CHEMISTRY (052) E
Question Bank
Question-1

Q. 1. (A) Answer the following in one or two sentences   **5**

   (1) Define extensive properties with two examples.

   (2) Define pH mathematically.

   (3) What is Larmor circulation ?

   (4) What is meant by entropy ?

   (5) Write the equations for solubility products of CaF_2 and PbS

(B) Solve any two of the following problems :   **6**

   (1) Calculate the weight of CH_3COOH in 500 ml of a solution of the acid which has pH = 3.8

      Ka of $CH_3COOH = 1.75 \times 10^{-5}$

   (2) A solution of H_2SO_4 contains 0.49 gm of the acid per 100 ml. Calculate the pH of the solution.

   (3) Which of the following reactions will occur spontaneously at 25^0C. Use data given against each reaction.

      Reaction A : $\Delta H = +10.0$ Kcal

                   $\Delta S = 30$ cal^0/K

      Reaction B : $\Delta H = -15.0$ Kcal

                   $\Delta S = -15$ cal^0K^{-1}
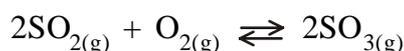
(C) Answer any three of the following   **9**

   (1) Write short notes on Schottky defect, Frenkel defect and Substitutional disorder.

   (2) Explain the relation between radius ratio of ions and crystal lattice.

   (3) Give information about 'Rees' symbols.

   (4) Explain Lewis Theory of Acids and Bases.

Q. 2. (A) Answer the following questions in brief.   **5**

   (1) Classify the following transition metal oxide on the basis of electrical conductivity Ti_2O_3, TiO_2, TiO.

   (2) Give molecular formula of halide of metal ion having co–ordination no. 6 and indicate the defect in its crystal structure by rees symbol.

   (3) Why is it necessary to develop a methamatical concept of entropy for spontaniety of the reaction ?

   (4) When the values of enthalpy change and internal energy change in any gaseous chemical reaction become equal ?

   (5) What is the range of concentrations of H_3O^+ or OH^- ions used in laboratories ?

(B) Solve Any Two examples   **6**

(1) The ionization constant of formic acid is 1.77×10^{-4}. Calculate pH of 0.25 M HCOOK solution at 25^0C.

(2) A person drinks 2.0 litres of water every day from a ceramic pot which is coated inside with chrome – Yellow ($PbCrO_4$) Pigment. How much lead goes in the body every day ?

K_{sp} of $PbCrO_4 = 1.8 \times 10^{-14}$

(At. Wt. Of Pb = 207.2)

(3) At 298 Kelvin temperature the equilibrium constant of the reaction is 3.44×10^{24}. If the standard free energies of formation of SO_3 is – 88.52 Kcal mole^{-1}, Calculate ΔG_f^0 of SO_2 for the given reaction

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

(C) Answer the following questions (Any Three)   **9**

(1) (i) Mention the importance of second law of thermodynamics

    (ii) Explain the change in entropy during expansion of an ideal gas in vaccum.

(2) Explain : (i) Ferromagnetic substances

              (ii) Enthalpy and first law of thermodynamics

(3) Explain relationship between the ratio of the radii of the ions and crystalline structure in case of tetrahedral structure.

(4) (i) Aqueous solution of sodium formate is basic. Why ?

    (ii) Differentiate between lewis acid and base CN^-, BF_3, Ag^+ and why are they ?

**Q. 3. (A) Answer the following questions in short :**   **5**

(1) Compare the value of ΔG with equilibrium constant K.

(2) Give conjugate acid of NH_2^- and conjugate base of NH_4^+

(3) What is the change in pH value of a solution in the range of 99.9% to 100% in a titration of 0.1 N NaOH against 0.1 N HCl ?

(4) What is a co–ordination number of metal–ions ?

(5) What does the following symbol indicate ?

$(K^+_{1-\delta} / \square_+) (Cl^-_{1-\delta} / \square_-)$

(B) Solve any 2 of the following numericals :   **6**

(1) The vaporization of 1.0 gm of water at 100^0C absorbs 540 calories. What would be the changes in enthalpy, entropy and free energy if 540 gm of water is converted into vapour at 100^0C.

(2) Calculate the change in free energy of the cell in joule and calorie at 25^0C.

$Mg(s) + Zn^{+2}(aq) \rightarrow Mg^{+2}(aq) + Zn(s)$

$E^0 Mg/Mg^{+2} = 2.37$ V and $E^0 Zn/Zn^{+2} = 0.76$ V

(3) A person drinks 2.0 liter of water everyday from a ceramic pot which is coated inside with chrome yellow ($PbCrO_4$) pigment. How much lead goes in the body every day ?

Ksp pf $PbCrO_4 = 1.8 \times 10^{-14}$

(C) Answer any 3 of the following questions :   **9**

(1) "A piece of ice kept in atmosphere at 25^0 melts spontaneously but liquid water does not get converted into ice spontaneously at this temperature". Account for this observation on the basis of second law of hermodynamics.

(2) Explain : NH_4Cl solution is added before the addition of NH_4OH to detect the ions of III A group in qualitative analysis.

(3) Explain : (a) Classification of silicate compounds.
           (b) Ferromagnetic substances

(4) Calculate radius ratio in tetrahedral crystal lattice structure.

Q. 4. (A) Answer the following questions in brief   **5**

(1) State the importance of the equation, $E = mc^2$

(2) Explain : Water is amphoteric in nature

(3) Why is entropy of ice less than that of water ?

(4) Which compound is used in the preparation of magnetic tapes ?

(5) Classify the following into soluble & sparingly soluble salts
(a) $Ba(OH)_2$ (b) $Zn(OH)_2$ (c) K_2SO_4 (d) $BaSO_4$

(B) Solve any two of the following   **6**

(1) The measured voltage of the electro chemical cell $Cu_{(s)} + 2\,Ag^+{}_{(1M)}$

$\rightleftharpoons 2\,Ag_{(s)} + Cu^{2+}{}_{(1M)}$ is 0.54 V at 25^0C Calculate the free energy change of the reaction

(2) pH of HCl is 2.8. To change its pH from 2.8 to 3.8 How much is the solution diluted

(3) The conc. of F^- ions in a sample of water is 2.5×10^{-5} M. Calculate the minimum quantity of solid $CaCl_2$ that should be added to water to precipitate CaF_2. (Ksp of $CaF_2 = 2.0 \times 10^{-10}$)

(C) Answer the following in detail (Any three)   **9**

(1) A piece of ice is kept in atmosphere at 25^0C melts spontaneously, but liq water does not get converted into ice spontaneously at the same temperature. Account for this observation on the basis of II law of thermodynamics.

(2) Explain giving scientific reason that the crystals of Ge & Si become semiconductor on introduction of impurities.

(3) Zn is found in two crystal forms with different lattice structures. Name & explain these two forms.

(4) What is meant by ionic product of water ? Derive the equation for it.

Q. 5. (A) Answer the following objective questions   **5**

(1) Will ΔG values be +ve or –ve for ice kept at 300 K and 250 K ?

(2) How is the indicator selected for an acid -base titration?

(3) Complete the following Lowry-Bronsted reaction :

$C_6H_5NH_2$ + H_2O ⇌

   base   acid
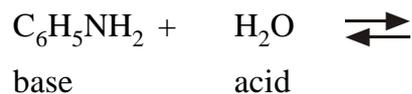
(4) What are silicates? Give equation for the preparation of sodium silicate.

(5) Give the molecular formula of fluorite. What is the co-ordination number of the metal ion in it?

(B) Solve any two of the following problems.   **6**

(1) Calculate the Std. Gibb's free energy change at 25^0C for the reaction and then calculate the equilibrium constant.

$Cd + Pb^{2+}$ ⇌ $Cd^{2+} + Pb$ $\Delta E^0 = 0.27$ V
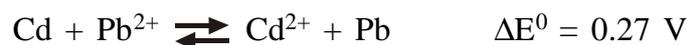
(2) Calculate the pH of 0.04M NaF solution. Ka of HF = 7.2×10^{-4}

(3) Will AgBr precipate on mixing 40 ml of 5.0×10^{-3} M $AgNO_3$ solution with 10 ml of 1.5×10^{-7} M NaBr solution ? (Ksp of AgBr = 5.0×10^{-13})

(C) Answer any three of the following questions.   **9**

(1) Explain
   (i) Energy change in a reaction is like a balance sheet in a business.
   (ii) The limitations and usefulness of pH scale.

(2) Explain giving reasons.
   (i) Aqueous solution of Aluminium nitrate is acidic.
   (ii) A piece of ice kept in the atmosphere at 27^0C melts spontaneously.

(3) Write notes on.
   (i) Hexagonal close packed structure.
   (ii) Schottky defect and Ree's symbol for this defect with one example.

(4) Explain the special magnetic properties in solids. Give examples for each.

Q. 6. (A) Answer the following objective questions :   **5**

(1) One mole of an ideal gas at 300^0 K expanded isothermally from an intial volume of 1 Litre to 10 Litre. The ΔE for the process is...
   (a) 163.7 cal (b) 138.1 cal (c) zero (d) 9.0 lit.atm.

(2) (a) Give Lewis acid and base in $[Al(H_2O)_6]^{3+}$
   (b) Give Lewis acid of $NH_3^+CH_2COO^-$

(3) Which alumino sillicate is used as an acid catalyst ?

(4) Which type of silicate mineral contains metal ion and hydroxide ions ? Give one example

(5) Give geometrical shape of crystal AB having radius ratio of crystal AB is 0.52. Also give co–ordination number of A^+ ion in crystal AB.

(B) Solve Any Two numericals of the following   **6**

(1) (a) If $\Delta G^0 HI(g) = -1.7$ KJ. Calculate Equilibrium constant for the following reaction at 25^0C

$$2HI_{(g)} \rightleftharpoons H_{2(g)} + I_{2(g)}$$
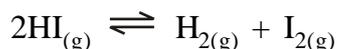
(b) Following reaction occurs spontaniously ? Why ?
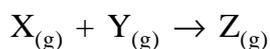
$$X_{(g)} + Y_{(g)} \rightarrow Z_{(g)} \quad\quad \text{Where, } \Delta E = -3.0 \text{ K.cal}$$
$$\Delta S = -10.0 \text{ Cal.K}^{-1}$$
$$R = 2.0 \text{ Cal.K}^{-1}.\text{Mol}^{-1}$$

(2) (a) 100 ml aqueous solution of NaOH contains 4×10^{-8} grams of NaOH. Calculate pH of the solution. (NaOH = 40 gm/mole)

(b) If the solubility of salt $Li_3Na_3(AlF_6)_2$ in its saturated solution is 'a' mol/litre. Calculate its solubility products at 25^0 C. temp.

(3) The solubility product of $Ca(OH)_2$ at 25^0C temp. is 4.47×10^{-5}. A 500 ml of saturated solution of $Ca(OH)_2$ is mixed with equal volume of 0.4M. NaOH solution. How much $Ca(OH)_2$ in miligrams is precipitated ?

(C) Answer any Thre of the following questions   **9**

(1) (a) Derive the equation $\Delta H = \Delta E + \Delta n_{(g)}RT$ for a gaseous system.
(b) Explain the limitations of the First law of thermodynamics.

(2) Explain : Lewis theory of Acids and Bases with two equations.

(3) (a) Explain : The Face Centered Cubic close–packed structure
(b) Explain : Diamagnetic substances

(4) (a) Derive radius ratio in Octahedral structure.
(b) Explain Electronic imperfections in solid.

Q. 7. (A) Answer the following questions in short   **5**

(1) Write the conjugate Acid–base reaction for liquid Ammonia and show the conjugate pairs.

(2) 1 mole of an ideal gas is filled in a cylinder at 25^0C temperature and 4 atmospheric pressure. What would be the values of ΔH^0 & ΔE^0 if this gas expanded in air ? Why ?

(3) Indicate Schottky defects seen in the crystal structure of KCl by Ress symbol.

(4) What type of silicate is asbestos ? Give the structural formula of the silicate ion present in it ?

(5) Which type of properties are fluidity of liquids and volume of substance.

(B) Solve any two of the following numericals.   **6**

(1) From the given information state which of the following reactions will occur sponteneously at 298^0C Kelvin temp.

(2) The heat of combustion of glucose is -687.0 kcal mole^{-1}. The heats of formation of CO_2 and H_2O are -94.05 and -68.32 Kcalmole^{-1} respectively calculate standard enthalpy of formation of glucose $(C_6H_{12}O_6)$

(3) 2 litres of an aqueous solution contains 4.0 gms of NaOH. Calculate pH of solution. Molar mass of NaOH = 40 gm/mole.

(C) Answer any three of the following questions.   9

(1) How are tetrahedral and Octahedral voids produced ?

(2) What is meant by work ? Explain the relationship between electrical work and Gibb's free energy

(3) Write a short note on ferromagnetic, antiferromagnetic and ferrimagnetic substances.

