_2 + Ca(OH)_2$

Calcium Carbide — Acetylene

8. What is inert pair effect?

As we move down the group in the periodic table, the two electron in the ns orbital becomes inert and they are less availability for bonding. This effect is known as inert pair effect.

9. HF (Hydrofluoric acid) is stored in wax bottles and not in glass bottles. Why?

Hydrofluoric acid is stored in wax bottles. It cannot be stored in glass bottles (or) silica bottles as it attacks silicates (or) silica.

$Na_2Sio_3 + 6HF \longrightarrow Na_2SiF_6 + 3H_2O$

$Sio_2 + 4HF \longrightarrow SiF_4 + 2H_2O$

10. Write the oxidizing nature of fluorine?

All the halogens have strong oxidizing property due to their high electron affinity. Fluorine is the strongest oxidizing agent. It oxidizes other halide ions into halogens in solutions (or) when dry.

$F_2 + 2x^- \longrightarrow 2F^- + x_2$ $(x^- = Cl^-, Br^-, I^-)$

11. Write the uses of Helium?

Because of its lightness and non-inflammability helium is used to filling balloons for meteorological observations.

It is used in inflating aero plane tyres.

Helium oxygen mixture is used by deep-sea divers. It is much less soluble in blood than N_2 and prevents bends.

A mixture of oxygen and helium is used in the treatment of asthma.

Liquid helium (b.pt 4.2K) is used as cryogenic agent for carrying out various experiment at low temperatures.

It is used in NMR spectrometers and MRI scan.

12. Write the uses of Neon?

It is used in discharge tubes and fluorescent bulbs.

It is used to protect electrical instruments from high voltage.

It is used in beacon lights for safety of air navigation as the light possesses fog.

It is used in botanical gardens as it stimulates growth and helps in formation of chlorophyll.

13. What are inter halogen compounds?

Each halogen combains with another halogen to form several compounds known as inter halogen compounds.

$Cl_2 + 3F_2 \longrightarrow 2ClF_3$ (Ax_3 type)

14. How is potash alum prepared?

Potash Alum : $K_2SO_4.Al_2(SO_4)_3 24H_2O$

Potash Alum is manufactured from alunite (or) alum stone.

Preparation :

Alunite (or) alum stone is $K_2SO_4.Al_2(SO_4)_3 4Al(OH)_3$

It is finely powdered and boiled with dilute sulphuric acid, the aluminium hydroxide part changes into aluminium sulphate. When a little more potassium sulphate in calculated amount is added, the alum is crystallized.

15. Write the Laboratory preparation of H_3PO_4?

Phosphoric acid is obtained by boiling a mixture of red phosphorus with 50% nitric acid at 453K in presence of iodine as catalyst.

$P + 5HNO_3 \longrightarrow H_3PO_4 + 5NO_2 + H_2O$

4 – d – BLOCK ELEMENTS

1. Explain why d – block elements exhibit variable oxidation states?

These elements have several (n-1)d and ns electrons.

The energies of (n-1)d and ns orbitals are fairly close to each other..

e.g. Fe^{2+}, Fe^{3+}, and Mn^{3+}

2. Why do transition elements form complexes?

Small size and high positive charge density.

Presence of vacant (n-1)d orbitals which are of appropriate energy to accept lone pair of electrons from the ligands for bonding with them.

E.g. $[Cu(NH_3)_4]SO_4$

3. Why transition metal compounds are coloured? Give reason.

The presence of unpaired electrons init.

The energy gap between two energy levels in the same 'd' subshell being small.

Hence very small amount of energy is required for excitation of electrons from one energy level to another can be provided by the visible light. The colour observed corresponds to the complementary colour of the light observed

Cu^{2+} - Blue, Ni^{2+} - green

4. Most of the transition metals and their compounds have catalytic activity. Why?

They show a variety of oxidation state and there by can form intermediate products with various reactants.

They are also capable of forming interstitial compounds which can adsorb and activate the reacting species.

5. Explain : Chrome Plating

Cathode : The articles to be plated.

Anode : A plate of lead

Electrolyte ; Chromic acid + H_2SO_4

First plated with :- Nickel

During electrolysis chromium deposits on the article (cathode)

6. What is spiting of silver?

Molten silver absorbs 20 times its volume of oxygen which it again expels on cooling. Globules of molten silver are thrown off. This is called spitting of silver. This can be prevented by covering the surface with a layer of charcoal.

7. Write the action of aquaregia on gold.

Gold dissolves in aquaregia (3 parts of conc.Hcl and (1part con.HNO_3) to form auric chloride.

$$2Au + 9HCl + 3HNO_3 \longrightarrow \underset{\text{Auric chloride}}{2AuCl_3} + 6\,H_2O + \underset{\text{Nitrosyl Chloride}}{3NOCl}$$

8. What is the actions of heat on copper sulphate crystals?

On heating $CuSO_4.5H_2O$ loses its water of crystallizations and decomposes at 720° C to give cupric oxide and sulphurtrioxide.

$$\underset{\text{(Blue)}}{CuSO_4 5H_2O} \xrightarrow[-4H_2O]{100^\circ C} CuSO_4.H_2O \xrightarrow[-H_2O]{230^\circ C} \underset{\text{(White)}}{CuSO_4} \xrightarrow{720^\circ C} CuO + SO_3$$

9. Zinc reacts with hot NaOH

Zinc dissolves in hot NaoH solution forming soluble sodium zincate ion.

$Zn + 2NaoH \longrightarrow Na_2ZnO_2$ (Sodium Zincate) + H_2

10. Show that $K_2Cr_2O_7$ is a powerful oxidizing agent?

$K_2Cr_2O_7$ is a powerful oxidizing agent. It oxidizes KI in to I_2.

$K_2Cr_2O_7 + 7H_2SO_4 + 6KI \rightarrow 4K_2SO_4 + Cr_2(SO_4)_3 + 3I_2 + 7H_2O$

It oxidizes ferrous to ferric salt:-

$Fe_2Cr_2O_7 + 7H_2SO_4 + 6FeSO_4 \rightarrow K_2SO_4 + Cr_2(SO_4)_3 + 3Fe_2(SO_4)_3 + 2H_2O$

11. Write a note about chromyl chloride test.

When a salt containing chloride is treated with $K_2Cr_2O_7$ and con.H_2SO_4 reddish brown vapours of chromyl chloride are obtained.

$K_2Cr_2O_7 + 4KCl + 6H_2SO_4 \rightarrow 2CrO_2Cl_2 + 6KHSO_4 + 3H_2O$

Chromyl Chloride

12. What is purple of cassius? How is it prepared?

Purple of cassius is only a form of colloidal gold.

Preparation:

It is prepared by mixing very dilute solution of gold chloride with stannous chloride solution.

$2Aucl_3 + 3Sncl_2 \longrightarrow 2Au + 3Sncl_4$

The gold thus precipitated is adsorbed by stannic hydroxide formed by the hydlolysis of $sncl_4$.

$Sncl_4 + 4H_2O \longrightarrow Sn(OH)_4 + 4Hcl$

Uses:-

It is used in making ruby – red glass.

It is used in high class pottery.

13. Why Zn^{2+} salts are white while Ni^{2+} salts are coloured?

Zn^{2+} has outer electronic configuration $3d^{10}$

Ni^{2+} has outer electronic configuration $3d^8$

1.In Zn^{2+}, promotion of d – electron is not possible due to completely filled d orbital, So, Zn^{2+} salt are colourless (or) white.

2.In NI^{2+}, promotion of d electrons from lower d orbital to higher d orbital is possible and absorbs energy from visible and produce coloured salts

e.g. Ni^{2+} = green.

14. What is philosopher's wool? How is it prepared?

When zinc is heated in air at 773K, it burns to forms a white colour of zinc oxide which settles to form a wooly flock called philosopher's wool.

$2Zn + O_2 \xrightarrow{773K} 2ZnO$

Zinc Oxide (or) Philosopher's wool

15. Substance is found to have a magnetic moment of 3.9 B.M. How many unpaired electrons does it contain?

Magnetic moment μ = 3.9 B.M.

$\sqrt{n(n+2)}$ = 3.9

n(n+2) = 15

n(n+2) = 15 = 3(3+2)

The number of unpaired electrons n = 3.

16. What is blue vitriol? How it is prepared?

Blue vitriol – copper sulphate

Preparation – $CuO + H_2SO_4 \longrightarrow CuSO_4 + H_2O$

17. What is Brodeaux – Mixture ? Write its use.

A mixture of copper sulphate and lime is known as Brodeaux mixture.

Use : Fungicide.

18. Action of heat on $AgNO_3$?

$2AgNO_3 \xrightarrow{723K} 2AgNO_2 + O_2$

$AgNO_2 \xrightarrow{980K} Ag + NO_2$

on heating $AgNO_3$ decomposes to give Ag

7. NUCLEAR CHEMISTRY

1. Write differences between chemical and nuclear reactions

Chemical reaction

1. These reaction involve some loss, gain or over lap of outer orbital electrons of the reactant atoms.
2. A chemical reaction is balanced in terms of mass only.
3. The energy changes in any chemical reactions is very much less when compared with nuclear reaction.
4. In chemical reactions the energy is expressed in terms of kilo joule per mole.
5. No new element is produce since nucleus is unaffected.

Nuclear Reactions

1. Nuclear reactions involve emission of alpha, beta and gamma particles from the nucleus.
2. Nuclear reaction is balanced in terms of both mass and energy.
3. The energy changes are for exceed than the energy changes in chemical reaction.
4. In nuclear reactions, the energy involved is expressed is MeV (Million electron Volt) per individual nucleus.
5. New element / isotope may be produced during the nuclear reaction.

2. What is Q – Value of a nuclear reaction?

The amount of energy absorbed (or) released during nuclear reaction is called Q – value of nuclear reaction.

Q value = $[m_p - m_r]$ 931 MeV.

Where m_r – sum of the masses of reactants.

m_p – sum of the masses of products.

3. Explain the principle behind the hydrogen bomb.

The hydrogen bomb is based on fission reaction of hydrogen to form helium. Producing large amount of energy. Hydrogen bomb consists of an arrangement for nuclear fission in the centre surrounded by a mixture of H_2 and $_3Li^6$ isotope. This fission reaction provides the high temperature necessary to start the fission.

Fission $\longrightarrow$ heat + neutrons

$_3Li^6 + _0n^1 \rightarrow {}_1H^3 + {}_2He^4 + 4.78$ MeV

$_1H^2 + {}_1H^3 \rightarrow {}_2He^4 + {}_0n^1 + 17.6$ MeV

4. Define spallation reaction?

Spallation reaction : The reaction in which high speed projects may chip heavy nucleus in to several fragments.

$_{29}Cu^{63} + {}_2He^4 + 400$ MeV $\longrightarrow {}_{17}Ci^{37} + 14\ {}_1H^1 + 16\ {}_0n^1$

5. Define Nuclear fission reaction?

The process in which a heavy nucleus breaks up into two lighter nuclei of almost equal size with the release of an enormous amount of energy.