(4) Derive the relationship between the ionisation constant Ka, concentration Co, and H_3O^+ ion concentration of Formic acid in aqueous solution.

Q. 8. (A) Answer the following objectives :   5

(1) Absolute value of free energy cannot be calculated. Why ?

(2) Which type of properties are enthalpy of formation & refraction ?

(3) From the following, which are sparingly soluble in water ?
Na_3PO_4, $CuCO_3$, $CdCl_2$, $Mg(OH)_2$

(4) Write conjugate bases of H_2PO_4, H_2O

(5) Which are the two oxides of transition element that are as good conductors as metals ?

(B) Solve any two examples :   6

(1) The cell potential of a standard electro–chemical cell is 0.32 volt at 25^0C. Calculate equilibrium constant value of the following reaction which occurs in it.
$Zn_{(s)} + Fe^{+2}{}_{(aq)} \rightleftarrows Zn^{+2}{}_{(aq)} + Fe_{(s)}$

(2) The ionization constant of HCOOH is 1.77×10^{-4} at 25^0C. Calculate pH of 0.25M aqueous solution of HCOOK at 25^0 temp.

(3) 200 ml of a solution contains 0.98 gms of H_2SO_4. Calculate its pH Value. Molecular weight of H_2SO_4 is 98.0 gms/mole.

(C) Answer the following questions : (Any three)   9

(1) State different forms and limitations of first law of thermodynamics.

(2) Define the term solubility and solubility product. Derive an equation showing relationship between the solubility and solubility products of Sb_2S_3 in its aqueous solution.

(3) What are alumino–silicates ? Explain the different types of aluminosilicates.

(4) Write short note on : (a) Paramagnetic Substances
                                   (b) Larmor Circulation

Q. 9. (A)   (5)

(1) What are basic anionic units of pyrosilicates and metasilicates ?

(2) If solubility of a salt Na [Ag (CN)$_2$] is 'x'. How will you write it's solubility product in terms of 'x' assuming it to be a sparingly soluble salt ?

(3) What is proces ? Define adiabatic process

(4) Round up value of 'R' to 2 cal per mole per Kelving and calculate value of change in free energy for a reaction having equilibrium constant 0.1 at 727 degree celcius.

(5) How much will be the change in hydronium in concentration of an aq solution if it's PH is increased by one ?

(B) Solve any two (6)

(1) Calculate ionization constant of 0.05 molar acid solution of PH = 3.68

(2) Latent heat of Vaporization of water is 540 cal. per gram. What would be the change in enthalpy, entropy and free energy if 9 gram of water is converted into Vapour at 100^0C ?

(3) How much CaF_2 is present in 5 litres of it's saturated solution if solubility product of CaF_2 is 1.7×10^{-10}

(C) Answer any three (9)

(1) How do NaCl and CsCl differ in their lattice structure ? How many atoms are present in unit cells of each of these ? Draw unit cell of NaCl.

(2) (a) Differentiate between dissociatin & ionization.
(b) Explain why solubility of AgCl is less in aq. NaCl than that in water.

(3) (a) How does entropy function predict the spontaneity of the reation ? Give expression for change in entropy when an ideal gas expands in vaccum.
(b) Write the relation between heat evolved during reaction at constant pressure and that evolved at constant volume. When are the values of the two equal ?

(4) Derive expression for dissociation constant of an aqueous solution of hydrocyanic acid. This acid is a weak acid.

(5) (a) Which point defect is found in sodium chloride ? Explain.
(b) Write account on ferromagnetic substances.

Q. 10 (A) Answer the following : (05)

(1) The volume of gas at 0^0C and 1 atm press is not a state function, true or false ?

(2) Identify the following as Lewis acid or Lewirs base.
CaO, CO_2

(3) Write the equation of the reaction between oxalic acid and two moles of caustic soda.

(4) In which compound both Schottky and Frenkel defect is found ?

(5) What kind of solid a glass is ?

(B) Attempt any two : (06)

(1) $2NO + O_2 \rightarrow 2NO_2$

ΔH	21.6 Kcal/mole	–	8.09 Kcal/mole
ΔS	50.3 cal/mole^{0}K	49.0 cal/mole^{0}K	57.5 cal/mole^{0}K

Calculate ΔH^0, ΔS^0 and ΔG^0 and Kp.

(2) Calculate the solubility of Ag_2S in mgm/lit.

Ksp of $Ag_2S = 1.0 \times 10^{-51}$ (moles/litre)^3 Ag = 108 gm/mole

S = 32 gm/mole

(3) What would be pH of solution when 10.2 ml 0.1M NaOH sol. is added to 10ml 0.1M HCl solution.

(C) Answer the following : (Any three) (09)

(1) Short note on meta silicate and chain silicate.

(2) (i) Explain Larmor circulation.

(ii) Give difference of amorphous solid and crystalline solid.

(3) (i) Explain the applications of first Law of thermodynamics.

(ii) Explain Extensive and intensive properties.

(4) Explain hydrolysis of sodium acetate and derive the relation between Kh, Kb and Kw.

Q. 11 (A) Answer the following questions in short. (5)

(1) What are extensive properties ?

(2) Define : Standard heat of formation.

(3) What is range of change in pH in a titration of HCl against NaOH at 99.9% to 100.1% stage ?

(4) Define the term : Ionic product of water.

(5) What is dimeric structure ?

(B) Calculate any two example. (6)

(1) The vaporizations of 1.0 grams of water at 100^{0}C absorb 540 cal heat what would be the changes in enthalpy, entropy and free energy if 9.0 grams of water is converted in to vapour at 100^{0}C ?

(2) The concentration of $Mg(OH)_2$ in its saturated solution is 8.2×10^{-4} % w/v calculate ksp of $Mg(OH)_2$. Molar mass of $Mg(OH)_2$ is 58.3 gms/mole.

(3) What would be pH of a solution containing 1.0 gram of NaOH in 100 ml solution ? (Na = 23, O = 16, H = 1)

(C) Answer any three of the following : (9)

(1) A piece of ice kept in atmosphere at 25^{0}C melts spontaneously but liquid water does not get converted in to ice spontaneously at this temperature prove this observation on the basis of second law of thermodynamics.

(2) (i) State limitations of Arrhenuis theory.

(ii) State limitations of pH scale.

(3) (i) Define unit cell and write number of atoms per unit cell in simple cubic structure.

(ii) What is co–ordination number ? State co–ordinationn number of Ti^{+4} in TiO_2.

(4) Give proper information about feldspar, Z eolite and ultramarines.

Q. 12 (A) Answer the following objective questions :   **5**

(1) Which of the two : an ideal crystal or a real crystal has more entropy ?

(2) Which of the following is true for the reaction at equilibrium ?

(a) $\Delta H > T \Delta S$ (b) $\Delta H < T \Delta S$

(c) $\Delta H = T \Delta S$ (d) $\Delta H = \Delta S$

(3) Fill in the blank :

In CsCl structure the co–ordination number of Cs^+ ion is.............

(4) How many atoms are there in a unit cell of compound fcc structure ?

(5) For an amine RNH_2 write an expression for Kb.

(B) Solve any two examples :   **6**

(1) The standard molar enthalpies of formation of eyclohexane (l) and benzene (l) at 25^0C are –156 and +49 KJ mole^{-1} respectively. The standard enthalpy of hydrogenation of eyclohexane (l) at 25^0C is –119Kj mole^{-1}. Use these data to estimate the magnitude of resonance energy of benzene.

(2) Calculate at 25^0C the equilibrium constant for the reaction :

$Cu_{(S)} + 2Ag^+_{(aq)} \rightarrow Cu^{+2}_{(aq)} + 2Ag_{(s)}$

at 25^0C, E^0 cell – 0.47 volt.

(3) How will you separate Fe^{2+} and Zn^{2+} from a solution containing 0.1M Fe^{2+} and 0.1M Zn^{2+}, using S^{2-} ions ? Ksp values of FeS and ZnS are 1.0×10^{-19} and 4.5×10^{-24} respectively.

(C) Answer any three questions from the following :   **9**

(1) Discuss paramagnetic, antiferromagnetic and network solids with one example of each type.

(2) What is free energy of a system ? Is it related with entropy change ? free energy and entropy are used to predict about spontaneity of a chemical change ?

Q. 13 (A) Answer the following questions in short :   **5**

(1) What is Larmor circulation ?

(2) Using Ree's symbol express Frenkel defect. Give one example.

(3) Write an equation for the solubility product of $Ca_3(PO_4)_2$.

(4) What is the change in pH value of a solution in the range of 99.9% to 100.1% in a titration of 0.1N NaOH against 0.1 N HCl.

(5) When an ideal gas in expanded in vacuum, what is the change in its internal energy. Why ?

(B) Solve any two of the following numericals :   6

(1) ΔH^0 for the reaction $Al_2Cl_{6(s)} + 6Na_{(s)} + 6\ NaCl_{(s)}$ is –256.8 Kcal at 25^0 C. The standard enthalpy of formation of $NaCl_{(s)}$ is –98.2 Keal.mole^{-1}. Calculate the standard enthalpy of formation of Al_2Cl_6.

(2) Calculate the weight of CH_3COOH in 100 ml of a solution of the acid which has 3.0 pH. Ka of $CH_3COOH = 1.75 \times 10^{-5}$

(3) Calculate the equilibrium constant of the following reaction at 25^0C.

$2\ SO_{2(g)} + O_{2(g)} = 2\ SO_{3(g)}$
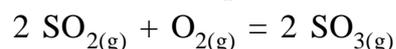
Δg^0 for $SO_{2(g)}$ and $SO_{3(g)}$ are –71.79 and –88.52 Kcal mole^{-1} respectively at 25^0C.

(C) Answer any three of the following questions :   9

(1) Write a short note on Aluminosilicates.

(2) Explain : (i) Anti ferro magnetic substances
               (ii) How are tetrahedral and octahedral voids produced ?

(3) Explain : (i) Hydration of a salt
               (ii) Limitations of pH Scale

(4) What is meant by a free energy ? How is the free energy change of a reaction related to the enthalpy change and entropy change of the reaction ? Explain, on the basis of this relationship, the conditions for sportaneity of reactions.

Q. 14 (A) Answer the following questions in short :   5

(1) State important difference between heat and energy.

(2) Write the equation for the expansion of an ideal gas in vaccum and change in its entropy.

(3) How can be the approximate and accurate pH value of a solution determined ?

(4) What is dimeric (island) structure ?

(5) Which anions are present in ultramarine green ?

(B) Solve any two examples :   6

(1) The equilibrium constant of the reaction A + B = C is 0.50 litre mole^{-1} at 25^0C. The standard free energies of formation of A and B are –20.0 and –25.0 K.cal mole^{-1} respectively. Calculate the standard free energy of formation of 'C' at 25^0C.

(2) Calculate the weight of CH_3COOH in 100 ml of a solution of acid which has pH of 2.8723. Ka of $CH_3COOH = 1.8 \times 10^{-5}$

(3) Calculate the solubility product of Ag_2CrO_4 whose solubility is 6.64 $\times 10^{-2}$ g/litre at 30^0C. (At. Wt Ag = 108, Cr = 52, O = 16)

(C) Answer any three of following questions   9

(1) Define the terms internal energy and enthalpy obtain $\Delta H = q_p$ on the basis of first law of thermodynamics.

(2) (a) Short note on titration and pH changes.

(b) Aqueous solution of copper sulfate is acidic. Give reason.

(3) What is called point defect. Explain schottky defect.

(4) Calculate the value of radius ratio in ionic solid with coordination number three or ratio of r^+/r^- in tetrahedral structure.

Q. 15 (A) Answer the following in short : (5)

(1) Indicate the defect seen in the crystal structure of an alloy of Copper with Gold by Rees Symbol.

(2) State the important characteristic of entropy.

(3) Give conjugate acids of : CO_3^{-2} & SO_4^{-2}.

(4) How can we know the co–ordination number & geometry of a crystal ?

(5) State the unit of extensive property.

(B) Solve the following (Any–2) (6)

(1) pH of 0.05M solution of a certain weak base is 10.32. Calculate the ionization constant of the base.

(2) Specific volumes of ice and water at 0^0C temperature are 1.089 and 1.0 ml.gm^{-1} respectively. The molar heat of fusion of ice at 0^0C and 1 atmosphere is 1.440 K.Cals.mole^{-1}. If 180.0 grams of ice melt at 0^0C under 1 atm. to produce water at same temperature, what would be the values of ΔH, ΔE, q_p and q_v ?

[1 lit–atm. = 24.21 cal.]

(3) Calculate the minimum amount of NaOH required to precipitate $Zn(OH)_2$ from 250 ml 0.1M $ZnCl_2$ Sol^n. Ksp of$Zn(OH)_2$ = 4.5 $\times$ 10^{-17} (Molar mass of NaOH is 40 mg/mole)

(C) Answer the following in brief : (Any – 3) (9)

(1) How are tetrahedral and octahedral voids produced ? Explain the F. C. C. and B. C. C. structure.

(2) Derive : $\Delta H = \Delta E + \Delta n_{(g)}RT$ for a gasesous system.

(3) (a) Derive equation for ionistation constant of weak acid.

(b) Define : Ksp (solubility product constant).

(4) Write short notes on ferromagnetic, anti– ferromagnetic and ferrimagnetic substance.

Q. 16 (A) Answer the following objectives 5

(1) When can values of internal energy and enthalpy be equal for a gaseous system ?

(2) Absolute value of free energy cannot be calculated. Why ?

(3) Classify Cu^{2+} and CH_3NH_2 in to Lewis acid and base.

(4) What is co–ordination number of a postive ion ?

(5) Which are the two oxides of transition elements that are as good conductors as metals ?

(B) Solve any two examples   **6**

(1) The complete combustion of 1.56 gm of benzene produced liquid water and CO_2 gas at 27^0 c and 1 atm. pressure along with the evolution of 15.62 k–cal of heat. How much heat will be evolved if the reaction is carried out at 27^0c. at a constant volume ?

(2) 500 ml aqueous solution contains 0.84 gm. CH_3COOH at 25^0C. Calculate the pH value of the solution. The value of ionisation constant of CH_3COOH is 1.75×10^{-5}

(3) If equal volumes of 1×10^{-4} M $AgNO_3$ and 0.5×10^{-4} M $BaCl_2$ are mixed. Will AgCl precipitate ? Ksp of AgCl = 2.8×10^{-10}

(C) Answer any three of the following   **9**

(1) Derive $\Delta H = \Delta E + \Delta n_{(g)}$ RT equation for gaseous system.

(2) Write short notes on :
  (a) Mathematical concept of entropy.
  (b) Importance of 2nd law of thermodynamics.

(3) Derive the relation between the ionisation constant and H_3O^+ of HCOOH in aqueous solution.

(4) Explain the relationship between the ratio of the radii of the ions and crystalline structure in case octahedral structure.

Q. 17 (A) Answer the followig in short :   **(5)**

(1) When q = –w ? what it indicate ?

(2) Why ionization constant of strong electrolytes can not be derive ?

(3) Which ions are considered responsible for ultramarine red ?

(4) Why dilute solutions cannot be tritrated successfuly ?

(5) What is the co–ordination number and which type of geometry for r_+/r_- = 0.414.

(B) Solve Any Two of the following examples :   **(06)**

(1) The ionization constant of ammonia is 1.8×10^{-5}. What woul be pH of a solution containing 1.70 grams of ammonia in 250 ml solution ?

(2) The concetration of $Mg(OH)_2$ in its saturated solution is 8.2×10^{-4} % (w/v). Calculate Ksp of $Mg(OH)_2$. Molar mass of $Mg(OH)_2$ is 58.3 g/mole.

(3) The standard heat of combustion of liquid benzene is –781.0 k.cal/ mole at 25^0C. How much heat will evolve by comustion of 1 kg of liquid benzene ? Calcualte the change in internal energy when 2.5 mole of liquid benzene is burnt.

(C) Answer Any Three questions from the following :   **(09)**

(1) What is meant by entropy ? Explain how this function is used to determine the direction of a spontaneous reaction.

(2) Explain hydrolysis of   (a) an acidic salt
                            (b) a basic salt

(3) Derive the equation of K_b for ionization of aniline in aqueous solution.

(4) (a) Discuss the relationship between radius ratio of ions for octohedral arrangement.

(b) Write note on Rees symbol.

Q. 18 (A) Answer in brief : 5

(1) State the importance of the equation $E = mc^2$.

(2) Why does $q_{rev} = O$ for expansion of an ideal gas in vaccum ?

(3) Wrtie importance of K_{sp}

(4) Give the number of atoms per unit cell in a face – centered cubic crystal.

(5) What is the effect on density of the substance by Frenkel defects ?

(B) Solve (any two) of the following : 6

(1) The solubility product of $CaSO_4$ is 1.4×10^{-4}. Calculate volume of its saturated solution containing 10 mg of the salt. [Ca = 40, S = 32, O =16]

(2) Calculate the minimum amount of NaOH required to precipitate $Mg(OH)_2$ from 500 ml 0.10 M $MgCl_2$ solution. K_{sp} of $Mg(OH)_2$ = 2.8×10^{-16}. [Na = 23, O = 16, H = 1]

(3) Calculate the equilibrium constant of the following reaction at $25\,^0C$:

$2SO_2 + O_2 \rightleftharpoons 2SO_{3(g)}$

$\Delta G^0_{\,f}$ for $SO_{2(g)}$ and $SO_{3(g)}$ are $– 71.79$ and $–88.52$ k.cal mole^{-1} respectively at $25\,^0C$.

(C) Answer the following (any three) 9

(1) Explain :

(a) Work and first law of thermodynamics.

(b) Various types of process in thermodynamics.

(2) (a) Discuss the imperfections in solid.

(b) Explain the defects, seen in crystal structure of KCl and Cu–Au alloy, Indicate by Rees symbol.

(3) What is hydrolysis of salt. Discuss acidic and basic behaviour of the aqueous salt solution on this basis.

(4) Give Explanation :

(a) Face–centered cubic close–pack structure.

(b) Standard free energy of formation of a compound.

Q. 19 (A) Answer the following questions in short : 5

(1) Define – State function.

(2) Under which condition does internal energy becomes equal to enthapy?

(3) What is meant by dimeric structure ? Draw its diagram.

(4) Give two methods to obtain amorphous solids.

(5) What is meant by electronic conductivity ?

(B) Solve any two of the following numericals : 6

(1) The solubility product at 25^0 C. of CaF_2 is 1.7×10^{-10}. How many Liters of its saturated solution can be prepared from its 0.078 grams? [Ca = 40, F = 19]

(2) The ionization constant of HCOOH is 1.8×10^{-4} at 25^0 C. temperature. Calculate pH of 0.18 M aqueous solutions of HCOOK at 25^0C. temperature.

(3) Calculate the change in free energy of the reaction. $Zn_{(s)} + Cu^{2+}_{(aq)}$ = $Cu_{(s)} + Zn^{2+}_{(aq)}$ which occurs in a standard cell at 25^0C. $E^o_{Zn/Zn^{+2}} = 0.76$ V, $E^o_{cu^{+2}/w} = + 0.34$ V

(C) Answer any three of the following questions 9

(1) Explain : (i) Anti Ferromegnatic substances
(ii) Mathematical concept of ENTROPY

(2) How are defects produced in crystal structure ? How are the properties of crystals affected by these defects ?

(3) Derive the relation between the ionization constant K_b, concentration of OH^- ion, and concentration Co of in the aqueous solution of Aniline.

(4) Explain : (i) Free energy and equilibrium constant.
(ii) Expansion of an ideal gas in vacuum and change in Entropy.

Q. 20 (A) Answer the following objective questions. 5

(1) Give an example of such equation for which $\Delta H < \Delta E$.

(2) State characteristics of entropy.

(3) Define : Solubility of sparingly soluble salt.

(4) Classify the following on the basis of electrical conductivity : TiO, TiO_2, Ti_2O_3.

(B) Solve any two of the following numericals. 6

(1) For the reaction C = 2A + 1/2B equilibrium constant is 1.12×10^{-8} at 25^0C. If the standard free energy of formation of A and C are 20.72 and 39.06 k.cal/mole, Calculate standard free energy of formation of B at 25^0c.

(2) pOH of an aqueous solution prepared by dissolving 1.5 gm of acid in 250 ml is 11.12 at 25^0C. Calculate Molecular weight of acid and ionization constant of acid is 1.75×10^{-5} at 25^0c.

(3) Calculate the minimum amount of KOH required to precipitate $Mg(OH)_2$ from 1 lit 0.05 M $MgCl_2$ solution ksp of $Mg(OH)_2$ is 2.8×10^{-16} [K = 39, O = 16, H = 1]

(C) Answer any three of the following questions. 9

(1) Explain : (i) Limitations of the first law
(ii) Schottky defects.

(2) Explian : (i) Acid–base Titration

(ii) Classification of silicates

(3) What is hydrolysis and hydrolysis constant ? Explain the nature of $(NH_4)_2SO_4$

(4) Explain : (i) Face centered cubic close pack structure

(ii) Useful work and free energy.

Q. 21(A) **Answer the following questions in short :** (5)

(1) State the limitations of second law of thermodynamics.

(2) Write the fomula for the change in entropy when an ideal gas is udnergoing expansion.

(3) Complete the following Lowry–Bronsted acidbase reaction :

$SO_4^{-2} + 2H_3O^+ \rightleftharpoons$

B–I   A–2

(4) Give the classification of the oxides of the given transition metals TiO, TiO_2, Ti_2O_3 on the basis of the properties of Electrical conductivity.

(5) What are antiferromagnetic substances ?

(B) **Solve ANY TWO of the following numericals :** (6)

(1) A cylinder is filled with one mole of an ideal gas at 25^0C and 5 atmospheric pressure. Due to a leakage in the valve, the gas diffuses in the atmospere. Calculate theh work done in te expansion of the gas. Calcualte ΔE and ΔH also (1 lit–atmp. = 24.21 calories)

(2) 100 ml of $3 \times 10^{-3}M$ aqueous solution of NaCl is added to 200 ml $1 \times 10^{-3}M$ aq. solution of $Pb(No_3)_2$. Whether precipitation will occur or not ? Ksp of $PbCl_2$: 2×10^{-4} (moles/litre)^3.

(3) What is the hydronium ion concentration in a solution of 0.02M CH_3COONa and 0.05M CH_3COOH. [K_a of $CH_3COOH = 1.8 \times 10^{-5}$] Determine pH of the solution.

(C) **Answer ANY THREE of the following questions :** (9)

(1) What is free energy ? How is free energy change of a reaction related to enthalpy change and entropy change ? Explain conditions for spontaneity of reaction.

(2) A.   What is meant by entropy ? How this function is used to determine the direction of a spontaneous reaction ?

B.   The aqueous solution of $CuSO_4$ possess acidic nature.

(3) What is common ion defect ? Explain its application in qualitative analysis of positive ions of group–II and III (A).

(4) State the importance of Ree's Symbols and with help of this symbol's explain schottky defect, Frenkel defect and substitutional disorder.

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Q. 1. [A] **Answer the following objectives.** 5

(1) Give the cell reaction of the following cell at 25^0C

Ni/Ni$^{+2}_{(1M)}$ // Au$^{+3}_{(1M)}$ / Au

(2) Write the law of mass action.

(3) What is the difference between, electro chemical and electrolytic cell ?

(4) Give an equation on the basis of schrodinger wave equation; if n = 1 and l = 0 for the acceptable value of ψ

(5) Define : Cell potential

[B] **Solve Any Two example** 6

(1) How much Mg will produce if fused $MgCl_2$ is elecrolysed for 12 hours using 5.0 ampere current ? How much quantity of this product would form, if the current efficiency is 90% ?

(2) The half life period of Ra^{226} is 1620 years. How many α–particles would be emitted per minute from 0.001 gram of Ra^{226} ? Each Ra^{226} atom emits one α– particle on decomposition.

(3) The velocity of a practice weighing 1.0×10^{-10} gram is 100 Km per minute. Calculate wave length associated with the particle.
(h = 6.626×10^{-27} erg/sec.)

[C] **Answer Any Three** 9

(1) What is corrosion of a metal ? Explain its chemistry. How can be corrosion of metals be prevented ?

(2) What is activation energy ? What are the necessary conditions for a reaction to occur between molecules ? Explain endothermic and Exothermic reaction on the of potential energy diagram.

(3) What is ψ ? Give the conditions which make the values of ψ acceptable. How is s-orbital is supposed to be spherical ?

(4) Explain :
(a) Bonding orbital and Antibonding molecular orbital
(b) State the principle advantage and chemical reaction of Fuel Cell :

Q. 2. (A) **Answer the following questions.** 5

(1) Write the electronic configuration of F_2 on the basis M. O. Theory.

(2) What is Heisenberg's uncertainity principle ?

(3) Write two advantages of fuel cell ?

(4) What is law of mass action ?

(5) What is Schrodinger wave equation ?

(B) **Answer any two of the following.** 6

(1) The potential of the following cell is 0.59 volt at 25^0C. Calculate the ionic product of water at 25^0C.

Pt/H$_{2\ (1\ atm)}$ /KOH$_{(0.01M)}$ // HCl$_{(0.01M)}$ // H$_{2(1atm)}$ / Pt
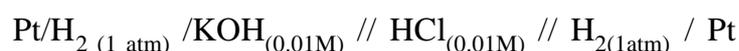
(2) How much silver will be obtained if 1 liter 0.50M $AgNO_3$ solution is electrolysed between inactive electrodes by passing 0.5 ampere current for 12 hours ? What would be the decrease in concentration of the solution ?