$_{92}U^{235} + {}_0n^1 \longrightarrow {}_{53}Ba^{141} + {}_{36}Kr^{92} + {}_{30}n^1 + 200$MeV

6. Define Nuclear fission reaction?

When lighter nuclei moving at a high speed are fused to gether to form a heavy nucleus.

$_1H^2 + {}_1H^2 \longrightarrow {}_2He^4 + {}_0n^1 + 17.6$ MeV.

7. Calculate the number of α and β particles emitted in the conversion of $_{90}Th^{232}$ to $_{12}pb^{208}$ Let 'a' and 'b' be the number of α and β particles emitted during the change.

$_{90}Th^{232} \longrightarrow {}_{82}pb^{208} + a_2He^4 + b_{-1}e^0$.

Comparing the mass numbers.

$232 = 208 + 4a + b \times 0$

$4a = 232 - 208$

$4a = 24$

$a = 6$

comparing the atomic numbers

$90 = 82 + 2 \times a + (-1)b$

$= 82 + 2a - b$

$2a - b = 90\text{-}82 = 8$

$2(6 - b) = 8$

$b = 12 - 8$

$b = 6.$

8. Half life period of a radio active element is 1500 years. Find the value of disintegration constant in terms of second.

$$\lambda = \frac{0.693}{t_{1/2}}$$

$$= \frac{0.693}{1500 yrs}$$

$$= \frac{0.693}{1500 \times 365 \times 24 \times 60 \times 60 \sec}$$

$$= \frac{0.693}{4730 \times 4 \times 10^4} Sec^{-1}$$

$$\lambda = 0.1465 \times 10^{-10} \text{ Sec}^{-1}$$

9. Calculate the average life of $_{79}Au^{196}$ leaving $t_{½}$ = 150 days

Average life of $_{79}Au^{198}$ = 1.44 x Half life period

= 1.44 x 150

Average life of $_{79}Au^{198}$ = 216 days

10. The atomic masses of Li, He and proton are 7.01823 amu, 4.00 387 amu and 1.00715 amu respectively calculate the energy evolved in the reaction.

$_3Li^7 + _1H^1 \rightarrow 2\ _2He^4 + \Delta E$

Given 1 amu = 931 MeV.

Mass of reactants = mass of Li + mass of H

= 7.01823 + 1.00715

= 8.02538 amu.

Mass of products = 2 x mass of He

= 2 x 4.00387

= 8.00774 amu.

Mass loss during change.

= (8.02538 – 8.00774) amu

= 0.01764 amu.

Energy evolved during reaction

= 0.0176 x 931 MeV

= 16.423 MeV.

Energy evolved = 16.423 MeV.

8. SOLID STATE – II

1. What are super conductors? Write it uses?

Super conductors are ultra cold substances that conduct electricity without resistance.These materials have virtually zero electrical resistance.

Uses : it is a basis of new generation of energy, saving power systems.

2. Write the Bragg's equation:

Bragg's equation is $n\lambda = 2d \sin\theta$

Where n is the order of reflection

λ is the wavelength of X – rays

d is the interplanar distance in the crystal

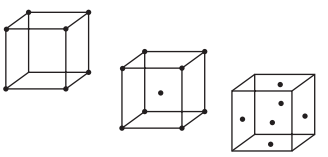
θ is the angle of reflection.

3. Sketch the i) sc ii) BCC iii) fcc

i) Simple cubic

ii) Body-centred cubic

iii) Face centred cubic



4.Write the no of atoms in sc, bcc, fcc, ecc crystal?

i)sc

Nc = 8, no of atoms=Nc/8=8/8=1

ii)bcc

Nc = 8,Nb = 1, no of atoms=Nc/8+Nb=8/8+1=1+1=2

iii) fcc

Nc = 8,Nf = 6, no of atoms =Nc/8 + Nf/2=8/8+6/2=1+3=4

iv)ecc

Nc=8, Ne = 12, no of atoms = Nc/8 + Ne/4 = 8/8 + 12/4 = 1+3 =4

No of atoms per unit cell

i) Sc = 1

ii) Bcc = 2

iii) fcc = 4

iv) ecc = 4

5. What is vitreous state?

Glassy (or) vitreous state is a condition in which certain substance can exit lying between the solid and liquid states.

e.g. glass.

6. Calculate number of Cscl units in a unit cell.

Number of chloride ions per unit = Nc/8 = 8/8 =1

Cscl crystal - (Bcc) body centred cubic.

Number of chloride ions = Nb = 1

Cs^+ = 1, Cl^- = 1

7. What are Molecular crystals?

The lattice points in molecular crystals consists of molecules which do not carry any charge.

The forces binding, the molecules together are of two types.

i) dipole – dipole interaction e.g. ice.

ii) vander waals forces, e.g. all kinds of molecules solids.

8. What are metallic crystal?

It consists of an assemblage of positive ions immersed in a sea of mobile electrons.

Each electron belongs to a number of positive ions and each positive ion belong to a number of electrons.

The force that binds a metal ion to a number of electrons with in its sphere of influence Is known as metallic bond.

9.THERMODYNAMICS – II

1. What is entropy? Write a unit of entropy?

Entropy is a measure of ran domness (or) disorder of the molecules of a system and it is a thermodynamic state function. The entropy function 'S' represents ratio of heat involved (q) to the temperature (T) of the process.

$S = q/T$

Unit : Calories / degree / mole.

2. State Trouton's rule.

According to Trouton's rule the heat of vapourisation is (ΔH_{vap}) divided by the boiling point of the liquid is a constant and is equal to 21 cal deg^{-1} mol^{-1}

$$\Delta S_{vap} = \frac{\Delta H_{vap}}{T_b}$$

$$= 21 \text{ cal deg}^{-1} \text{ mol}^{-1}$$

3. What are the substances that deviate from Trouton's rule.

Substances that deviate from Trouton's rule.

Low boiling liquids such as hydrogen and helium which boil only a little above OK.

Polar substances like water, alcohol which form hydrogen bonded liquids and exihibit very high boiling points as well as high ΔH_{vap}

Liquids such as acetic acid whose molecules are partically associated in the vapour phase and posses very low entrophy of vapourization which is very much less than 21 cals/mol/deg

Those liquids that obey Trouton's rule are said to behave ideally.

4. What are spontaneous reaction?

Spontaneous process is the process that is natural and does not need to be induced. It takes place on its own accord.

In order to find out whether a process is spontaneous or not, the entrophy changes of the system and the surroundings for the stipulated process is considered.

ΔS = (+)ve, the entrophy of the universe increases.

5. What is Gibb's free energy?

The isothermally available energy in a system is called free energy (G)

G = H – Ts.

H = enthalphy (or) heat content of the system.

T = Temperature in Kelvin.

S = entrophy

6. Calculate the maximum efficiency possible from a thermal engine operating between 110° C and 25° C.

T1 = 110° C + 273 = 383 K

T2 = 25°C + 273 = 298K

Efficiency % η = $(1-\frac{T_2}{T_1})\times 100$

= $\frac{383-298}{383}$

= 22.19

= 22.2

% efficiency = 22.2

7. Define standard entrophy?

The absolute entrophy of a pure substance at 25° C (298 K) and 1 atm pressure is called the standard entrophy 'S'

10. CHEMICAL EQUILIBRIUM – II

1. State Lechatelier's principle?

   If a system at equilibrium is subjected to a disturbance (or) stress then the equilibrium shifts in the direction that tends to nullify the effect of the disturbance (or) stress.

2. Why do chemical equilibrium is referred to as Dynamic equilibrium?

   Chemical equilibrium is referred to as Dynamic equilibrium, since both the forward and reverse reactions continue even after the equilibrium has reached and their rates are equal.

3. What is equilibrium constant?

   Equilibrium constant is defined as the ratio of the products of molar concentration of the substances produced to that of the reacting substances raised to the power equal to the number of molecules that involved in the stoichiometric equation.

$$K_c = \frac{[C]^c[D]^d}{[A]^a[B]^b}$$

4. Write a note about reaction Quotient (Q)?

   The reaction Quotient is defined as the ratio of the product of initial concentrations of products to the product of initial concentration of reactant under non – equilibrium conditions.

   $Q < K_c$ = forward reaction is favoured.

   $Q > K_c$ = backward reaction is favoured.

5. What is the relationship between the dissociation and formation equilibrium constant?

   i) formation equilibrium

$$2SO_2 + O_2 \Leftrightarrow 2SO_3, \quad K_c = \frac{[SO_3]^2}{[SO_2]^2[O_2]}$$

   ii) Dissociation equilibrium

$$2SO_3 \Leftrightarrow 2SO_2 + O_2, \quad K_c = \frac{[SO_2]^2[O_2]}{[SO_3]^2} = \frac{1}{K_c}$$

$$K_c = \frac{1}{K_c}$$

6. What happens when $\triangle ng$ = 0, $\triangle ng$ = +ve, $\triangle ng$ = -ve in a gaseous reaction?

i) $\triangle ng$ = 0, $K_p = K_c$; $H_{2(g)} + I_{2(g)} \rightleftharpoons 2HI$; $\triangle ng$ = 2-2 = 0

ii) $\triangle ng$ = +ve; $K_p > K_c$; $2H_2O_{(g)} + 2Cl_{2(g)} \rightleftharpoons 4HCl_{(g)} + O_{2(g)}$; $\triangle ng$ = 5-4 = 1

iii) $\triangle ng$ =-ve; $K_p < K_c$; $3H_{2(g)} + N_{2(g)} \rightleftharpoons 2NH_{3(g)}$; $\triangle ng$ = 2-4 = -2

7. Dissociation of PCl_5 decreases in the presence of increases in Cl_2 why?

According to lechatlier principle, increase in concentration of one of the reactants (or) products the equilibrium shifts more towards opposite direction.

So by increasing the presence of Cl_2 the equilibrium shifts in the reverse direction. i.e. more PCl_5 is formed.

By increasing the concentration of Cl_2 dissociation of PCl_5 is decreased

10. CHEMICAL EQUILIBRIUM – II

1. Define order of a reaction?

Order can be defined as the sum of powers of the concentration of reactants that involved in the rate equation.

Rate of reaction = $K[A]^p [B]^q$

Order of reaction = p + q

2. Define Half – life period?

Half life period of a reaction is defined as the time required to reduce the concentration of a reactant to one half of its initial value.

$$t_{\frac{1}{2}} = \frac{0.693}{k} \text{sec}$$

3. What is Pseudo first order reaction? Give example?

In a second order reaction, when one of the reactants concentration in excess (10-100 times) of the other reactant, then the reaction follows a first order kinetics. Such a reaction is called pseudo first order reaction.

e.g. Acid cataysed hydrolysis of an ester.

4. Write the Arrhenius equation and explain the terms?

Arrhenius equation $K = Ae^{-Ea/RT}$

K = Rate constant

A = Frequency factor

Ea = Activation energy

R = Gas constant

T = Temperature

5. Define activation energy?

The additional energy required by the molecules to attain the threshold energy, in addition to the energy of colloiding molecules is called as activation energy.

Activation energy = Threshold energy – Energy of colliding molecules.

Ea > 0 rate of the reaction is lower.

Ea < 0 rate of the reaction is higher.

6. Write a note on consecutive reactions?

The reactions in which the reactant forms an intermediate and the intermediate forms the product in one (or) many subsequent reactions are called consecutive (or) sequential reactions.

e.g. saponificatin of a diester in the presence of an alkali.

7. Write an note on parallel reactions?

The reactions which in one or more reactants react simultaneous in two (or) more path ways to give two (or) more products are known as parallel reactions.

E.g. Bromination of Bromo benzene.

8. Write a note on opposing reactions.

The reaction in which the products formed react back simultaneously to form reactants are called opposing reactions.

e.g. $2HI_{(g)} \rightleftharpoons H_{2(g)} + I_{2(g)}$

12. SURFACE CHEMISTRY

1. Write a note on Auto catalyst?

In certain reaction, it is observed that one of the products formed during the reaction acts as a catalyst for that reaction, such type of catalyst is called auto catalyst.

e.g. in the oxidation of oxalic acid by $KMnO_4$ one of the products $MnSO_4$ acts as a auto catalyst because it increases the speed of the reaction.

$MnSO_4$ – auto catalyst.

2. Write a note about promoters.

A substance which itself not a catalyst it promotes the activity of a catalyst is called a promoter.

e.g. Haber's process for the synthesis of NH_3

$$N_2 + 3H_2 \underset{\text{Mo}}{\overset{\text{Fe}}{\rightleftharpoons}} 2NH_3$$

Fe – Catalyst, Mo – promoter

3. What are catalytic poisons? Give an example?

A substance which destroys the activity of the catalyst is called a catalyst poison and the process is called catalyst poisoning.

e.g. the platinum catalyst used in the oxidation of SO_2 in contact process is poisoned by As_2O_3

$$SO_2 + O_2 \overset{\text{Pt}}{\rightleftharpoons} 2SO_3$$

Poisoned by As_2O_3

4. Write notes on Homogeneous and heterogeneous catalysts.

i) Homogeneous catalysts : The catalytic process in which the reactant and catalyst are in the same phase.

$$2SO_{2(g)} + O_{2(g)} \overset{NO_{(g)}}{\rightleftharpoons} 2SO_{3(g)}$$

ii) Hetegeneous catalysts : The catalytic process in which the reactant and catalyst are in the different phases.

$$2SO_{2(g)} + O_{2(g)} \xrightleftharpoons{Pt_{(s)}} 2SO_{3(g)}$$

5. Why is a colloidal system of gas in gas does not exist?

A colloidal solution of gas in gas is not possible. Because the gases are completely miscible and always form true solution.

6. What is Tyndall effect?

When a strong beam of light is passed through a sol, the path of light is illuminated by the scatting of light by colloidal particles.

Reason: The phenomenon of the scattering of light by the sol particles is called Tyndall effect.

7. What is Brownian movement?

The continuous rapid zig – zag, chaotic random and ceaseless movement executed by a colloidal particle in the dispersion medium is called Brownian movement.

Reason : This is due to the unbalanced bombardment of the particles by the molecules of the dispersion medium.

8. What is meant by emulsions?

Emulsions are the colloidal solution of two immiscible liquids in which the liquid acts as the dispersed phase as well as the dispersion medium.

9. Define colloidal solution.

The colloidal solutions are intermediate between true solutions and suspension When the diameter of the particles of a substance dispersed in asolvent about 10 A° to 2000 A°

10. Write note about induced catalyst.

When no reactant influences the rate of the other reaction which does not occur under ordinary conditions, the phenomenon is known as induced catalyst.

$$\text{Sodium arsenite} \xrightarrow[\text{Air}]{\text{oxidation}} \text{no reaction}$$

$$\text{Sodium arsenite + sodium sulphate} \xrightarrow[\text{Air}]{\text{oxidation}} \text{reaction occurs}$$

11. What are active centres?

Active centres are certain points or spots in the surface of the catalysts where the catalytic activity due to adsorption of reacting molecules is maximum.

12. Write a note on Helmholtz double layer.

The surface of the colloidal particle acquires a positive charges by selective adsorption of a layer of positive ions around it.

This layer attracts counter ions from the medium which forms a second layer of negative charges.

The combination of the two layers of charges around the sol particles is called Helmholtz double layer.

13. What is electro – osmosis?

In a sol, the dispersion medium carries an equal but opposite charge to that of the dispersed particles. The movement of dispersion medium under the influence of applied potential. When the dispersed particles are prevented from moving is known as electro – Osmosis.

14. Wrie medicinal uses of colloids

1. Argyrol silver sol - Eye lotion
2. Colloidal antimony - curing halazar
3. Colloidal gold - Intramuscular injection
4. Milk of magnesia - stomach disorders.

15. Write a note on tanning.

1. Animal hides are colloidal in nature.

2.when a hide, which has positively charges particles is soaked in tannin, which contains negatively charged colloidal particles, mutual coagulation takes place.

3.which results in the hardening of leather. The process is termed as tanning. Chromium salts have been used in place of tannin.

16. Distinguish between physical and chemical adsorption.

Physical adsorption

It is due to inter molecular vander wall's force.

Reversible

Heat of adsorption is small.

Chemical adsorption

It is due to chemical bond formation.

Irreversible.

Heat of adsorption is large.

17. What are the general characteristics of a catalyst?

The catalyst remains unchanged in mass and in chemical composition at the end of the reaction.

Only a small quantity of catalyst is needed.

It cannot initiate a reaction and it alters the speed of the reaction which is already occurring at a slow rate.

18. Define : cataphoresis (or) Electrophoresis.

The movement of sol particles under an applied electric potential is called electrophoresis.

13. ELECTRO CHEMISTRY – I

1. State Faraday's Laws

Faraday's first law:

The mass of the substance (m) liberated at the electrodes during the electrolysis is directly proportional to the quantity of electricity (Q) that passes through the electrolyte.

$m \propto Q$ (or) $m = ZIt$.

Faraday's second law:

When the same quantity of electricity passes through solution of different electrolytes, the amounts of the substance liberated at the electrodes are directly proportional to their chemical equivalents.

2. Define electro chemical equivalent (Z)? write its unit.

Electro chemical equivalent is defined as the amount of a substance deposited by 1 ampere current passing for 1 sec through the electrolyte. $Z = \frac{m}{It}$ (or) $Q = It$

Unit : Kg C^{-1}

3. State Ostwald's dilution law.

Ostwald's dilution law relates the dissociation constant of the weak electrolyte with the degree of dissociation and the concentration of the weak electrolyte.

$K_a = \alpha^2 C / (1-\alpha)$

K_a = dissociation constant of weak acid.

α = degree of dissociation

C = concentration.

4. Define equivalent conductance.

The equivalent conductance is equal to the product of specific conductance (K) of the solution and the volume (V) of the solution that contains 1 gm equivalent of the electrolyte.

$$\lambda_C = K \times V$$

$$\lambda_C = \frac{K \times 10^{-3}}{C}$$

Unit of λ_c = $mol.m^2.gram.equiv^{-1}$

5. What is meant by molar conductance?

Molar conductance :

Molar conductance 'μ_C' is defined as the conductance of a solution containing one mole of the electrolyte dissolved in it.

$$\mu_C = \frac{K \times 10^{-3}}{m} mho\, m^2\, mol^{-1}$$

6. State Kohlrausch's law.

Kohlrausch's law states that, “at infinite dilution where is the ionization of all electrolytes is complete, each ion migrates independently and contributes a definite value to the total equivalent conductance of the electrolyte.

$$\lambda_\alpha AlCl_3 = \frac{1}{3}\lambda_\alpha Al^{3+} + \lambda_\alpha cl^-$$

7. What is common ion effect? Give an example.

The reduction of the degree of dissociation of a salt by the addition of a common ion is called common ion effect.

e.g. $AgCl \rightleftharpoons Ag^+ + Cl^-$

Nacl is added to the Agcl solution. Here Cl^- ion act as a common ion. So the dissociation of Agcl is decreased.

8. What is ionic product of water (K_w)?

At 298K, the value of ionic product of water is the product of concentrations of Hydronium ion [H_3O^+] and Hydroxide [OH^-] is called ionic product of water (K_w)

$K_W = [H_3O^+]\,[OH^-]$ $K_W = 1x\ 10^{-14}\ mol^3 litre^{-2}$

9. Define P^H of a solution

P^H is defined as the negative of the base – 10 lograthamic (log) of the [H^+] concentration. $PH = -\log_{10}[H^+]$

10. What are Buffer solution? Give an example.

A Buffer solution is one which maintains its PH fairly constant even upon the addition of small amount of acid or base.

e.g. $CH_3COOH + CH_3COONa$ - Acidic Buffer solution.

$NH_4OH + NH_4Cl$ – Basic Buffer solution

15. ISOMERISM IN ORGANIC COMPOUNDS

1. Define Geometrical isomerism.

   Isomerism that arises out of difference in the spatial arrangement of atoms or groups about the doubly bonded carbon atoms is called geometrical isomerism.

2. What are the types of geometrical isomerism?

   Cis isomer: The isomer in which similar groups lie on the same side is called cis isomer.

   Trans isomer: The similar groups lie opposite direction is called trans isomer.

3. What are the conditions for optical isomer?

   The compounds should contain asymmetric (or) chiral carbon atom.

   The compounds should have non – super impossible object and mirror image configuration.

4. Distinguish Enantiomers and diastereomers.

   Enantiomers

   Optical isomers having the same magnitude but different sign of optical rotation.

   They have configuration with non-super impossible object mirror image relationship.

   They are identical in all properties except the sign of optical rotation.

   Diastereomers

   Differ in the magnitude of optical rotation.

   They are never mirror images.

   They differ in all physical properties.

5. Distinguish Racemic form from Meso form.

   Racemic form

   It is mixture that contains equal amount of d – isomer and l – isomer.

   It is optically inactive due to external compensation.

   Molecules of isomers present are chiral.

   Meso form

   It is a single compound.

   It is optically inactive due to internal compensation.

   Molecules are achiral.

16. HYOROXY DERIVATIVES

1. Write breath analysis test (or) How can the consumption of alcohol by a person be detected?

   The detection of ethanol involves the oxidation of alcohol in the breath of a person who has consumed, by acidic $K_2Cr_2O_7$.

   Chromium ion (Cr^{VI}) $\rightarrow$ $Cr(^{III})$

   (Yellow orange) (blue green)

   From the observing the change in the colour of chromium ions the consumption of alcohol by a person be detected.