(3) The concentration of a reactant of a certain first order reaction becomes 50% of initial concentration after 40 minutes at 30^0 C. Calculate the rate constant of the reaction.

(C) Answer any three of the following   **9**

(1) Explain Valence Bond theory and its limitations.

(2) State in detail the quantum numbers (n, l, m) for 2p, 3d and 4s – orbitals.

(3) Magnesium blocks are attached to iron plates of a steamer. Why ? Explain your answer in detail.

(4) Explain the effect of use of a catalyst on the rate of a reaction. How does the use of a catalyst affect ΔH values of reactions ?

**Q. 3. (A) Answer the following questions in short**   **5**

(1) When the law of mass action is as good as the differential rate law ?

(2) What is the order of decay of radioactivity ?

(3) What will happen if a nickel rod is used to stir an aqueous solution of $AgNO_3$

$E^0_{Ni}/_{Ni2+}$ = 0.25V & $E^0_{Ag}/_{Ag+}$ = –0.80 V

(4) What is the symmetry of sigma and pi bonding molecular orbitals ?

(5) State the factors on which the physical and chemical properties of molecules depend.

(B) Solve Any Two examples   **6**

(1) The potential of the following cell is 0.71 volts at 25^0 C. Calculate the ionic product of water (Kw) at 25^0 C.
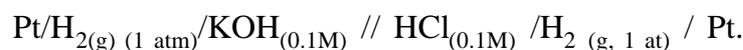
$Pt/H_{2(g)\ (1\ atm)}/KOH_{(0.1M)}$ // $HCl_{(0.1M)}/H_{2\ (g,\ 1\ at)}$ / Pt.

(2) The half life period of Th^{232} is 1.39×10^{10} years. How many α–particles would be emitted per minute from 1 gm. of Th^{232}. Each Th^{232} atom emits one α–particle on decomposition.

(3) The kinetic energy of an electron is 2.18×10^{-11} erg. Calculate wave length associated with an electron. Mass of an electron = 9.109×10^{-28} grams. $(K \cdot E = \frac{1}{2}mv^2)$

(C) Answer Any Three of the following.   **9**

(1) Give the balanced chemical equations of the reactions occuring on anode and cathode in Dry cell, Lead storage cell and Fuel cell.

(2) The reaction $C_2H_5Cl_{(g)} = C_2H_4 + HCl_{(g)}$ follows the first order rate law. Write the equations for the rate of reaction. Derive unit for K. If the concentration of C_2H_5Cl is doubled keeping temperature constant what would be the effect on the rate of reaction.

(3) Give the schrodinger's wave equation and give the meaning of each letter in the equation. How did schrodinger inspire to obtain this equation ? Give the equation for the calculation of energy of an electron on its basis.

(4) Answer the questions
  (i) What is corrosion ? Give reactions occuring on iron rod due to corrosion.
  (ii) What informations can be obtained from hybridization of orbitals.

Q. 4. (A) Answer the following questions in short :   **5**
(1) How many coulombs of electricity should be passed through 1 M aqueous $CuSO_4$ to obtain 1 mole of copper metal during electrolysis ?
(2) What is concentration cell ? Give illustration.
(3) What are necessary conditions for effective collisions ?
(4) State the law of Mass action and give the names of the scientists who proposed this law.
(5) Mention the conditions of acceptable values of ψ in Schrodinger's equation.

(B) Solve any two of the following numericals :   **6**
(1) The standard oxidation potentials of Co/Co^{+2} and Ni/Ni^{+2} electrodes are +0.28 and +0.23 volt respectively at 25^0 C. Calculate the equilibrium constant of a reaction occuring in the cell formed from these two standard half cells at 25^0C.
(2) The concentration of N_2O_5 decreases from 0.25 M to 0.10 M at the end of 1800 seconds, calculate half–life of the reaction. How much time it would take for 75% completion of the reaction.
(3) Calculate the wavelength of a photon having the value of einstein 1.995×10^{12} ergs/mole photons.

(C) Answer any three in detail :   **9**
(1) What is cell Potential ? Draw the figure of Daniel Cell and represent it by symbolic method, and write the functions of Salt Bridge.
(2) Explain : (1) Nernst's equation with one illustration
  (2) S–orbital is spherical.
(3) State important points of Valence bond theory and give its limitations.
(4) Derive the integrated rate law of the first order reaction.

Q. 5. (A) Answer the following in brief   **5**
(1) Interpret the crystal defect represented by $(Ag^+ \, \delta/\Delta) \, (Ag^+1-\delta/\square_+)Br$
(2) Write Lewis structures for CO_2 & PCl_5 molecules.

(3) Which catalysts are used in fuel cell.

(4) State de–Broglie principle & give its equation.

(5) What is the rate determining step of a reaction.

(B) Solve any two of the following　　　　　　　　　　　　　**6**

(1) Calculate the energy of photon of radiation having wavelength 5000^0A. Also calculate the value of Einstein. (Velocity of light is 3.0×10^{10} cm/sec)

(2) Calculate the time for which 2 amp current is passed through 250 ml 0.02M $AgNO_3$ solution, so as to reduce all Ag^+ to Ag

(3) In a certain 1st order reaction, the concn of the reactant decreases from 0.06 M to 0.03 M in 40 minutes. Calculate time of the half reaction.

(C) Answer any three of the following in detail　　　　　　　**9**

(1) (a) S–orbitals are spherically symmetrical, explain.

　　　(b) What is bond order ? Calculate the bond order of O_2 & Explain its magnetic property

(2) (a) Why de–Broglies principle is not appliable to Heavy objects in motion ?

　　　(b) Use of catalyst increases the rate of reaction. Explain.

(3) State & Explain Faradays laws of electrolysis.

(4) (a) Why is platinum electrode of a std. Hydrogen electrode coated with platinum black.

　　　(b) State the applications of E.M.F. series.

Q. 6. (A) Answer the following objective questions.　　　　　**5**

(1) Differentiate electrode and half-cell.

(2) Write the anode and cathode reactions of a fuel cell.

(3) When an aqueous solution of NaCl is added to $AgNO_3$ solution, reaction occurs very Fast. Why ?

(4) What is the type of hybrid orbitals in [Fe $(CO)_5$]? Write its geometrical shape.

(5) State the quantum numbers 1 and n for $5dz^2$ orbital.

(B) Solve any two of the following problems.　　　　　　　**6**

(1) At 25^0C potential of the following cell is 0.64V.Calculate pH of HCl solution.
Cu^{2+}/Cu = 0.34 V.

(2) Atomic mass of radium is 226 g/mole and its decay activity per one gram is 3.7×10^{10} atoms per second. Calculate half-life of radium.

(3) The velocity of a particle weighing 1.0×10^{-13} Kg is 100 Km min^{-1}. Calculate wavelength associated with the particle in A^0.

(C) Answer any three of the following questions   **9**

(1) Explain

    (i) The electrolysis of aqueous copper sulphate solution between graphite electrodes.

    (ii) Differential rate law.

(2) Write note on

    (i) EMF series.

    (ii) Heisenberg's Principle.

(3) Prove that oxygen molecule is paramagnetic on the basis of Molecular Orbital theory. Give its electronic configuration.

(4) Write Schrodingers Wave equation and explain the terms. How the shape of S-orbital is determined using this equation?

Q. 7. (A) Answer the following objective questions   **5**

(1) Give the name of catalyst used in anode and cathode of the fuel cell.

(2) How many coulombs are required to obtain $\frac{1}{2}$ of O_2 from 1 mole of H_2O ?

(3) Why ionic reactions are very fast ?

(4) Define : Hybridization energy

(5) What are ψ and ψ^2 ?

(B) Solve any two numericals of the following numericals   **6**

(1) 500 ml of 0.2 M $CuSO_4$ solution is electrolysed with a current of 2A for 1.5 Hrs. using platinum electrodes. Assuming that the volume of the solution remain the same. Calculate the concentration of the solution after electrolysis.

(2) In the Arrhenius equation for a first order reaction, the values of A and Ea are 4.0×10^{13} S^{-1} and 98.6 KJ.mol^{-1}. respectively. At what temperature will its half life period be 10 minute ?

(3) With what velocity must be an electron travel so that its momentum is equal to that of photon of wavelength 520 nm ? [1nm = 10^{-7} cms, h = 6.626×10^{-27} erg sec.]

(C) Answer any three of the following questions   **9**

(1) State the construction, working and use of the Standard Hydrogen Electrode.

(2) What are σ and π Molecular orbitals ? Explain the structure and symmetry of σ and σ^*, π and π^* molecular orbitals.

(3) What is hybridization ? Why the concept of hybridization is accepted ? Explain the fact with the help of Methane molecule.

(4) (a) Give an information about energy barrier of reactions.

    (b) Explain the effect of concentration of reactants on the rate of reaction.

Q. 8. (A) Answer the following objective questions   **5**

(1) On what factors potential of cell depend ?

(2) Who proposed the concept of pilot waves ?

(3) Write the type of hybridisation, bond angle and shape of CH_4 molecule.

(4) What is meant by Energy of activation.

(5) Give Arrhenius rate equation.

(B) Solve the following numerical (any two)   **6**

(1) First order reaction is completed 50% in 16 minutes. How long will it take for the completion of 87.5%

(2) The Standard oxidation potential of Co/Co^{2+} and Ni/Ni^{2+} electrodes are +0.28 and 0.23 Volt respectively at 25^0C. Calculate the equilibrium constant of a reaction occuring in the cell formed from these two standard half cell at 25^0C.

(3) A particle having mass of 1.00 milligram has a velocity of 3600 kilometers per hour. Calculate the wave length of the particles.

(C) Answer any three of the following questions   **9**

(1) Explain the molecular orbital theory.

(2) Give balance Chemical equations of the reaction occuring at cathode and anode in Dry cell and Lead storage cell.

(3) Give Schrodinger's wave equation and give meaning of each letter in the equation. How did Irwin Schrodinger inspire to obtain this equation ? Give equation for the calculation of energy of an electron on the basis of schrodinger equation.

(4) "Colliding molecules should collide at proper angle to result into chemical reaction" Justify this statementwith the help of decomposition of HI gas.

Q. 9. (A) Answer the following :   **5**

(1) Give two uses of electrolysis.

(2) Milk stored at room temperature gets spoiled earlier in summer than in winter. Give reasons.

(3) Which of the following reactions will be faster ? Why ?
(i) $H^+ + OH^- = H_2O$ (ii) $C_2H_5Cl + OH^- = C_2H_5OH + Cl^-$

(4) State acceptable values of ψ.

(5) Write shape of hybridized orbital, hybridization, number of orbitals and shape of NH_4^+ ion.

(B) Solve any two examples :   **6**

(1) The potential of the following cell is 0.59 volt at 25^0C. Calculate the ionic product of water at 25^0C.

Pt/H_2 (1 atm)$/KOH$ (0.01M) $// HCL$ (0.01M) $/ H_2$ (1 atm) $/Pt.$

(2) 2.24 C^{14} atoms undergo decomposition per minute in the 1 gram Carbon old wooden iol. In 1 gm. Carbon of a green wood 15.3 C^{14} atoms undergo decomposition per minute. The half life period of C^{14} is 5730 years. Estimate in years how old the iold is ?

(3) With the help of the standard half cell potential, state which of the following reaction will occur spontaneously.

$2BR^- + Cl_2 = Br_2 + 2Cl^-$ $E^0Cl_2/Cl^- = +1.36$ volt

$Br_2 + 2Cl^- = 2Br^- + Cl_2$ $E^0Br_2/Br^- = +1.07$ volt

(C) Answer any three of the following :   **9**

(1) Explain two types of electrodes

(2) The reaction $C_2H_5Cl = C_2H_4 + HCl$ is of first order. For this reaction :
   (A) Write the reaction rate equation
   (B) Derive the dimension of K
   (C) Keeping temperature constant if the concentration of C_2H_5Cl is doubled, what will be the rate of reaction

(3) Give Schrodinger's wave equation and give the meaning of each letter in the equation. How was Erwin Schrodinger inspired to obtain this equation ? Give the equation for calculation of energy of an electron on the bais of Schrodinger's equation.

(4) (A) Explain from which type of experiment the idea of spin quantum number arose. What are the values of these numbers ?
   (B) Write the values of quantum numbers associated with $3d_{xy}$ and $2pz$.

Q. 10 (A) Answer in brief :   **(5)**

(1) State Heisenberg's uncertainty principle.

(2) State quantum numbers n, l & m for $4p_y$ orbital.

(3) What is galvanization of Iron ? What is it's purpose ?