2. Write Bouveault Blanc reduction reaction.

   Diethyl oxalate is reduced to ethylene glycol by sodium and ethanol.

3. How will you get phenolphthalein from phenol?
4. Why is Glycol more viscous than ethanol?

   Glycol contains two hydroxyl groups which are able to form intermolecular H – bonding.

   This bond is much stronger and resulting in a polymeric structure.

   So this leads to high viscosity in glycol but ethanol has no strong, H – bonding and it is less viscous.
5. Write a note on coupling reaction.
6. Write the uses of benzyl alcohol?

   Used as a local anaesthetic in intravenous subcutaneous injections.

   As an antiseptic in oinments.

   As ester in perfumery.

   As benzyl benzoate in the treatment of asthma and whooping cough.

   In the manufacture of synthetic resigns.

7. What is dehydration reaction of glycerol (or) how is Acrolein prepared?
8. How will you get terylene from glycol?
9. Etylene Glycol $\rightarrow$ Dioxan?

10. Write the uses of Ethylene glycol?

As an antifreeze in automobile radiators.

As a cool ant in aeroplane engines.

As an explosive.

In the preparation of synthetic fibre, terylene

As a solvent and preservative.

In the preparation of numerous compouns like dioxan.

11. write any three test for phenol.

12. How will you get Isobutylene from tertiary butyl alcohol?

13. G.T.N. (or) How is Nitro Glycerine prepared?

14. Why alcohols cannot be used as solvent for Grignard reagent?

Strongly basic substances like Grignard reagent are decomposed by alcohol.

$R\text{-}OH + CH_3MgBr \rightarrow R - O - MgBr + CH_4$

Hence alcohols cannot be used as a solvent for Grignard reagent.

15. What is Dow's process?

$$C_6H_5Cl + NaOH \xrightarrow[300\ atm]{623K} C_6H_5OH + NaCl$$

16. Phenols dissolve in sodium hydroxide but not in sodium bicarbonate? Why?

Phenols are weakly acidic due to resonance stabilization.

Phenols are weakly acidic than carboxylic acids.

So they do not dissolve in (weaker base) $NaHCO_3$.

18. CARBONYL COMPOUNDS

1. Give three tests for Aldehydes?

It reduces Tollen's reagent. ($Ag^+ \rightarrow Ag$)

$CH_3CHO + 2Ag + 3\ OH^- \rightarrow CH_3COO^- + 2Ag + 2H_2O$

It reduces Fehling's solution. ($Cu^{2+} \rightarrow Cu^+$)

$CH_3CHO + 2Cu^{2+} + 5OH^- \rightarrow CH_3COO^- + Cu_2O + 3H_2O$

It restore the original colour (red – pink) of the Schiff's reagent.

2. Write a note on Urotropine?

Preparation: Formaldehyde forms hexa methylene tetramine with NH_3

Use: Urinary antiseptic.

$$6CH_2O + 4NH_3 \rightarrow (CH_2)_6 N_4 + 6H_2O$$

Hexa methylene tetramine

3. Write a note about Rosenmund's reduction?

Acid chlorides are reduced to aldehydes in the presence of Pd /BaSo4

$$CH_3COCl + H_2 \xrightarrow[BaSO_4]{Pd} CH_3 - CHO$$

Acetyl Chloride — Acetaldehyde

4. Give the IUPAC name of the following

a) Crotonaldehyde - 2 Butenal

b) Methyl n-propyl ketone –2 – pentanone

5. Write Friedel craft Acetylation Reaction?

Acetylation of benzene takes places in presence of anhydrous $AlCl_3$ to give acetophenone.

$$C_6H_6 + CH_3COCl \xrightarrow{\text{Anhyd } AlCl_3} C_6H_5 - CO\text{-}CH_3 + HCl$$

Acetyl chloride — acetophenone

6. What is formalin? Write its use?

40% aqueous solution of formaldehyde is known as formalin.

Uses: preservative for Biological specimens.

In leather tanning.

7. How will you get phenacyl bromide from Acetophenone?

When acetophenone reacts with bromine in ether at 273k, phenacyl bromide is formed.

$$C_6H_5 - CO - CH_2\text{-} \boxed{H + Br} \text{-} Br \rightarrow C_6H_5COCH_2Br + HBr$$

8. Write the uses of Acetophenone?

Used as a hypnotic (sleep inducing) by name hypnone.

In perfumery.

19. CARBOXYLIC ACIDS

1. Write a note on esterification with an example?

Carboxylic acids reacts with alcohols in presence of con.H_2SO_4 gives ester.

$$CH_3COOH + CH_3OH \xrightarrow{Con.H_2SO_4} CH_3COOCH_3 + H_2O$$

Acetic acid methylalcohol methyl acetate

2. Write a note on trans esterification reaction?

Methyl acetate reacts with ethyl alcohol in the presence of acid to give ethyl acetate.

$$CH_3COOCH_3 + C_2H5OH \xrightarrow{H^+} CH_3COOC_2H_5 + CH_3OH$$

Ethyl acetate

3. Write the uses of oxalic acid?

For removing ink stains and iron stains.

As mordant in dyeing and calico printing

It is used in Redox titration.

In manufacture of ink and metal polishes.

4. Write three tests for carboxylic acids?

It turns blue litmus into red colour.

Carboxcylic acids + $NaHCO_3 \rightarrow$ brisk effervescence (-CO_2)

Carboxylic acids + alcohol $\rightarrow$ ester identified from its fruity colour.

5. How is aspirin prepared?

Salicylic acid undergoes acetylation by heating acetic anhydride to forms aspirin. Aspirin is also called acetyl salicylic acid.

6. How is oil of winter green prepared?

Salicylic acid on heating with methyl alcohol in the presence of con.H_2SO_4 oil of winter green is prepared. Oil of winter green is also called as methyl salicylate.

7. Explain HVZ reaction?

When carboxylic acid is treated with halogen and phosphorus trihalide halogenations is carried out and this reaction is known as HVZ reaction.

$$R\,CH_2COOH \xrightarrow{Br_2/PBr_3} RCH_2COBr \xrightarrow{Br_2/PBr_3} RCHBrCOBr \xrightarrow{H_2O} RCHBrCOOH$$

8. Formic acid reduces Tollen's reagent, but acetic acid does not give reason?

Formic acid contain both an aldehyde and carboxyl group. But acetic acid does not contain aldehyde group.

9. Explain the action of PCl_5 with Lactic acid?

Lactic acid reacts with PCl_5 it forms lactyl chloride

$$CH_3CH(OH)\,COOH + PCl_5 \rightarrow CH_3 - CH\text{-}Cl - CO\text{-}Cl$$

Lactyl chloride

10. How is Lactide formed?

Lactic acid is heated in the presence of con.H_2SO_4 a cyclic deister is formed.

11. What is meant by Kolbe's electrolyte reaction?

12. Give three tests for salicylic acid?

Salicyclic acid + neutral $FeCl_3 \rightarrow$ Violet colour.

Salicyclic acid + $NaHCO_3 \rightarrow$ Brisk effervescence ($-CO_2$)

Salicyclic acid + $Br_2/H_2O \rightarrow$ 2,4,6 tribromo phenol (White ppt)

20. ORGANIC NITROGEN COMPOUNDS

1. How is chloropicrin prepared?

   Nitro methane reacts with Cl_2/NaOH to give chloropicrin.

   $CH_3NO_2 + 3Cl_2 \rightarrow CCl_3NO_2 + 3HCl$

   Chloropicrin

2. What is Gabriel phthalimide synthesis?

   On the treatment of phthalimide with KOH and RX to give primary amine.

3. How is Nitrobenzene prepared?

   Benzene reacts with mixture of con.HNO_3 and con.H_2SO_4 to form Nitrobenzene.

4. Nitro benzene $\rightarrow$ Aniline?

   Nitro benzene on reduction with Sn/HCl produce Aniline as product.

   $$C_6H_5NO_2 + 6[H] \xrightarrow[Fe/con.Hcl]{Sn/con.HCl} C_6H_5NH_2 + 2H_2O$$

   aniline

5. How is schiff's base formed?

   Benzaldehyde reacts with primary anines to form 'aldimine' type of compound called schiff's base.

   $C_6H_5CH = O + C_6H_5NH_2 \rightarrow C_6H_5CH = NC_6H_5$

   Schiff's base

6. What is diazotization reaction?

   Aniline reacts with HNO_2/HCl benzene diazonum chloride is obtained.

   $$C_6H_5NH_2 \xrightarrow[0^{\circ}c]{HNO_2 / HCL} C_6H_5N_2Cl$$

7. Write a note on carbylamines reaction?

   Methyl amine on heating with $CHCl_3$/KOH form a foul smelling substance called methyl isocyanide.

   $CH_3NH_2 + CHCl_3 + 3KOH \rightarrow CH_3NC + 3KCl + 3H_2O$

   Methyl isocyanide

8. Write mustard oil reaction.

Methylamine reacts with CS_2 and Hg_2Cl_2 to give methyl isothiocyanate.

$$CH_3NH_2 + CS_2 \xrightarrow{Hg_2Cl_2} CH_3NCS + H_2S$$

Methyl isothiocyanate

9. Write a note on Gatterman reaction

When $C_6H_5N_2Cl$ is warmed with Cu/HBr bromo benzene is formed.

$$C_6H_5N_2Cl \xrightarrow[HBr]{Cu} C_6H_5Br + N_2$$

10. Write a note on Sandmeyer reaction.

When aqueous solution of $C_6H_5N_2Cl$ is warmed with Cu_2Cl_2/HCl chloro benzene is formed.

$$C_6H_5N_2Cl \xrightarrow[CuCl_2]{HCl} C_6H_5Cl + N_2$$

22. CHEMISTRY IN ACTION

1. What are anaesthetics?

The drugs which produce loss of sensation are called Anaesthetics.

2. What are Antipyretics?

Antipyretics are the compounds which are used for the purpose of reducing fever. Lowering the body temperature to the normal.

e.g. Aspirin, Phenacetin and Paracetamol.

3. What are Analgesics?

Analgesics are compounds which all sorts of pains without the loss of consciousness. There are also called painkillers.

e.g. Aspirin.

4. What are Antibiotics?

Many micro organisms produces certain chemicals which inhibit the growth (or) metabolism of some other micro organisms.

e.g. Penicilin.

5. What are Antacids?

Antacids are the drugs used to rectify the imbalance in the acidity in the stomach. e.g. magnesium and Aluminium hydroxide.

6. What are Antipasmodics?

Antipasmodics are used to relieve cramps, spasms of the stomach intestines and bladder.

e.g. Atropine.

7. What are Antiseptic?

Antiseptic is a substance that renders micro-organisms innocuous by killing them (or) preventing their growth.

e.g. CHI_3

8. What are Anti – oxidants?

The substances that act against oxidants are called anti – oxidants.

It protects us against cardio – vascular disease, cancer and cataract.

It act as radical inhibitors.

9. What are Antimalarials (or) Antiprotozoals?

Antiprotozoals are the chemical compounds used to cure ma;aria. Extracts of certain plants, specially the roots and stems are extensively used as antimalarial.

e.g. Quinine, primaquinine, chloroquinine.

10.Write about Artificial sweetness/

Certain organic compounds which have been synthesized in laboratories are known to be many times sweeter than cane sugar. Such compounds are called artificial sweetness.

e.g. saccharin, Dulcin.

11. How is Buna – S prepared?

Buna – S is a synthetic rubber obtained by the polymerization of butadiene and styrene in the presence of sodium metal.

Uses: It is used for the manufacture of tyres and rubber tubes.

12. Write a note about Buna – N?

Uses : It is used for Manufacture of storage tanks for the solvents.

13. How is Nylon – 66 prepared?

Nylon – 66 is obtained by polymerization of hexa methylene diamine and adipic acid by removal of water.

Uses: It is used for making bristles for making brushes and elastic hostery.

5 MARKS

1. Explain Davission and Germer experiment.
2. Derive die-Brogle relation and give the significance.
3. Discuss the shapes of s,p and d orbitals.
4. Apply molecular orbital theory to nitrogen molecule.
5. Apply molecular orbital theory to oxygen molecule.
6. Give the sailent features regarding hybridization.
7. Explain the pauling's method to calculate the ionic radii.
8. Describe the pauling's scale of determination of electronegativity.
9. Explain mullikens scale of determination of electronegativity.
10. Write the applications of electronegativity.
11. Write the factors that affect electron affinity.
12. Write the factors that governing ionization energy.
13. Write the uses of silicones.
14. What are silicones? How they are prepared?
15. Write anamolous nature of fluorine.
16. How fluorine is isolated from their fluorine (Dennis method)
17. How are rare gases separated from air (Ramsay Rayleigh method)
18. How are noble gases separated individually (Dewar method)

19. Explain extraction of gold from its ore.
20. How is $K_2Cr_2O_7$ prepared
21. Explain aluminothermic process.
22. Describe the extraction of lanthanide from monazite sand.
23. Compare and contrast any 5 properties of lanthanides and actinides.
24. Write the uses of lanthanides and actinides.
25. What is lanthanide contraction? Discuss its causes and consequences.
26. What is actinide contraction. Discuss its causes.
27. Write the postulates of werner's theory .
28. Write the postulates of VB theory.
29. Mention the functions of haemoglobn in natural process.
30. How is chlorophyll important in environment chemistry? Mention its functions.
31. Write the i) IUPAC name ii) central metal ion iii) ligands iv) co – ordination number v) shape of the following co – ordination compounds.
32. a) $K_3[Fe(CN)_6]$ b) $K_4[Fe(CN)_6]$ c) $[Cu(NH_3)_4]SO_4$ d) $COCl_36NH_3$ f) $[Ni(CN)_4]^{2-}$ g) $[Pt^{II}Cl_2(NH_3)_2]$
33. Mention the type of hybridization and magnetic property of the following Complexes using VB theory.
    i) a) $[FeF_6]4-$ b) $[Fe(CN)_6]4-$
    ii) a) $[Ni(NH3)_4]2-$ b) $[Ni(CN)_4]2-$
34. Explain nuclear fission reaction with mechanism.
35. write a note on nuclear fission and hydrogen bomb.
36. Explain radio carbon dating.
37. Write the nuclear reaction taking place in sun (stars)
38. Explain the uses of radio active isotopes in the mechanism of reactions.
39. Give the uses of radio active isotopes in medicine.
40. What is Bragg's equation. Give its significances.
41. Explain Bragg's spectrometer method.
42. Write a note on i) schottky method ii) Frenkel defect.
43. Explain the nature of glass.
44. Write the properties of ionic crystals.
45. State the various statement of second law of thermodynamics.

46. Discuss the characteristics of entropy.
47. Discuss the characteristics of 'G'
48. What are the spontaneous reaction?
    What are the conditions for the spontaneity of a process.
49. Derive $Kp = Kc (RT)^{\Delta ng}$ for a chemical reaction.
50. Derive Kp and Kc for the synthesis of hydrogen iodide.
51. Discuss the conditions which favour the formation of ammonia by Haber's process.
52. Discuss the conditions which favour the formation of SO_3 in contact process.
53. Derive the expression for the rate constant of a first order reaction?
54. Write the characteristics of order of a reaction.
55. illustrate pseudo first order reaction with suitable example.
56. Write notes on i) consecutive reactions ii) parallel reactions iii) opposing reaction,
57. Write briefly about the adsorption theory of catalysis.
58. Write briefly about the intermediate compound formation theory of catalysis.
59. Write briefly about the preparation of colloid by condensation method.
60. Write briefly about the preparation of colloids by dispersion methos.
61. Write the general characteristics of catalytic reaction.
62. Write a notes on i) Dialysis ii) Electrolysis iii) ultrafiltration.
63. Give an account of Arrhenius theory of electrolytic dissociation.
64. Derive Ostwald's dilution law.
65. Explain the mechanism of buffer action with an example.
66. Write notes on i) Ostwald's theory ii) quinonoid theory of indicatiors.
67. Derive Henderson equation?
68. What is common ion effect? Explain with examples.
69. Derive the expression for Nernst equation in a reversible cell.
70. Write notes on IUPAC convention of representation of a cell.
71. How is e.m.f. of a cell determined?
72. Describe the construction and function of Daniel cell.
73. Explain the relation between e.m.f and free energy.
74. Distiguish enantiomer and diasteromer with example.
75. Write a note on the conformations of cyclohexanol.

76. Discuss the optical isomerism in tartaric acid.
77. Discuss the optical isomerism in lactic acid.
78. Write the structural elucidation of glucose.
79. Write the structural elucidation of fructose
80. What are rocket propellants?
81. How are terylene and nylon – 66 prepared?
82. Write short notes on i) analgesics ii) antipyretics.
83. Write short notes on i) antibioties ii) anaesthetics.
84. Write a note on antioxidants.
85. How are Buna – N, Buna – S rubber obtained write it uses.
86. Write i) Chromophore ii) chromogen iii) auxochrome with an example.

5. f – BLOCK ELEMENTS

1. Flow sheet: Extraction of Lanthanide from monazite sand.

   Monazite sand

   Heat 210°C

   With H_2SO_4 for several hours

   Gray mud

   Cold

   Water

   Unreacted monazite sand, SiO_2, TiO_2, $ZrSiO_4$ etc.

   (recycle sand)

   Filtrate containing (Ln^{3+}, Th^{4+}, $H3O^{+}$, HSO_4^{-}, SO_4^{2-}, H_2PO^{4-})

   Neutralised acidity

   To proper or added HF

   Precipitate of $Th_3(PO_4)_4$ (or) Precipitate of Th

   Filtrate containing lanthanide and Phosphate ions.

   NaOH or Oxalic acid

   Lanthanide hydroxides or Oxalates.

2. Compare Lanthanides and Actinides.

Lanthanides	Actinides
1. Binding energies of 4f electron are higher.	1. Binding energies of 5f electrons are lower.
2. Maximum oxidation state exhibited by Lanthanides is +4. e.g. Ce^{4+}	2. Due to lower binding energies they show higher oxidation states such as +4,+5 and 6+ Uranium exhibits +6 oxidation state in UF_6 and UO_2Cl_2.
3. 4f electrons have greater shielding effect.	3. 5f electrons have poor shielding effect.
4. Most of their ions are colourless.	4. Most of their ions are coloured U^{3+} (red), U^{4+} (green) and UO_2^{2+}(yellow)
5. They are paramagnetic but magnetic properties can be easily explained.	5. They are also paramagnetic. But their magnetic properties are very difficult to interpret.
6. They do not form complexes easily.	6. They have much greater tendency to form complexes.
7. Except promethium, they are non-radio active.	7. All of them are radio active.
8. Their compounds are less basic.	8. Their compounds are more basic.
9. They do not form oxocations.	9. They form oxocations such as UO^{2+}, UO^{+},NPO_2^{+},PuO_2^{+}

3. What is Lanthanide contraction? Explain cause and consequences of Lanthanide contraction?

Lanthanide Contraction:

The size of M^{+3} ions decreases as we move through the lanthanides from lanthanum to lutetium. This steady decrease in ionic radii of M^{+3} ions in the lanthanide series is called lanthanide contraction.

Causes:

The lanthanide contraction is due to the imperfect shielding of one 4f electron by another in the same sub shell. As we move along the lanthanide series, the nuclear charge and the number of 4f electrons increase by one unit at each step. However due to imperfect shielding, the effective nuclear charge increases causing a contraction in electron cloud of 4f – subshell.

Consequences:

Basicity of ions :

Due to lanthanide contraction, the size of Ln^{3+} ions decreases regularly with increase in atomic number. According to Fajan's rule, drcreases in size of Ln^{3+} ions increase the covalent character and decreases the basic character between Ln^{3+} and OH^- ions in $Ln(OH)_3$, since the order of size of Ln^{3+} ions are

$La^{3+} > Ce^{3+} \ldots\ldots\ldots\ldots\ldots\ldots > Lu^{3+}$

There is regular decrease in their ionic radii.

Regular decrease in their tendency to act as reducing agent, with increase in atomic number.

Due to lanthanide contraction, second and third rows of transistion elements are quite close in properties.

Due to lanthanide contraction, these elements occur together in natural minerals and are difficult to separate.

4. Lanthanides and Actinides uses.

Use of Lanthanides:

A pyrophoric alloy which contains cerium, lanthanum and Neodymium, iron aluminium, calcium carbon and silicon is used in cigarette lighters, toys, flame throwing tanks and bullets.

Ceria (CeO_2) and thoria (ThO_2) is used in gas lamp materials.

Cerium salts are used in dyeing cotton, lead storage batteries and as catalyst.

Lanthanides are used in metallothermic reactions due to their extraordinary reducing property. Lanthanide thermic process can yield sufficiently pure Nb, Zr, Fe, Co, Ni, Mn, Y,W, U, B and Si.

Alloys of lanthanides are known as mish metals. The major constitution of mish – metals are Ce (45 – 50%) La (25%) Nd (5%) and small quantities of other lanthanide metals and Fe and Ca impurities mish – metals are used for the production of brands of steel like heat resistant, stainless and instrumental steels.

Mg – alloys containing 30% mish metal and 1% Zr are useful in making parts of jet engines.

Uses of actinides:

U – 235 is fissionable it is used as fuel in nuclear process plants and as a component in nuclear weapons.

Plutonium – 238 is used as a power source in long mission space probes.

6. COORDINATION COMPOUNDS AND BIO – COORDINATION COMPOUNDS

1. Write the postulates of Werner' s theory.

Postulates of Werner's theory:

Every metal atom has two types of valencies.

Primary valency or ionisable valency

Secondary valency or non ionisable valency.