(4) What is the slope of a plot of log K V/S $\frac{1}{T}$ for a certain 1st order reaction.

(5) Why dry cell cannot be recharged ?

(B) Solve any two :   **(6)**

(1) Calculate equilibrium constant for the reaction at 25^0C.
   $Ni^{+2} + Co \rightarrow Co^{+2} + N1$
   Standard oxidation of potentials for Ni and Co are 0.23 and 0.25 volt respectively.

(2) Calculate ionization energy of He^+

(3) The concentratoin of a certain first order reaction becomes 50% after 40 minutes at 300^0C. Determine time required for 70% completion of the reaction.

(C) Answer any three :   **(9)**

(1) Explain order of reaction.

(2) Give molecular orbital diagram of oxygen molecule. Which anamoly regarding oxygen is solved with the help of this ? Explain how.

(3) (a) Explain electrolysis of concentrated solution of sodium chloride between graphite electrodes.

(b) Write in brief about salt bridge.

(4) Derive and Explain de Broglie equation. Why this is not applicable to plane flying in air ?

(5) (a) Draw potential energy diagram for an endothermic reaction. Label it neatly.

(b) Explain importance of proper orientation of reactants in a reaction.

Q. 11 (A) Answer the following : (05)

(1) What is the function of salt bridge ?

(2) State any two uses of electrolysis.

(3) Define : moleculr orbital.

(4) What is pilot wave ?

(5) What is Radiomatric dating ?

(B) Attempt any two : (06)

(1) Calculate equilibrium constant of the reactionn.

$Ni + Co^{+2}_{(aq)} = Ni^{+2}_{(aq)} + Co_{(S)}$

$E^0 \, Ni/Ni^{+2} = 0.23v \quad E^0 Co^{+2}/Co = -0.28v$
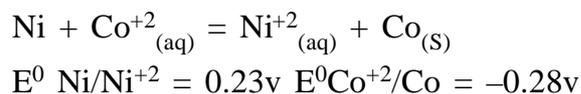
(2) Calculate IP of He^+ ion.

(3) Prove that hydrolysis of CH_3COOCH_3 is a first order reaction.

$$CH_3COOCH_3 + H_2O \xrightarrow{\text{HCl}} CH_3COOH + CH_3OH$$

	t_0	t_1	t_2	t_3	t_∞
Time min.	0	20	75	120	∞
Vol of NaOH	24.40	25.82	29.35	31.75	47.50
ml.	V_0	V_1	V_2	V_3	V_∞

(C) Answer in detail : (Any three) (09)

(1) Explain faraday's laws of electrolysis.

(2) Derive integration rate Law for first order reaction.

(3) Explain Heisenberg's uncertainnty principle.

(4) Explain giving illustrations the concept of hybridization of orbitals.

Q. 12 (A) Answer the following questions in short. (5)

(1) Give the mathematical form of the differential rate Law for the reaction $n_1C + n_1D \rightarrow n_3A + n_4B$.

(2) Mention any two ways of prevention of corrosion of iron.

(3) Give the potential energy diagram for exothermic reaction.

(4) How is 2s orbital different from 1s orbital in turns of probability of finding electrons ?

(5) Why does the use of catalyst increase the rate of a reaction ?

(B) Solve ANY TWO of the following numericals : (6)

(1) The half–life period of Ra^{226} is 1620 years. How many alpha particles would be emitted per minute from 0.002 grams of Ra^{226}. Each Ra^{226} atom emits one alpha particles on degradation.

(2) The standard potential of a cell in which the following reactin occurs is 1.10 volt at 25^0C. Calculate the equilibrium constant of the reaction at 25^0C.

$$Zn_{(S)} + Cu^{+2}_{(aq)} \rightleftharpoons Zn^{+2}_{(aq)} + Cu_{(s)}$$

(3) An electron of a hydrogen atom is to be located with ±0.05 A^0. If the velocity of the electron is measured simultaneously, what would be the uncertainly in the measured velocity ?

(C) Answer ANY THREE of the following questions : (9)

(1) Define anode and cathode ? Hence, explain the mechanism of corrosion in iron ?

(2) Highlight the main features of Valence Bond Theory, supported with examples ? List the limitations.

(3) Derive the equation for (a) the rate constant for first order reaction (b) half reaction time.

(4) Give the applicationns of cell potential. Hence, discuss "fuel cell" and its advantages.

Q. 13 (A) Answer the following objective questions : (5)

(1) Predict the magnetic moment of O_2 molecule.

(2) Predict which of the following will have higher bond dissociation energy :

O_2, O_2^+

(3) Can Fe^{3+} oxidise Br^- to Br_2 under standard conditions.

E^0 Fe^{3+}/Fe^{2+} = 0.771V; E^0 $Br_2/2Br^-$ = 1.09V

(4) For a chemical reaction

$X + 2Y \rightarrow Z$

the rate of formation of Z is 0.40 mole L^{-1} sec^{-1}. What is the rate of disappearance of x and Y ?

(4) Can activation energy for reactions be zero ?

(B) Solve any two examples : 6

(1) The first order reaction is 50% complete in 30 minutes at 27^0C and in 10 minutes at 47^0C. Calculate the activation energy of the reaction.

(2) For what concentration of Fe^{2+} will e.m.f. of the cell be 0.314 volt at 25^0C; if the concentration of Zn^{2+} is 0.01M ?

Zn/Zn^{2+} (0.01M) || Fe^{2+} (M_1) | Fe
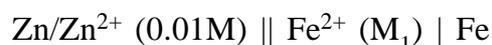
given that E^0 Zn | Zn^{2+} = –0.763 volt and

E^0 Fe^{2+} | Fe = –0.44 volt
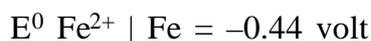
(3) Calculate the uncertainly in the position of an electron if uncertainly in its velocity is (a) 0.001% (b) zero.

(C) Answer any three questions from the following :   **9**

(1) With the help of molecular orbital theory, show that N_2 molecule has triple bond, O_2 molecule has double bond while F_2 molecule has single bond. Compare their bond strengths.

(2) Describe a Lead stronge cell. What are the reactions taking place in it during working of the cell.

(3) What is order of reaction ? Describe the following methods to determine the order of a reaction :
   (a) Half life period methmod.
   (b) Integration method.

(4) What is nernst's equations for cell potential ? Write Nernst's equation for following cells :
$Zn \mid Zn^{2+} (C_1) \parallel Ag^+ (C_2) \mid Ag$
$Ag \mid Ag^+ (0.20M) \parallel Ag^+ (0.60M) \mid Ag$
How can this equation be used for measuring pH of a solution ?

Q. 14(A) Answer the following questions in short   **5**

(1) On what do the product of electrolysis of aqueous salt solution depend.

(2) Give the factors affecting the rate of reactions.

(3) Why is the value of ψ_2 more important than that of ψ ?

(4) How is the wave nature of moving microscopic particle proved ? Who has proved ?

(5) What is specific rate constant of the reaction ?

(B) Solve any two examples :   **6**

(1) The potential of the following cell is 1.04 V at 25^0c Calculate pH of HCl solution. Pt/H_2 (1 atm) /HCl(xM) // Ag^+(0.01M)/Ag. The standard oxidation potential of Ag/Ag^+ at 25^0c is –0.80 V.

(2) 2.25 C^{14} atoms undergo decomposition per minute in an old wooden idol. In green wood 15.3 C^{14} atoms undergo decomposition per minute. The hald life period of C^{14} is 5730 years. Estimate the age of idol in years.

(3) Calculate the energy of a photon of radiation having wavelength 5000^0A. Also calculate the value of Einstein velocity of light = 3.0 $\times 10^{10}$ cm/sec.

(C) Answer any three of the following questions :   **9**

(1) Write a short note on "Lead Storage Cell"

(2) Derive the equation for the rate constant of a first order reaction.

(3) State and explain Heisenbergs Uncertainty principle.

(4) Explain the Hybridization of orbitals and shape of CH_4 molecules.

Q. 15(A) Answer the following in short : (05)

(1) For prevention of rusting of iron, iron plates are attached to metals like Mg or Zn. Why ?

(2) Why bond length in H_2 molecules is shorter than the bond length in H_2^+ ?

(3) Give acceptable solution of ψ; if Schrodinger equation is solved for $n = 1$ and $l = 0$.

(4) In Arrhenius equation when constant A is affected ?

(5) Why concept of matter waves cannot be applied to relatively large size particles ?

(B) Solve Any Two of the following examples : (06)

(1) The rate constant of a certain reaction is 2×10^{-3} min^{-1} at 27^0C. When the temperature of the system is increased by 30^0C, the value of the rate constant becomes three times. Calculate the energy of activation of the reaction and also rate constant at 42^0C.

(2) Calcualte the energy of a photon of radiation having wavelength 5000 A^0. Also calculate the value of einstein. Velocity of light $= 3.0 \times 10^{10}$ cm/sec.

(3) The potential of the following cell is 0.59 volt at 25^0C. Calculate the ionic product of water at 25^0C.

Pt/H_2 (g, 1 atm) / KOH (0.01M) // HCl (0.01M) / H_2 (g, 1 atm) / Pt

(C) Answer Any Three questions from the following : (09)

(1) With the help of molecular orbital theory explain that Ne_2 molecule is not possible.

(2) Derive the equation for integrated rate law of a first order reaction.

(3) (a) Explain the electrolysis of a concentrated aqueous NaCl using graphite electrodes.

   (b) What are the factors which influence the product of electrolysis.

(4) What is the physical significance of the energy of activation Ea ?

Q. 16(A) Answer in brief :

(1) Which relation is established by Faraday's laws of electrolysis ?

(2) Which cell was used in the Apollo space programme ?

(3) There are many collisions between carbon atoms and the oxygen in air, even then carbon does not burn at normal temperature. Why ?

(4) How is the value of A in Arrhenius equation obtained ?

(5) P–orbitals and d–orbitals have directional character. Why ?

(B) Solve (Any Two) of the following : 6

(1) How much copper will be obtained at cathode when 2.5 ampere current is passed for 30 minutes through $CuSO_4$ solution ? What would be the voume of O_2 gas evolved at 1 atm. and 27^0C.

(2) The half–life period of Th^{232} is 1.39×10^{10} years. How many α– particles would be emitted per second from 1 gm of Th^{232} ? Each Th^{232} atom emits one α–particle on decompostion.

(3) Calculate the ionization energy of He^+ and Li^{2+}
(Z = 2 for He & for Li Z = 3)

(C) Answer the following (any three) 9

(1) What is called electrolysis ? Electrolysis of dil. aqueous NaCl is actually electrolysis of water. Explain.

(2) What is activation energy ? Explain endothermic and exothermic reaction on the basis of potential energy diagram.

(3) Explain relation between rate of reaction and concentration and derive differential rate law.

(4) How are the shapes of orbitals defermined ? Why do we believe that s – orbital in spherical ?

Q. 17(A) Give the preparation of methyl benzoate and ethyl benzoate.

(B) Explain giving equations the reactions of acetic anhydride with water, ammonia and ethanol.

(3) Explain giving reasons :

(a) Amines have higher boiling points than their corresponding hydrocarbons are lower boiling points than their corresponding alcohols.

(b) Boiling point of iso meric primary amine is higher than tertiary amine why ?

(C) Aqueous solutions of amines are basic. Why ?

(4) Compound A on fusion with soda lime produced B, which on treatment with a mixture & conc. HNO_3 and conc. H_2SO_4 produced compound C. On reduction with Ni catalyst at 600^0C compound C produced an organic compound D. Give reaction scheme and identify the compound A, B, C & D from the chemical reactoins.

Q. 18(A) Answer the following questions in short 5

(1) What is meant by activated complex ?

(2) How is the wave nature of a moving microscopic particle proved ? Who has proved ?

(3) What is meant by the differential rate law ?

(4) Can aqueous Ferrous Sulphate solution be stored in a silver container ? Why ? $E^o_{Fe/Fe^{+2}} = 0.45$ V, $E^o_{Ag/Ag^+} = - 0.80$ V

(5) What are called "Pilot Waves" ?

(B) Solve any two of the following numericals : 6

(1) The standard oxidation potentials of Co/Co^{2+} and Ni/Ni^{2+} electrodes are 0.28 and 0.23 volt respectively at 25^0C. Calculate the equilibrium constant of a reaction occuring in the cell formed from these two standard half–cells. Give cell reaction.

(2) In a certain first order reaction, the concentration of the reactant decreases from 0.08 M to 0.06 M in 45 minutes. Calculate the time for half reaction.

(3) (i) An electron is moving with a velocity of 3.0×10^7 cm second^{-1}. The mass of electron is 9.109×10^{-28} gram per electron. Calculate the wave length of the electron.

(ii) Calculate the ionization energy of $He^+_{(g)}$

(C) Answer any three of the following :   **9**

(1) Give the schrodinger's wave equation and give the meaning of each letters in the equation. How did schrodinger inspire to obtain this equation ?