The primary valency corresponds to the oxidation state of the metal ion. The primary valency of the metal ion is always satisfied by negative ions.

Secondary valency corresponds to the co ordination number of the metal ion of atom. The secondary valencies may be satisfied by either negative ions or neutral molecules.

The molecules or ion that satisfy secondary valencies are called ligands.

The ligands which satisfy secondary valencies must project in definite directions in space.

So the secondary valencies are directional in nature where as the primary valencies are non directional in nature.

The ligands have unshared pair of electrons. There unshared pair of electrons are donated to central metal ion as atom is a compound. Such compounds are called co ordination compounds.

2. Explain structural isomerism in coordination compounds.

Coordination isomerism:

In a bimetallic complex, both complex cation and complex anion may be present. In such a case the distribution of ligands between the two coordination spheres can vary, giving riser to isomers called the coordination isomers.

$[Co^{III}(NH_3)_6]$ $[Cr(CN)_6]$ - Hexammine cobalt (III) hexacyano chromate (III) and

$[Cr^{III}(NH_3)_6]$ $[Co^{III}(CN)_6]$ – Hexammine chromium (III) Hexacyano coballate (III)

Ionization isomerism:

Coordination compounds having the same molecular formula but forming different ions in solution are called ionization isomers.

$[Co(NH_3)_5Br]SO_4$ – pentaamminebromocobalt (III) sulphate

$[Co(NH_3)_5SO_4]Br$ – Pentaamminesulphatocobalt (III)bromide.

Hydrate isomerism a solvate isomerism

$[Cr(H_2O)_4Cl_2]Cl.2H_2O$ – Bright green

Tetraaquadichlorochromium (III)chloride dehydrate

$[Cr(H_2O)_5\ Cl]Cl_2.H_2O$ – grey – green

Pentaaquachlorochromium (III)chloride monohydrate

These isomers have very different chemical properties and on reaction with $AgNO_3$ to test for Cl- ions, would find 1,2 and 3 Cl^- ions in solution respectively.

Linkage isomerism

Linkage isomerism occurs with ambidentate ligands. There ligands are capable of coordinating in more than one way.

$[Co(NH_3)_5ONO]Cl_2$ the nitro isomer – red colour

Pentaamminenitritocobalt (III) chloride – O attached

$[Co(NH_3)_5NO_2]Cl_2$ the nitro isomer - yellow colour

Pentaamminenitrocobalt (III) Chloride – N attached

Ligand isomerism

Ligand isomerism arises from the presence of ligands which can adopt different isomeric forms.

$H_2N - CH_2 - CH_2 - CH_2 - NH_2$ or $H_2N - CH_2 - \underset{\displaystyle NH_2}{\underset{|}{CH}} - CH_3$

3. Write the i) IUPAC Name ii) Central metal ion iii) Ligands iv) co – ordination number v) shape of the following coordination compounds.

$K_3[Fe(CN)_6]$

Name: Potassium Hexa Cyano Ferrate (III)

Central ion: Fe^{3+} or Fe III

Ligand : CN^- or Cyano coordination number : 6

Shape: Octahedral.

$[Cu(NH_3)_4]SO_4$

Name : Tetra ammine copper (II) Sulphate

Central ion : Cu^{2+} or Cu II

Ligand : NH_3 or ammine

Co – ordination number : 4

Shape : Octahedral

$COCl_36NH_3$ or $[CO(NH_3)_6]Cl_3$

Name : Hexa ammine cobalt (III) Chloride

Central metal ion : Co^{3+} or Co III

Ligand : NH_3 or Ammine

Co – ordination number : 6

Shape : Octahedral

$[Cr^{III}(en)_3]Cl_3$

Name : Tris (ethylene di amine) Chromium (III) Chloride

Ligand : $NH_2 – CH_2 – CH_2 – NH_2$ or Ethylene diamine

Coordination Number : 6

$[Ni^{II}(CN)_4]^{2-}$

Name : Tetra cyano NIcklateion

Central metal ion : Ni^{2+} or Ni II

Ligand : CN- or Cyano

Coordination number : 4

Shape : square planar

$Pt^{II}Cl_2(NH_3)_2]$

Name : Diammine dich loro platinum (II)

Ligand : Cl^-, NH_3 Coordination number : 4

9. THERMODYNAMICS – II

1. Explain the various statements of second Law of thermodynamics?

i) Kelvin planck statement

It is impossible to construct an engine which operated in a complete cycle will absorb heat from a single body and convert it completely to work without leaving some changes in the working system.

ii) Classius Priniciple

It is impossible to transfer heat from a cold body to a hot body without doing some work.

iii) A process accompanied by increase in entropy tends to be spontaneous. Entropy is a measure of randomness (or) disorder of the molecules of a system and it is a thermodynamic state function.

iv) Efficiency of a machine can never be cent percent.

v) % efficiency = $\frac{output}{input} \times 100$ % efficiency = $\frac{T_1 - T_2}{T_1} \times 100$

2. What are the characteristics of Gibbs free energy?

G is defined as (H – TS), where H and S are the enthalpy and entropy of the system respectively, T – Temperature. Since H and S are the state function. G is a state function.

G is extensive property while $\Delta G = (G_2 - G_1)$ which is the free energy change between the initial and final states of the system becomes the intensive property when mass remains constant between initial and final states (or) when the system is a closed system.

G has a single value for the thermodynamic state of the system.

G and ΔG values are correspond to the system only. There are three cases of ΔG in predicting the nature of the process. When $\Delta G < 0$ (negative) the process is spontaneous and feasible, $\Delta G = 0$, the process is equilibrium and $\Delta G > 0$ (positive) the process is non spontaneous and not feasible.

$\triangle G = \triangle H - T\triangle S$, but according to I law of thermodynamics $\triangle H = \triangle E + P\triangle V$ and

$\triangle E = q - w$

$\triangle G = q - w + P\triangle V - T\triangle S$

But $\triangle S = \frac{q}{t}$ and $T\triangle S = q$ = heat involved in the process.

$\triangle G = q - w + P\triangle V - q = -w + P\triangle V$ (or) $-\triangle G = w - P\triangle V$ = network

3. What are the characteristics of entropy?

The term 'S' entropy is evolved from the formulation of second law of thermodynamics.

Entropy change 'ΔS' of a system under process is defined as the constant equal to the ratio of the heat change accompanying a process at constant temperature to the temperature of the system under process. The process should be reversible at that temperature.

$\triangle S_{rev} = \triangle q_{rev} / T(k)$

Heat q is not a state function. But for a reversible process $\triangle q = (q2 - q1)$ divided by temperature (T) of the process is a state function.

A spontaneous process is accompanied by increase in the disorder (or) randomness of the molecules constituting the system. Entropy increases in all spontaneous process. Hence entropy may be regarded as a measure of disorder (or) randomness of the molecules of the system.

When a system undergoes a physical (or) a chemical process there occurs a change in the entropy of the system and also in its surroundings. This total change in the entropy of the system and its surroundings is termed as the entropy change of the universe brought about by the process for an isothermal process (T – constant) the entropy of the universe during a reversible process is zero.

The entropy of the universe increases in an irreversible process.

The energy of the universe remains constant although the entropy of the universe tends to a maximum.

For a spontaneous process at constant T, ΔS is positive ($\Delta S>0$).

for an equilibrium process. ΔS is zero for a non spontaneous process.

ΔS is negative or ($\Delta S<0$)

Unit of entropy is calories per degree per mole (or) eu. per mole .

Cgs units of entropy is $cal.K^{-1}$ denoted as eu. The SI unit is JK^{-1} and denoted EU.leu = 4.184EU

4. What are spontaneous reactions?

Spontaneous process is the process that is natural and does not need to be induced. It takes place on the own accord. In order to find out wheather a process is spontaneous or not, the entropy change of the system and the surroundings for the stipulated process is considered.

For a Spontaneous Process

ΔG = -ve

ΔS = +ve

ΔH = -ve

10. CHEMICAL EQUILIBRIUM – II

1. Write the Haber's process for yielding of ammonia?

$$N_2 + 3H_2 \overset{Fe}{\rightleftharpoons} 2NH_3, \ \Delta Hf^{\circ} = -22.0 \text{ Kcal/mol}$$

Increased pressure = 300 – 500 atm

Optimum temperature = 500°C – 550°C

Catalyst = iron

Steam is passed to remove away the ammonia when it is formed so that the equilibrium remain shifted towards the product side.

The maximum yield of ammonia is 37%

2. Write the contact process for yielding of SO_3?

$$2SO_{2(g)} + O_{2(g)} \overset{V_2O_5}{\rightleftharpoons} 2SO_{3(g)} \qquad \Delta H_f^\circ = -47\text{Kcal/mol}$$

Increased pressure = 700 – 1200 atm

Optimum temperature = 400°C – 450°C

Catalyst = V_2O_5

Therefore SO_3 from contact process along with steam is used in oleum and H_2SO_4 manufacturing processes in contact process the yield of SO_3 is nearly 97%

14. ELECTRO CHEMISTRY – II

1. Write the Nernst equation (or) Derive the Nernst equation?

The reaction occurring in a reversible cell represented by the equation.

$A + B \rightleftharpoons C + D$

The decrease in free energy, $-\Delta G$; accompanying the process is given.

$-\Delta G = -\Delta G^\circ - RT1nJ$

$-\Delta G^\circ$ is the decrease in free energy accompanying the same process when all the reactants and products are in their standard states of unit activity.

J is the reaction co – efficient of the activities for the products and reactants Substituting the value of J

$$-\Delta G = -\Delta G^\circ - RT \text{ in } \frac{a_c x a_D}{a_A x a_B}$$

If E is the EMF of the cell in volts and the all reaction involves the passage of 'n' Faradays(i.e)nF coulombs the electrical work done by the cell is in nFE volt,coulombs (or) Joules. Hence free energy decrease of the system, $-\Delta G$ is given by the expression.

$$-\Delta G = nFE$$

$$nFE = -\Delta G^\circ - RT \ln \frac{a_c x a_D}{a_A x a_B}$$

$$nFE = -nFE^\circ - RT \ln \frac{a_c x a_D}{a_A x a_B}$$

$$E = E^\circ - \frac{RT}{nF} \ln \frac{a_c x a_D}{a_A x a_B}$$

Where E° is the EMF of the cell in which the activity or as an approximation, the concentration of each reactant and each product of the cell reaction is equal to unity E° is known as the standard EMF of the cell.

$$E = E^o - \frac{RT}{nF} \text{ in } \frac{a_c x a_D}{a_A x a_B} \text{ is offered to as the Nernst equation.}$$

$$E = E^o - \frac{RT}{nF} \ln \frac{[c][o]}{[A][B]} \quad \frac{a_c \text{ x } a_d}{a_A \text{ x } a_B}$$

$$E = E^o - \frac{RT}{nF} \text{ in K}$$

$$E = E^o - 2.303 \frac{RT}{nF} \log K$$

Where E° = standard electrode potential

R = gas constant

T = Kelvin temperature

n = number of electrons transferred in the half-reaction

F = Faraday of electricity

K = equilibrium constant for the half-cell reaction as in equilibrium law.