(2) Drive the equation for the rate constant of a First order reaction.

(3) What is meant by corrosion of metals ? Explain its chemistry. How can the corrosion be stopped ?

(4) Answer the following questions :

(i) What informations be obtained about hybridization of orbitals ?

(ii) State and explain the modern form of Faraday's laws of electrolysis.

Q. 19(A) Answer the following objective questions.   **5**

(1) Distinguish between atomic orbitals and molecular orbitals.

(2) Define : Activated complex.

(3) The law of mass action is as good as differential rate law. Explain.

(4) State type of hybridization, bond angle and shape as $[Fe(CO)_5]$

(5) State the function of salt–bridge.

(B) Solve any two of the following numericals.   **6**

(1) 1200 spoons can be plated by silver produced when electric current passed for 5 hours is an electrolytic cell filled with $AgNO_4$ solution. If plating of one spoon required 25 mg Ag. Calculate the current strength in ampere. (Ag = 108 gms/mole)

(2) The half life of X^{226} is 1620 yrs. Calculate the no. of α–particles emmitted per second from 0.001 kilogram X^{226}. Each X^{226} atomemits one α– particles on decomposition.

(3) When position and speed of hydrogen is measured imultaneously. The uncertainty is the measured value of velocity is 1.16×10^9 cm/sec. Calculate the wave length of radiation used Mass of e^- is 9.109×10^{-31} kilogram.

(C) Answer any three of the following :   **9**

(1) State and explain – Faraday's laws of electrolysis.

(2) Discuss the experimental methods for determines the order of reactions.

(3) Explain : Hybridisation of atomic orbitals with illustration.

(4) (i) Explain : s–orbitals are believed to be spherical ?

(ii) What is EMF series ? State it's importance.

Q. 20(A) Answer the following questins in short :   (5)

(1) On what do the products obtained by electrolysis of aqueous solutions of electrolytes depend ?

(2) Write the mordern presentation of Faraday's law.

(3) What is Radiometric dating ?

(4) Write the hybridization of orbital and the geometrical shape of molecule of C_2H_4.

(5) Write the acceptable solution for obtaining ψ for $n = 1$ and $l = 0$ value.

(B) Solve ANY TWO of the following numericals :   (6)

(1) Determine whether the oxidation–reduction reaction, $Sn_{(S)} + Ni^{2+}_{(aq)}$ $\rightarrow Sn^{2+}_{(aq)} + Ni_{(S)}$ is spontaneous or not ? Calculate its equillibrium constant at 25^0C.
$E^0_{Sn/Sn}{}^{2+} = 0.14V$; $E^0_{Ni/Ni}{}^{2+} = 0.23V$.

(2) The rate constant of a certain reaction is 2×10^{-3} min^{-1} at 27^0C. When the temperature of the system is increaed by 20^0C, the value of the rate constant becomes three times. Calculate the energy of activation of the reaction and also rate constant at 37^0C.

(3) An electron of a hydrogen atom is to be located within $\pm0.05A^0$. If the velocity of the electron is measured simeeltaneously, what would be the uncertainity in the measured velocity ?

(C) Answer ANY THREE of the following questions :   (9)

(1) Describe the construction, working and use of standard hydrogen electrode.

(2) What is meant by corrosion of metals ? Give the causes and explain its chemistry.

(3) Obtain the integrated rate law for the first order reaction.

(4) a. State the conditions for acceptable solution of ψ.
    b. Draw molecular orbital diagram and calculate bond order of O_2.

✳–✳–✳

Question-3

Q. 1. [A] Answer the follwing objectives   **5**

(1) Give equation for the hydrolysis reaction of Benzene triozonide.

(2) Why is neutralisation of phenol not possible by weak base like Sodium Carbonate inspite of phenol being acidic ?

(3) Give Chemical reaction showing thermal decomposition of lithium nitrate

(4) Write the name and molecular formula of two compounds of fluorine with oxygen.

(5) Write limitations of Friedle crafts reaction.

[B] Write any three of the following conversions. Write conditions and name of important substances.   **6**

(1) m-xylene from Benzene.

(2) Ethyl bromide from ethyl chloride.

(3) p–nitro benzoic acid from Toluene.

(4) Chloro benzene from phenol.

[C] Answer any three of the following   **9**

(1) (a) Chemical equivalence of all carbon C is identical in Benzene. Why ?

    (b) Write structural formula of BHC, BDS Anisole.

(2) (a) The value of ionization energy of alkali metals is very low. Why ?

    (b) Discuss the types of oxides formed by alkali metals.

(3) (a) Write name, molecular formula and structural formula of oxyacids of chlorine.

    (b) Why are boiling points of alcohols more than that of the corresponding alkanes or alkyl halides ?

(4) (a) Short note :

    Cumene process

(b) Short note :

    β–elimination reaction.

Q. 2. [A] Answer the following objectives :   **5**

(1) Franscium does not occur free. Why ?

(2) What are oxy fluorides ? Give the formula of oxygen mono fluoride.

(3) Give the structural formula of :

    Anthranilic acid, Sulphanilic acid

(4) Give Uses of Chloroform, Carbon tetrachloride

(5) Give IUPAC name of Benzyl alcohol and phenetone.

[B] Give any three conversions :   **6**

(1) m–bromo benzoic acid from Toluene

(2) Benzaldehyde from Benzyl chloride

[30]

(3) Benzoic acid from Benzyl alcohol

(4) Phenyl Acetate from Chloro Benzene

[C] Answer any three : 9

(1) (a) Preparation of halogen acids.

    (b) Give the reactions of halogen becomes less and less vigorous with water.

(2) Explain the chemical reactions of alkali metals with oxygen.

(3) Give reasons :

    (a) Benzene is aromatic

    (b) Huckel's rule

(4) (a) Lucas test

    (b) Classification of Ethers

Q. 3. (A) Answer the following questions 5

(1) How ethers are classified ? Name them.

(2) How is the structure of any organic compound determined ?

(3) Give structural formulae of

    i) dimethyl ether

    ii) DDT

(4) Give the IUPAC name of

    i) Picric acid

    ii) Isobutyl Chloride

(5) Which reaction will take place when benzene is heated with mixture of con: HNO_3 and con : H_2SO_4 Give Chemical equation of the reaction.

(B) Write Chemical equations for any three of the following conversions. Also give the conditions of the reaction, names and structural formula of main organic compounds. 6

(1) Salicylic acid from Phenol

(2) O and P–Cresol from toluene

(3) m–Nitrobenzene sulphonic acid from benzene

(4) TNT from benzene

(C) Answer any three of the following 9

(1) Discuss the physical properties of alkali metals.

(2) Explain with scientific reason

    (i) Alkyl and aryl halides have higher boiling points than alkanes.

    (ii) Ethers have lower boiling points than alcohols containing same number of carbons.

(3) Write short notes on :

    i) Williamson synthesis

    ii) Kolbe–Schmitt reaction

(4) Give equations of the reactions of alkali metals with,
(1) Water (2) Hydrogen (3) Oxygen (4) Halogen (5) Sulphur
(6) Ammonia

Q. 4. (A) Answer the following questions. 5

(1) On what does the stability of inter halogen compounds depend ?

(2) What are oxy fluorides ? Give illustration

(3) Give molecular structure and uses of BHC

(4) Give IUPAC names of isopropyl alcohol and Tert. Butyl chloride

(5) Write chemical reaction of toluene with CH_3Cl in a mixture of BF_3 and HF

(B) Write chemical equations for any three of the following conversions. Give conditions, names and the structures of main organic compounds ? Do in only two steps. 6

(1) Propane from isopropyl alcohol

(2) m–chloro benzaldehyde from toluene

(3) Nitro benzene from phenol

(4) Sod. Phenoxide from chloro benzene

(C) Answer any three of the following 9

(1) Write balanced chemical equations for the following reactions.
   (i) Reaction of decomposition of lithium nitrate
   (ii) Reaction of chlorine with water
   (iii) Reaction of fluorine with potassium chloride

(2) Discuss (i) Density (ii) Electro negativity and Melting and boiling points with respect to alkali elements.

(3) Give Reasons :
   (i) Benzene resists oxidation Why ?
   (ii) Bromination of nitrobenzene gives m–derivative while nitration of bromobenzene gives o–and p– derivatives. Give reason

(4) Explain :
   (i) Grignard reaction (For alkyl halide and aryl halide)
   (ii) Dehydration of Alcohols

Q. 5. (A) Answer the following objective questions. 5

(1) What type of functional groups are meta directing ? Give two examples.

(2) Give structural formulae.
   (i) Sulphanllic acid.
   (ii) Phenoxy benzene.

(3) What are the uses of diethyl ether?

(4) What will be the physical state of Cs at 35^0C?

(5) What are polyhalogen compounds?

(B) Give equations for any three conversions.   **6**

(1) Benzaldehyde from benzyl alcohol.

(2) Ethane from diethyl ether.

(3) Cumene from phenol.

(4) p-bromo phenol from benzene sulphonic acid.

(C) Answer any three of the following questions   **9**

(1) Write names, molecular formulae and structural formulae of any three oxy acids of chlorine.

(2) Explain giving reasons.

    (i) C-C bond length in benzene is 139 A^0.

    (ii) Boiling points of alcohols are higher than that of corresponding alkanes and alkylhalides.

(3) Write notes on

    (i) Reduction reaction and reducing property of alkali metals.

    (ii) Huckel's rule.

(4) Explain the oxidation reactions of alcohols.

Q. 6. (A) Answer the following objectives   **5**

(1) Give Structural Formula : (a) Chlorine dioxide

                              (b) Chloric Acid

(2) How Rubidium and Cesieum are obtained ?

(3) What is an organic conversion ?

(4) Why a mixture of Sodium–amalgum and Ethanol is used in reduction of some organic compounds ?

(5) The product of reaction of alcoholic silver cyanide with ethyl bromide is :

    (a) Ethylene   (b) Ethyl cyanide

    (c) Ethyl isocyanide   (d) Ethyl alcohol

(B) Write Chemical equations for any three conversions Also give the conditions of reactions, names and structural formulae of main organic products. [There should be only two steps of each conversion]   **6**

(1) Acetanilide from Chlorobenzene

(2) Benzyl alcohol from chloro ethane

(3) Nitrobenzene from phenol

(4) Acetyl Salicylic acid from sodium Salicylate

(C) Answer any Three of the following questions :   **9**

(1) Explain : (a) Oxy–salts of alkali metals

                (b) Flourine and Chlorine are powerful oxidizing agent

(2) (a) Give equations of the reactions of alkali metals with oxygen

    (b) Explain ozonolysis reaction of Benzene. What Information regarding the structure of benzene is obtained on the basis of this reaction ?

(3) What is meant by directing groups ? Explain their directive effect by a suitable illustrations.

(4) (a) Explain Cumene Process of manufacturing phenol

(b) Explain reactions of Amines with Ammonia

Q. 7. (A) Answer the following objective questions **5**

(1) What are oxy fluorides ? Give an example of such compound in which oxygen is in +2 oxidation state.

(2) Write structural formula of :

(i) Anthranilic acid (ii) Benzyl Chloride

(3) Show the directive effects of functional groups – COR and –NH_2

(4) On what factor does the stability of interhalogen compounds depend. Give an example.

(5) Give the equation for reaction of toluene with chromic acid and name the product obtained ?

(B) Write Chemical equations for the following conversions. Give condition of reactions, name and the structure of the main organic compounds. (any three) **6**

(1) Ethanoic acid from 2–propanol

(2) styrene from benzene

(3) Ethyl benzoate from toluene

(4) Sodium phenoxide from Benzene sulphonic acid

(C) Answer any three of the following **9**

(1) Explain

(i) Alkylation of Toluene

(ii) Bromination of benzene sulphonic acid give m– derivative while sulphonation of bromo benzene give o and –p isomers.

(2) Discuss following regarding structure of benzene

(i) "Six carbon atoms in benzene are identical" prove on the basis of molecular orbital theory.

(ii) Give evidence of hexagonal structure of six carbon atoms in benzene.

(3) Explain :

(i) Reducing nature of alkali metals

(ii) Oxidizing nature of Halogen elements

(4) Write the balanced chemical equations for the following reactions

(i) Reaction of potassium iodide with ortho phosphoric acid

(ii) Decomposition reaction of sodium nitrate

(iii) Reaction of Bromine with water

Q. 8. (A) Answer the following   **5**

(1) Complete the equation with the main product – when toluene is oxidized by chromic acid.

(2) Give the equation of the reaction when toluene reacts with methyl chloride at 111^0C in presence of hydrogen fluoride and borontrifluoride. Give name and structure of the main organic compound.