2. Write notes on IUPAC Conventions of representation of a cell?

A cell diagram is an abbreviated symbolic depiction of an electro chemical cell. For this purpose. We will consider that a cell consists of two half - cells. Each half - cells is again made of a metal electrode in contact with metal ion solution of a metal electrode in contact with metal ion in solution.

IUPAC Conventions

Let us consider Zinc - copper cell.

(i) A single Vertical line (I) represents a phase boundary between metal electrode and ion solution (electrolyte). Thus the two half - cells in a voltalic cell are indicated as

Phase Boundary

Zn/Zn^{2+} Cu^{2+} / Cu

Anode half-cell Cathode half-cell

It may be noted that the metal electrode in anode half-cell between metal is on the left, while in cathode half-cell it is on the right of the metal ion.

(ii) A double vertical line represent the salt bridge, porous partition or any other means of permitting ion flow while, preventing the electrolyte from mixing.

(iii) Anode half - cell is written on the left and cathode half - cell on the right.

(iv) In the complete cell diagram, the two half-cells are separated by a double vertical line (11-dalt bridge) in between. The Zinc copper cell can now be written as

Salt bridge

Zn/Zn^{2} // Cu^{2+} / Cu

Anode half-cell Cathode half-cell

(v) The symbol for an inert electrode, like the platinum, electrode in often enclosed in a bracket for example

Inert Electrode

Mg / Mg^{2+} // H^{+}/H_2 (pt)

Anode half-cell Cathode half-cell

(vi) The value of emf of a cell is written on the right of the cell diagram. Thus a Zinc-Copper cell has emf 1.1v and representated as

$Zn/Znso_4$ // $Cuso_4$ / Cu E = +1.1v

$\rightarrow$ direction of election flow.

(Vii) If the emf acts in the opposite direction though the cell circuit it is denoted as a negative value.

$CU/CUSo_4$ // $ZnSo_4$ /Zn E = -1.1v

$\leftarrow$ direction of election flow.

(viii) The negative sign also indicates that the cell is not feasible is the given direction and the reaction will take place in the reverse direction only. The overall cell reaction for E = -1.1v of the Daniel cell is

$CU_{(S)} + Zn^{2+}_{(aq)} \rightarrow CU(aq)^{2+} + Zn^{(S)}$

(ix) The reversal of the cell current is accompanied by the reversal of the direction of the cell reactions. Thus a reversal of cell is defined as that operates by reversal of cell reactions when the direction of flow of current is reversed.

3. Explain the working of Daniel cell?

The Daniel cell consists of zinc electrode as anode and copper electrode as cathode. It is represented as

$Zn \setminus Zn^{+2} \quad \setminus\setminus \quad CU^{+2} \setminus Cu$

The oxidation half reaction occurring at the Zinc electrode in contact with the aqueous electrolyte containing Zn^{2+}.

$Zn_{(s)} \rightarrow Zn^{2+}{}_{(aq)} + 2e^-$

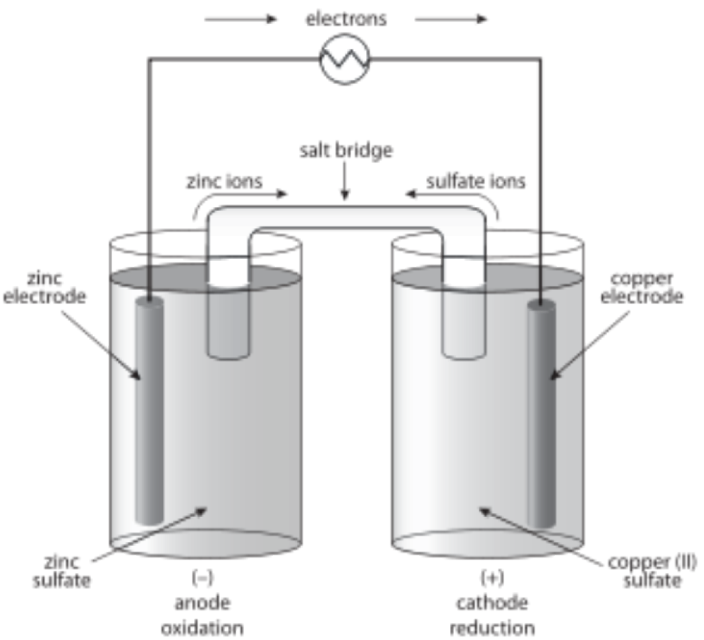
The reduction half reaction occurring at the copper electrode in contact with the aqueous electrode containing Cu^{2+} ions receives the electrons from the zinc electrode when connected externally, to produce metallic copper according to the reaction as

$Cu^{2+} + 2e^- \rightarrow Cu_{(S)}$

The overall reaction taking place in the cell is the redox reaction given as

$Zn_{(S)} + Cu^{2+}{}_{(aq)}) \rightarrow Cu_{(S)} +$

The overall reaction is made up of the summation of two half reactions such as oxidation half reaction and reduction half reaction.



When the cell is set up, electrons flow from Zinc electrode through the wire to the Copper cathode. As a result Zinc dissolves in the anode solution to form Zn^{2+} ions.The Cu^{2+} ions in the cathode half cell pick up there electrons and are converted to Cu atoms on the cathode. At the same time, So_4^{2-} ions from the cathode half-cell migrate to anode half - cell through salt bridge. Like wise, Zn^{2+} ions from the anode half - cell move into the cathode half-cell. This flow of ions from one half-cell to the outer completes the electrical circuit which answers continuous supply of current. The cell will operate till either the Zinc metal or copper ion is completely used up.

4. Determination of e.m.f. of a half cell.

By a single electrode potential, we also mean the emf of an isolated half-cell or its half-reaction. The emf of a cell that is made of two half-cells can be determined by connecting them to a voltmeter. However there is no way of measuring the emf of a single half – cell directly. The emf of the newly constructed cell, E is determined with a voltmeter. The emf of the unknown half – cell E° can then be calculated from the expression.

$$E_{measured} = E_R - E_L$$

If the standard half – cell acts as anode, the equation becomes

$$E_R = E_{measured} \qquad (E_L = 0)$$

On the other hand, if standard half – cell is cathode, the equation takes the form.

$$E_L = - E_{measured} \qquad (E_R = 0)$$

The symbol for an inert electrode like the platinum electrode is often enclosed in a bracket. For e.g. Mg/Mg^{2+} II H^+/H_2(Pt) – inert electrode

Anode Half Cell Cathode Half Cell

The value of emf of a cell is written on the right of the cell diagram. Thus a zinc – copper cell has emf (0) V and is represented as

$Zn/Znso_4$ II $CuSo_4/Cu$ E = 1.1 V

If the emf acts in the opposite direction through the cell circuit it is denoted us negative value.

$Cu/Cuso_4$ II $Znso_4/Zn$ E=-1.1 V

The negative sign indicates that the cell is not feasible in the given direction and the reaction will take place in the reverse direction only. The over all cell reaction for E = - 1.1V

Of the Daniel cell is $Cu_{(s)} + Zn^{2+} \rightarrow Cu^{2+} + Zn_{(s)}$

17. ETHERS

1. Distinction between Aromatic and Aliphatic ethers.

Aromatic ethers (Anisole)	Aliphatic ethers (Diethyl ether)
1. Comparatively high boiling point.	1. Volatile liquid.
2. Used in perfumery.	2. Ued as anaesthetic.
3. Not used as solvent.	3. Used as a solvent.
4. Can not be used as a substitute for petrol.	4. Mixed with alcohol, used as a substitute for petrol.
5. On heating with HI forms phenols and CH_3I only.	5. It forms C_2H_5OH, and C_2H_5I
6. With nitrating mixture forms nitro anisoles.	6. Nitration does not take place.
7. Does not form peroxide easily.	7. Forms peroxide in air.

2. Isomerism in ethers?

Isomerism:

Ethers are functional isomers of alcohols as both have the same general formula $C_nH_{2n+2}O$

The C_2H_6O stands for both CH_3CH_2OH and CH_3-O-CH_3.

Functional isomerism

Molecular Formula

C_3H_8O

$C_4H_{10}O$

Ethers

CH_3-O-CH_2-CH_3 ethyl methyl ether

CH_3CH_2-O-CH_2CH_3

Di ethyl ether

CH_3-O-CH_2-CH_2-CH_3

Methyl-n- propyl ether

CH_3-O-CH-CH_3

I

CH_3

Methyl isopropyl ether

Alcohols

$CH_3CH_2CH_2OH$

n – propyl alcohol

CH_3-CH-CH_3

I

OH

Isopropyl alcohol

CH_3-CH_2-CH_2-CH_2-OH

n – Butyl alcohol

CH_3-CH-CH_2-OH

I

CH_3

Isobutyl alcohol

CH_3-CH_2-CH-CH_3
|
OH

Sec. Butyl alcohol

CH_3
|
CH_3-C-OH
|
CH_3

Tert Butyl alcohol

metamerism

It is a special isomerism in which molecules with same formula, same functional group differing only in nature of the alkyl group attached to oxygen.

CH_3-O-$CH_2CH_2CH_3$

Methyl – n- propyl ether

CH_3-CH_2-O-CH_2CH_3

Di ethyl ether

CH_3
|
CH_3-O-CH-CH_3

Methyl isopropyl ether.

3. Preparation of diethyl ethers?

Intomolecular dehydration of alcohol

$$C_2H_5\text{-O-H} + \text{H-O-}C_2H_5 \xrightarrow[\text{Con. } H_2So_4]{413K} C_2H_5\text{-O-}C_2H_5$$

Ethyl alcohol diethyl ether

$$2C_2H_5OH \xrightarrow[Al_2O_3]{250^\circ C} C_2H_5\text{-}O\text{-}C_2H_5 + H_2O$$

Diethyl alcohol diethyl ether

Williamson's synthesis

$$C_2H_5Br + NaOC_2H_5 \rightarrow C_2H_5\text{-}O\text{-}C_2H_5 + NaBr$$

Ethyl bromide sodium ethoxide diethyl ether

From alkyl halides

$$C_2H_5\text{-}I + Ag_2O + I\text{-}C_2H_5 \xrightarrow{\Delta} C_2H_5\text{-}O\text{-}C_2H_5 + 2AgI$$

Ethyl Iodide silver oxide diethyl ether

Grignard reagent

$$CH_3CH_2\text{-}O\text{-}CH_2Cl + BrMgCH_3 \rightarrow CH_3CH_2\text{-}O\text{-}CH_2CH_3 + Mg\text{-}Br\text{-}Cl$$

Mono-chlono diethyl ether diethyl ether

Chemical properties of diethyl ethers?