(3) Write the IUPAC name : (i) CH_3OCH_3

                 (ii) CH_2Cl
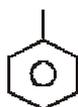
(4) Write the structural formula of (A) Benzyl alcohol

                                 (B) BHC

(5) Which colored solution does liquor ammonia give with alkali metals ? Give balanced chemical equation for this reaction.

(B) Write chemical equation for any three   **6**

(1) Benzyl alcohol from Benzaldehyde

(2) 2–propanol to acetone hydrazone

(3) Acetanilide from chlorobenzene

(4) Methoxy benzene from phenol

(C) Answer any three :   **9**

(1) Explain in detail the following reactions :

   (a) Sulphonation of Toluene

   (b) Acylation of toluene

(2) Write short note on : (a) Huckel rule

                           (b) Dehydration of alcohol

(3) Write equation for the following reaction :

   (a) Reaction of Potassium iodide with orthophosphoric acid

   (b) Reaction of decomposition of sodium nitrate

   (c) Reaction of bromine with water

(4) Explain lithium metal is different from the alkali metals.

Q. 9. (A) Answer in brief :   **(5)**

(1) Give structure and full form of DDT.

(2) Why do alkali metals produce coloured flame on heating ?

(3) Define cohesive energy.

(4) Which observation in laboratory serves as a proof that benzene has characteristic unsaturation ?

(5) Give structural formulae of

   (a) anthranilic acid (b) quinol.

(B) Do any three of the following)conversions. (6)

(1) Ethyl iodide from ethyl chloride.

(2) Sodium Phenoxide from benezene sulphonic acid.

(3) Acetaldehyde from diethyl ether.

(4) Phenyl acetate from chlorobenzene.

(C) Answer any three. (9)

(1) Explain

    (a) Bromination of benzene

    (b) Dehydration of alcohol

(2) (a) Give reactions which established three double bonds in benzene.

    (b) Why are these double bonds indicated by a ring ?

(3) Write a note on Kolbe–Schmit reaction.

(4) Write names & structural formulas of various oxyacids of chlorine. Also give oxidation state of chlorine in each.

Q. 10(A) Answer the following : (05)

(1) What is the drawback of Dow's process ?

(2) Write limitation of resonance structure of benzene.

(3) Francium does not occur free why ?

(4) 'Iodine has a strong tendency to combine with oxygen.' Prove it by chemical reaction.

(5) Write the reaction of quaternary salt tetra methyl ammonium chloride from trimethyl amine.

(B) Write names of any three conversions :

(1) A on heating with ethane in presence of anhydrous $AlCl_3$ give B which on dehydrogenation give vinyl benzene. Write names and structures of A and B and write the equation.

(2) Diketone from benzene.

(3) Ethanal from ethoxyethane.

(4) Benzaldehyde from benzyl alcohol.

(C) Answer the following : (Any three) (09)

(1) Explain Williamson synthesis.

(2) (i) Explain any two reactions of hydroxyl group of phenol.

    (ii) π electrons in benzene are indicated by a circle instead of double bonds.

(3) (i) What is meant by mono and disubstituted benzene derivatives ? Give their names with examples.

    (ii) Explain interhalogen compounds.

(4) (i) What are the characteristics of Lithium ?

    (ii) Explain atomic volume and ionic volume of IA group.

Q. 11(A) Answer the following short questions : (5)

(1) Why do alkali metals behave as good reducing agents ?

(2) Why do ethers have lower boiling points than alcohols conntainning same number of carbon atoms ?

(3) Mention the contributionn of Hymphery Davy in chemistry.

(4) Why do alkalimetals give characteristic coloured flame ?

(5) What is aromaticity ?

(B) Write chemical equations for ANY THREE of the followinng conversionns. Also give the conditions of the reactions names and structural formulae of the main organic compounds.   (6) (There should be only two steps of each connversion)

(1) Benzaldehyde from Benzene

(2) Benzylalcohol from Toluene

(3) 1–Amino propane from Ethyl Chloride

(4) Ethen from Ethanol

(C) Answer ANY THREE of the following questions :   (9)

(1) (a) How is litthium different from the other elements of the group ?

(b) Give only the reactions of alkali metals with oxygen.

(2) Explain : (a) Grignard reaction

(b) β–elimination reaction.

(3) Explain in detail giving equations the chlorination and oxidation reactions of methyl group in toluene.

(4) Explain : (a) Detection of alcohols

(b) Oxidation of alcohols.

Q. 12(A) Answer the following questions in short :   5

(1) Alkali metal elements give characteristic coloured flame. Why ?

(2) Explain the ozonolysis of benzene.

(3) Give IUPAC names of (1) Benzyl alcohol

(2) Ethylene glycol

(4) Give structural formula of (1) DDT (2) Anisole

(5) What is β–elimination reaction ?

(B) Write chemical equations for any three of the following conversions. Also give the conditions of the reacting, names and structural formulae of the main organic compounds. (There should be only two steps of each conversions)   6

(1) Benzyl Chloride from benzaldehyde

(2) Acetic acid from 2–propanol

(3) Diethyl ether from ethyl alcohol

(4) Ethanol from Methanal

(C) Answer any three of the following :   9

(1) Explain : (a) Lithium metal is specific from other alkali metals

(b) cohesive energy of alkali metals.

(2) Explain : a) Polyhalogen compounds

2) Give the molecular formula and structural formula of a) Chlorous acid b) Chlorine heptoxide

(3) Explain the substitution reaction in the phenyl nucleus of phenol.

(4) Explan : i) Huckel's rule

ii) Resonance structure of benzene on the basis of C–C bond length

Q. 13(A) Answer the following in short : (5)

(1) Phenol cannot be neutranlized by a weak base like sodium be carbonate. Why ?

(2) Give factors on which cohesive energy depend.

(3) Give equation of the reaction of ethyl iodide with conc. HI in preseance of red phosphorous.

(4) Give IUPAC name : $CH_3–O–CH_2CH_3$ and isobutly chloride.

(5) What are oxysalts ? Give two examples.

(B) Write chemical equations for any three of the following conversions. Also give the conditions of the reaction, names and structural formula of the main organic compounds. (Each conversion must be of two steps) (6)

(1) Diethyl ether to ethane.

(2) Benzyl alcohol to benzal dichloride.

(3) Benzene to m–xylene.

(4) Ethanol to ethyl isocyanide.

(C) Answer the following in brief : (Any–3) (9)

(1) Explain (i) Characteristics of lithium

(ii) β–elimination reaction.

(2) Write a note on physical properties of halogens.

(3) Explain the different methods of detection of alcohols.

(4) Explain : (i) m–Directing groups.

(ii) Resonance structure of benzene.

Q. 14(A) Answer objective questions. 5

(1) What is electrophile ?

(2) Give IUPAC name of tert butyl chloride and benzyl alcohol.

(3) Give structural formula of picric acid and phenyl acetate.

(4) Give names of different oxides of alkali metals.

(5) Give equation showing strong tendency of iodine to combine with oxygen.
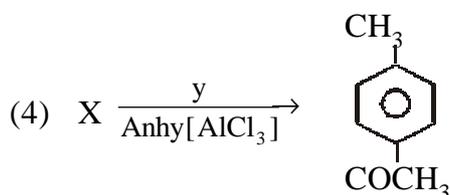
(B) Explain the following conversion any three. 6

(1) p–methyl acetophenone from benzene

(2) m–chloro benzoic acid from Toluene

(3) Ethane from ethyl chloride

(4) dimethyl ether from methanol

(C) Attempt any three 9

(1) Prove resonance structure of benzene on the basis of c–c bond length and heat of hydrogenation.

(2a) Give chemical equation of hydroxyl group of phenol.

(2b) Give chemical equation of ethyl chloride with alcoholic KOH, KCN and ammonia.

(3) Give an account of Lucas Test and Wurtz reaction.

(4a) Give only equations of alkali metals with water, sulphur and ammonia

(4b) Give only equations of preparation of halogen acids.

Q. 15(A) Answer the following in short : (05)

(1) Which energy is a measure of hardness ? On which it depends ?

(2) Which alkali metal does not occur in free state ? Why ?

(3) Classify following functional group in ortho–para Or Meta directing
– COOR, – OCOR, – OH, – SO_3H

(4) $X \xrightarrow[\text{Anhy}[AlCl_3]]{y}$

identify X & Y

(5) Give structural formula and use of 1, 2–dichloro ethene

(B) Write the chemical equations for Any Three of the following conversions. Give condition of the reactions, names and structures of the main organic compounds. Three should be only two steps of each conversion. (06)

(1) Benzene from sodium phenole

(2) 1–amino propane from ethyl chloride

(3) Aniline from benzene

(4) m–xylene from benzene

(C) Answer Any Three questions from the following : (09)

(1) Write note on
   (a) Characteristics of Lithium
   (b) Oxides of Chlorine

(2) Give reasons :
   (a) 1, 2 – ethane diol has higher water solubility and higher b. p. than ethanol.
   (b) Toluene has only one isomer while xylene has three isomers.

(3) Write note on
   (a) β–elimination reaction
   (b) Dehydration of Alcohols

(4) Explain sulphonation of benzene and toluene

Q. 16(A) **Answer in brief :** (5)

 (1) On exposure to air, yellow phospherous ignites spontaneously, why ?

 (2) Mention the names of compounds which are not soluble in benzene.

 (3) Give the structural formulae of x & y in following reaction.

$$X \xrightarrow[\text{NaOH}]{\text{Fused}} \text{Phenol (Y)}$$
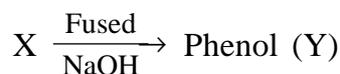
 (4) Write the equation and name of product when ethyl cyanide is reduced with Ni or $LiAlH_4$.

 (5) Give structural formula and use of chloroform.

(B) **Write chemical equations for any three of the following conversions. Also give the conditions of the reactEions, names and structural formula of the main organic compounds.**

 (1) Benzoyl chloride from benzaldehyde

 (2) Isopropyl benzene from phenol.

 (3) Ethene from ethyl acetate.

 (4) p–chloro acetophenone from benzene.

(C) **Answer the following (any three)** 9

 (1) Explain giving reasons :

  (a) Napthalene is aromatic

  (b) Resonance energy of benzene is 36.0 k. cal/mole.

 (2) Discuss any two important industrial processes for the manufacture of phenol.

 (3) Write a note on alkali hydroxides and oxysalts of alkalis.

 (4) (a) Explain in detail the preparation of resorcinol and m–xylene from benzene.

  (b) Write a note on oxidising property of halogen elements.

Q. 17(A) **Answer the questions in short :** 5

 (1) On what does the stability of inter Halogen compounds depend ? Give an example to justify.

 (2) Give structural formula of perchloric acid and Dichlorine heptoxide.

 (3) Write the structural formula of Isopropile chloride and tertiary butyl chloride.

 (4) Write chemical equation for the reaction of B.D.S. with Molten NaOH. Give name atnd structural formula of the organic product in the reaction.

 (5) Who and How were Na and K metals found ?

(B) **Give any reaction of any three of the following conversions. Also write the name of the reaction the conditions and name of important organic products. (Conversion must be in two steps)** 6

 (1) Acetophenone from phenol.

 (2) Styrene from Acetophenone

 (3) Formic acid from methanol.

 (4) m–bromobenzoic acid from toluene

(C) Answer any three of the following :   **9**

(1) Explain : (i) Reduction of ethanol and oxidation of Benzyl alcohol

            (ii) Ozonolysis of benzene

(2) Discuss the Aromatic structure of Benzene on the basis of physical properties

(3) Write balanced chemical equations for the following reactions.

    (i) Reaction of Potassium Iodide with orthophosphoric acid.

    (ii) Reaction of Na metal with water.

    (iii) Reaction of Potassium Chlorate with Iodine.

(4) Explain : (i) Alkali metals gives coloured flame.

            (ii) Fluorine is most powerful oxidizing agent

Q. 18(A) Answer the following questions :   **5**

(1) Give structural formulae of hydroquinone and m–bromo benzene sulphonic acid.

(2) If Ethanol is heated with H_2SO_4......

(3) If Toluene is reacted with chromyl chloride......

(4) Oxygen compounds of florine are called floride. Why ?

(5) When ethanol is reacted with phosphorous trioxide...

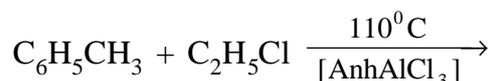**(B) Give equation for any three of the following conversions.**   **6**

(1) Benzoyl chloride from Acetophenone.

(2) P–bromo Phenol from benzene sulphonic acid

(3) Propane Nitrile from Ethanol

(4) Di Ethyl amine from chloro Ethane.
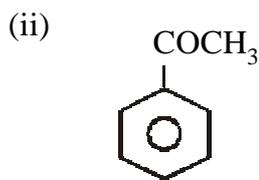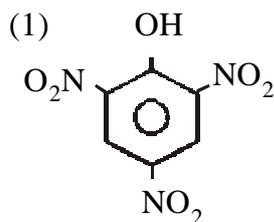
(C) Answer any three of the following :   **9**

(1) What is nuecleophillic substitation reaction ? Explain with reference to action of Ethanolic ammonia to R–X

(2) Explain : (i) Insplite of three double bonds, benzene does not give additionareaction under ordinary condition.