With Cl_2

$$C_2H_5\text{-}O\text{-}C_2H_5 \xrightarrow[dark]{Cl_2} CH_3\text{-}CHCl\text{-}O\text{-}CH_2CH_3 \xrightarrow{Cl_2} CH_3CHCl\text{-}O\text{-}CHCl\text{-}CH_3$$

α – Chloro diethyl ether α,α' – dichloro diethyl ether

$$C_2H_5\text{-}O\text{-}C_2H_5 + 10Cl_2 \xrightarrow{light} C_2Cl_5\text{-}O\text{-}C_2Cl_5$$

Diethyl ether perchloro diethyl ether

With O_2

$$C_2H_5\text{-}O\text{-}C_2H_5 \xrightarrow{(o)} (C_2H_5)_2O_2$$

Diethyl ether diethyl peroxide

$$C_2H_5\text{-}O\text{-}C_2H_5 + HCl \rightarrow \left[C_2H_5\text{-}\overset{+}{\underset{H}{O}}\text{-}C_2H_5 \right] Cl^-$$

Diethyl oxonium chloride

$C_2H_5\text{-}O\text{-}C_2H_5 + H_2So_4 \rightarrow$ $\left[C_2H_5\text{-}\overset{\overset{H}{|}}{O}\text{-}C_2H_5 \right]^{+} H_2So_4^{-}$

Diethyl ether

(diethyl oxonium hydrogen sulphate)

With BF_3 $AlCl_3$

$C_2H_5\text{-}O\text{-}C_2H_5 + BF_3 \xrightarrow{H^+} C_2H_5\text{-}\overset{\overset{BF_3}{\cdot\cdot}}{O}\text{-}C_2H_5$

With dil H_2So_4

$C_2H_5\text{-}O\text{-}C_2H_5 + H\text{-}O\text{-}H \rightarrow 2C_2H_5OH$

Diethyl ether — ethyl alcohol

With HI

$C_2H_5\text{-}O\text{-}C_2H_5 + HI \rightarrow C_2H_5OH + C_2H_5I$

Diethyl ether — ethyl alcohol

$C_2H_5\text{-}O\text{-}C_2H_5 + PCl_5 \rightarrow 2C_2H_5I + H_2O$

Diethyl ether — diethyl Iodide

With PCl_5

$C_2H_5\text{-}O\text{-}C_2H_5 + PCl_5 \rightarrow 2C_2H_5Cl + POCl_3$

Diethyl ether — ethyl chloride

4.Write the uses of diethyl ether?

Diethyl ether is used as a refrigerant.

As an anaesthetic.

As a medium for the preparation of Grignard reagent.

As a solvent for the extraction of organic compounds.

Mixed with ethanol used as substitute for petrol.

5. Preparation of Anisole? Write the uses and chemical properties?

Williamson's synthesis:

$C_6H_5ONa + CH_3I \rightarrow C_6H_5OCH_3 + NaI$

Sodium phenoxide — methyl Iodide — Anisole

Using diazomethane

$C_6H_5OH + CH_2N_2 \rightarrow C_6H_5OCH_3 + N_2$

Phenol diazomethane Anisole

Manufacture of ether (or) From phenol

$C_6H_5OH + (CH_3)_2So_4 \rightarrow C_6H_5OCH_3 + CH_3.HSO_4$

Phenol Anisole

Chemical properties: ANISOLE

With HI

$C_6H_5OCH_3 + HI \rightarrow C_6H_5OH + CH_3I$

Anisole phenol methyl Iodide

With BF_3 (with LEWIS ACID)

$$C_6H_5OCH_3 + \overset{\overset{\cdot\cdot}{BF_3}}{} \rightarrow C_6H_5OCH_3$$

Anisole

Nitration : Anisole reacts with con.HNO_3 and con.H_2So_4 gives ortho and para Nitro anisole.

Bromination: Anisole reacts with Bromine gives ortho and para bromo anisole.

USES OF ANISOLE :

It is used in perfumery.

It is used as a starting material in organic synthesis.

Problem for practice:

1. What is the mass of a photon of sodium light with a wavelength of 5890 A^o
2. Calculate the wavelength of a particle of mass m = 6.62 x 10^{-27} Kg moving with kinetic energy 7.425 x 10^{-13} J (h = 6.626 x 10^{-34} Kgm^2sec^{-1})
3. Using uncertainity principle, calculate the uncertainity in velocity of an electron if the uncertainity in position is 10^{-4} m.
4. The uncertainly in the position of a moving bullet of mass 10g is 10^{-5}m. calculate the uncertainly in its velocity.

5. An element A occupies group number 14 and period number 6 is a metal. It can be cut with a knife. It is a not a good conductor of heat and electricity. A does not react with pure water. But reacts with water containing dissolved oxygen to give hydroxide. Identify A.
6. An element A occupies group no 15 and period number 3, Exhibits allotropy and it is tetra atomic. A reacts with caustic soda to give B which is having rotten fish odour. A reacts with chlorine to give C which has a smeall of garlic. Identify A,B, and C. write the reactions.
7. An element A occupies group number 15 and period number 3 reacts with chlorine to give compound B. the compound B on hydrolysis gives a dibasic acid C. the compound C on heating under goes auto oxidation and reduction to give a tri basic acid D. identify the element A, compound B,C, and D. write the reactions.
8. An element A occupies group number 17 and period number 2 is the most electro negative element. Element A reacts with another element B, which occupies group number 17 and period number 4, to give a compound C. compounds C under goes sp^3d^2 hybridisation and has octahedral structure. Identify the element A and B and the compound C. write the reactions.
9. The chief ore of Zinc, on roasting gave a compound A, which on reduction by carbon, gives B. identify A and B, give the chemical reactions.
10. A sulphate compound of group II. This compound is also called as blue vitriol. The compound under goes decomposition at various temperature.

$$A \xrightarrow{305K} B \xrightarrow{373K} C \xrightarrow{423K} D$$ identify the compounds A,B,C and D

11. A compound of chromium, in which chromium exisits in +6 oxidation state. Its chief ore (A) on roasting with alkali gives compound (B). this compound on acidification gave compound C. Compound C on treatment with KCl gave compound D. identify the compounds A,B,C and D. explain with proper chemical reactions.
12. Calculate the maximum efficiency % possible from a thermol engine operating between 110°C and 25°C
13. What is the entropy change of an engine that operates at 100°C when 453.6 K.cal of heat is supplied it.

14. In the equilibrium $H_2 + I_2 \rightleftharpoons 2HI$ the number of moles of H_2,I_2 and HI are 1,2,3 moles respectively. Total pressure of the reaction mixture is. Calculate the partial pressure of H_2,I_2 and HI in the mixture.
15. In 1 litre volume reaction vessel, the equilibrium constant K_c of the reaction $PCl_5 \rightleftharpoons PCl_3 + Cl_2$ is $2x10^{-4}$ lit^{-1} What will be the degree of the dissociation assuming only a small extent of mole of PCl_5 has dissociated
16. Hydrogen iodide is injected into a container at 458°C certain amount of HI dissociates to H_2 and I_2. At equilibrium, concentration of HI is found to be 0.421 M while $[H_2]$ and $[I_2]$ each equal to 6.04×10^{-2} M at 458°C. Calculate the value of the equilibrium constant of dissociation of HI at the same temperature.
17. Rate constant of a first order reaction is 0.45 sec. calculate its half life.
18. A first order reaction completes 25% of the reaction in 100 mins. What are the rate constant and half life values of the reaction?
19. If 30% of a first order reaction is completed in 12 mins. What percentage will be completed in 65.33 mins?
20. Show that for a first order reaction the time require for 99.9% completion is about 10 times its half life period.
21. The half life period of a first order reaction is 10 mins, what percentage of the reactant will remain after one hour?
22. Show that for a first order reaction time requires for 99% completion is twice the time required for 90% completion of the reaction.
23. What iselectro chemical equivalent of a substance when 150 gm of it is deposited by 10 ampere of current passed for 1 sec?
24. The hydrogen ion concentration of a fruit juice is 33×10^{-2} M. what is the P^H of the juice? Is it acid or basic?
25. If a solution has a PH of 7.41, determine its H^+ concentration.
26. P^H of a solution is 5.5 at 25°C. Calculate its $[OH^-]$
27. Calculate the P^H of 0.001 M HCl solution
28. Calculate the P^H of 0.1 M CH_3COOH solution. Dissociation constant of acetic acid is 1.8×10^{-5} M
29. Find the P^H of a buffer solution containing 0.20 mole per litre CH_3COONa and 0.15 mole per litre CH_3COOH, Ka for acetic acid is 1.8×10^{-5}

30. The Ka of propionic acid is 1.34 x 10^{-5} what is the P^H of a solution containing 0.5 M propionic and 0.5 M sodium proportimate? What happens to the P^H of the solution when volume is double by adding water?
31. Calculate the E.M.F. of the Zinc – silver cell at 25°C when $[Zn^{2+}]$ = 0.10 M and $[Ag^{+}]$ = 10 M. $[E^{\circ}_{cell}$ at 25°C = 1.50 volt]
32. Determine the standard E.M.F. of the cell and standard free energy change of the cell reaction. $Zn/Zn^{2+}//Ni^{2+}Ni$. The standard reduction potential of Zn^{2+} Zn and Ni^{2+} Ni half cells are – 0.76 V and -0.25 V respectively.
33. Compound (A) with molecular formula C_6H_6O gives violet colour with neutral Fecl3 reacts with $CHCl_3$ and NaoH at 333K gives two isomers (B) and (C) with molecular formula $C_7H_6O_2$. (B) on oxidation gives (D) carboxylic acid (A) on treatment with NaoH and CO_2 gives the same acid (D) at high pressure. Identify A,B,C,D.
34. An organic compound (A) $C_2H_6O_2$ liberates hydrogen with metallic sodium. A under goes mild oxidation gives compound (B) C_2H_4O. compound (B) under goes Iodoform reaction. Compound (B) undergoes polymerization gives a cyclic compound (C) in presence of con.H_2SO_4. identify A,B,C. Explain the reactions involves.
35. An organic compound A (C_2H_6O) with PCl_5 gives compound (B) compound (B) with KCN gives compound (C). the molecular formula of (C) is C_3H_5N. 'C' on hydrolysis gives D. ($C_3H_6O_3$). Compound (D) with soda lime gives hydrotation. Identify A,B,C and D. explain the reactions.
36. Two organic compounds (A) and (B) with molecular formula C_2H_6O.(A) gives hydrogen with metallic sodium (B) does not give hydrogen. Compound (A) on strong oxidation gives (C). compound (C) with $NaHCO_3$ gives basic effervescence. Identify A,B,C and D. Explain the reactions.
37. An aromatic compound (A) with molecular formula C_7H_6O has the smell of bitter almonds. (A) reacts with Cl2 in the absence of catalyst to give (B) and in the presence of catalyst compound (A) reacts with chlorine to give (C). identify (A) (B) and (C). explain the reactions.