            (ii) Give an account of oxides of chlorine.

(3) Explain (i) Reaction of alkali with (i) H_2O (ii) NH_3

            (ii) Preparation of alkane from alkyl halide

(4) Explain : (i) Fridel–Craft acylation.

            (ii) Alkali metals are strong reducing agent.

Q. 19(A) Answer the following objective questions :   **(5)**

(1) What are interhalogen compounds ?

(2) Give molecular structure of chlorine trioxide and clorous acid.

(3) Complete the equation :

$$C_6H_5CH_3 + C_2H_5Cl \xrightarrow[\text{[AnhAlCl}_3\text{]}]{110^0 C}$$

(4) Give IUPAC names :

(1)   OH   (ii)   COCH₃

O_2N [benzene ring with OH at top, NO_2 at both meta-upper positions and NO_2 at bottom] NO_2

NO_2

[benzene ring with $COCH_3$ substituent]

(5) Give structural formula :
    (i) Phenoxy benzene (ii) BHC

(B) Give conditions, names and the structure of the main organic compounds of any THREE reactions for the following conversions.   (6)

(1) Ethyl benzoate from toluene

(2) Propionic acid from ethyl chloride

(3) Acetophenone from phenol

(4) TNT from benzene

(C) Answer Any THREE of the following questions :   (9)

(1) Write short notes on
    (i) Chemical reactions of ethers.
    (ii) Kolbe–Schmitt reaction.

(2) What is meant by directing groups ? Explain their directive effects by examples.

(3) Write the balanced chemical equation for the following reaction.
    (i) Reaction of potassium chlorate with Iodine
    (ii) Decomposition reaction of sodium nitrate
    (iii) Reaction of Bromine with water

(4) Compare the properties of hydrides, oxides and halides of alkalimetal elements.

Q. 20 (A) Answer the following objective questions.   (5)

(1) C_s and K are used as cathodes in photoelectric cells why ?

(2) What are polyhalogen compounds ? Give example.
    Write the chemical equation, give name and structural formula of main organic compounds.

(3) When ethyl benzene is heated with ZnO at 630⁰C.

(4) Phenol when heated with acetic anhydride.

(5) Give structural formula and IUPAC name of : DDT

(B) Write chemical equations for any THREE of the following conversions. Also give the conditions of the reactions names and structural formula of the main organic compounds. (There should be only two steps of each conversion.)

(1) m–nitrobenzene sulphonic acid from benzene.

(2) Benzotrichloride from benzyl chloride.

(3) 1–amino propane from ethyl chloride.

(4) Dimethyl ether from methanol.

(C) Answer any THREE of the following questions. **(9)**

(1) Explain the structure of Benzene on the basis of molecular orbital theory.

(2) Explain giving reasons
(i) Benzene is a six membered cyclic compound.
(ii) The alkali metal elements give characteristic coloured flame.

(3) Write short note on :
(i) Lucas test
(ii) Wurtz reaction.

(4) Give name molecular formulae, structural formulae, and oxidation state of oxyacids of chlorine.

Q. 21(A) Answer the following questions in short : **(5)**

(1) What is aromaticity ?

(2) Give structural formula of : BHC and TNT

(3) Complete the following reaction :
$2CH_3Cl + Ag_2O \rightarrow$

(4) What are interhalogen compounds ? Give examples.

(5) "Alkali metals impart characteristic colour to the flame" comment.

(B) Write chemical equations for ANY THREE of the following conversions. Also give the conditions of the reactions name and structural formuale of the main organic compounds. (Only two steps) **(6)**

(1) m–chloronitrobenzene from Benzene

(2) 1–aminopropane from Ethylchloride

(3) Ethene from Ethanol

(4) Phenol from Cumene

(C) Answer ANY THREE of the following questios : **(9)**

(1) a. In what ways the Lithium differs from other alkali metals of the group.
b. Give the reactions for the preparations of halogen acids.

(2) a. Give the name, molecular formula and structural formula of oxide of chlorine having oxidation state +7.
b. Discuss aromatic nature of benzene on the basis of molecular orbital theory.

(3) Explain in detail giving equations the chlorination and oxidation reaction of methyl group in toluene.

(4) Write short notes on : (a) Test used for detection of 1^0, 2^0 and 3^0 alcohols in presence of anhyd. $ZnCl_2$ (b) β-elemination reaction. Explain.

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Question-4

Q. 1. [A] Answer the following objectives.   **5**

  (1) Give the equation for the addition reaction of acetone with the gringnard reagent Methyl Magnesium Iodide and give the structure.

  (2) Give equation for the products formed on heating propane and vapours of conc. Nitric acid at 400^0C and name the products.

  (3) Mention the amount of hemoglobin blood.

  (4) How is acetic anhydride obtained industrially ?

  (5) What is saponification ?

[B] Write Any Three of the following conversions. Write conditions and name of important substances.

  (1) Lactic acid from acetaldehyde

  (2) Acetanilide from Benzamide

  (3) Acetyl chloride to Ethanal

  (4) Ethyl amine from Ethanol

[C] Answer Any Three   **9**

  (1) Explain classification of polymers on the basis of effect of temperature and on basis of structure.

  (2) Write short note :

    (a) Silver mirror test

    (b) Condensation reaction of aldehyde

  (3) Explain

    (a) Mechanism of cleaning

    (b) Hofmann reaction

  (4) Explain

    (a) Effect of H–bond on physical properties of carboxylic acid.

    (b) Wolf–Kishner and clemmensen reduction.

Q. 2. [A] Answer the following :   **5**

  (1) What is Vinegar ?

  (2) What is esterification ?

  (3) Benzene diazonium Chloride cannot be obtained as a dry salt from the solution. Why ?

  (4) Write the uses of PVC

  (5) What are optical brightners ?

[B] Give any three conversions :   **6**

  (1) 1–phenyl, 1–ethanol from Benzene

  (2) Benzamide from Benzoic acid

  (3) Acetanilide from Chloro Benzene

  (4) Phenyl hydrazine from Aniline.

[44]

[C] Answer any three :   **9**

(1) Distinguish the tests by which aldehyde can be detected in the laboratory.

(2) Explain with reactions the industrial production of Aniline ?

(3) (a) Nylon 6, 6

    (b) Characteristics of polymers

(4) What are drugs ? Give uses of various drugs

Q. 3. (A) Answer the following objective questions :   **5**

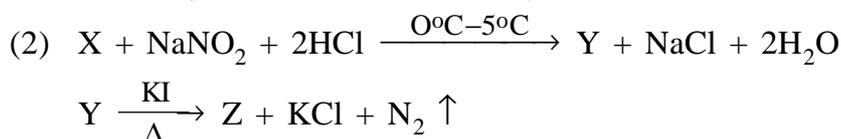(1) Complete the reaction

Acetamide + NaOH $\xrightarrow{\Delta}$

      Hydrolysis

(2) Write the structural formula of a) acetoxime b) benzamide

(3) Write IUPAC names of (a) HCOOH (b) $C_6H_5COCH_3$

(4) Write the chemical equation when aniline is heated with chloroform in potassium hydroxide solution. Write the name and structural formula of Organic product.

(5) Give the name and function of hormone secreted from thyroid secretary gland.

(B) Write the chemical equations for any three of the following conversions. Give conditions of reactions, name and structures of main organic product. There should be only two steps of each conversion.   **6**

(1) Ethanol from acetamide

(2) Acetamide from nitrobenzene

(3) Benzene diazonium chloride from nitrobenzene

(4) N, N–diethyl aniline from analine.

(C) Answer any three questions from following :   **9**

(1) Discuss the effect of hydrogen bond on properties of carboxylic acids

(2) Explain :

(a) Reaction of aniline with (a) nitrous acid (b) Chloroform and Potassium hydroxide.

(3) Write short notes on (a) Haemoglobin (b) What are thermoplastic and thermosetting polymers ?

(4) Explain   (a) Distinguish between LDP and HDP Polymers

            (b) Chemical reactions of acetic anhydride.

Q. 4. (A) Answer the following questions   **5**

(1) What are bio–hard detergents ?

(2) Give structural formulae for

    i)   Ethyl isocyanide

    ii) diethyl methyl amine

(3) What are Oligomers ?

(4) What is the product formed when benzoic acid is heated with soda lime ?

(5) What are thermosetting polymers ? Give two examples

(B) Write the chemical equation for any three of the following conversions. Also give conditions of reactions, names and structural formulae of main organic compounds   **9**

(1) Ethene from ethyl acetate

(2) Aniline from benzoic acid

(3) Phenyl hydrazine from aniline

(4) Phenol from nitrobenzene

(C) Answer the following questions (any three)   **6**

(1) Write short notes on :
   i)   Tollen's and Fehlings tests
   ii) Grignard reactions of aldehydes and Ketones.

(2) $X + NaNO_2 + 2HCl \xrightarrow{\text{0}^{\text{o}}\text{C}-5^{\text{o}}\text{C}} Y + NaCl + 2H_2O$

$Y \xrightarrow[\Delta]{\text{KI}} Z + KCl + N_2 \uparrow$

Give structural formulae and names of X, Y and Z for the above reactions.

(3) Give method of preparation and uses of the following :
   i)   Urea
   ii) Superphosphate of lime

(4) Explain the hydrolysis, reduction and dehydration reactions of acetamide.

Q. 5. (A) Answer the following questions   **5**

(1) What is meant by hormone ? How are they useful in the human body ?

(2) Give the chemical names of Vit.B_4 and B_6.

(3) Explain the term Hyperglycemia

(4) Give the reaction of acetic anhydride with ammonia

(5) Write the chemical name of orange azo dye and give its molecular structure.

(B) Write the chemical equations for any three of the conversions. Give conditions, names and structures of the organic compounds. There should be only two steps.   **6**

(1) Ethanol from Acetamide

(2) Acetic anhydride from acetone

(3) Benzamide from benzoic acid

(4) Methyl amine from acetyl chloride

(C) Answer any three of the following question   **9**

(1) Explain esterification with examples. Give the chemical equations of hydrolysis, reduction and reaction of ammonia with Ethyl acetate.

(2) Explain   (a) Hofmann reaction
                   (b) Sandmeyer reaction
(3) Write preparation and uses of
    (a) Super phosphate of lime
    (b) Terryline
(4) Explain :
    (a) Distinguish between L.D.P. and H.D.P. polymers
    (b) Method to prepare pure aldehyde

Q. 6. (A) Answer the following questions in short   **5**
(1) What are antioxidants ? Give examples
(2) Why 1% ethanol is added to chloroform used in surgerey.
(3) What are Fehling–A and Fehling–B solution ?
(4) Complete the following reaction giving name and structural formula of reacants and products.

Acetone + Phenylhydrazine $\xrightarrow{\text{acid}}$

(5) Give the equation for carbylamine test of primary amine.

(B) Write chemical equation for any three of the following conversions :6 Also give the conditions of the reactions names and structural formulae of main organic compounds (There should be only two steps of each conversion) :
(1) LAS from Lauryl alcohol
(2) p–hydroxyazobenzene from Aniline
(3) p–nitroaniilne from Benzamide
(4) 2, 4, 6–tribromophenol from Benzene diazonium chloride

(C) Answer any three of the following questions   **9**
(1) Explain : (1) Tollen's Test (2) Clemmenson reduction.
(2) Write a short note on : (1) Haemoglobin (2) Nylon 6, 6.
(3) Explain industrial manufacturing of aniline.
(4) (1) Give classification of detergents.
    (2) Explain Sandmeyer Process.

Q. 7. (A) Answer the following in brief   **5**
(1) Explain Hemin & Heme.
(2) Define C.N.D.
(3) Why are boiling points of aldehydes & Ketones Lower than alcohols
(4) Explain Saponification with one example
(5) Give a reaction of phenol with Benzene diazonium– chloride

(B) Write chemical equations for any three of the following conversions 6
(1) Paracetamol from Paranitrophenol
(2) 2–methyl, 2–propanol from acetone
(3) Phenyl hydrazine from chlorobenzene
(4) Ethanol from methanol

(C) Answer any three of the following 9

(1) (a) Write a note on condensation reaction of Aldehydes

(b) Write a note on a test used to detect primary amine

(2) Write uses of

(a) Methyl Salicylate (b) Acriflavin (c) Blankofor

(d) Paracetamol (e) Aspirin (f) Polythene

(3) Write a note on (a) Tollen's test

(b) wolfkishner reduction

(4) (a) Differentiate between Dyes & Pigments

(b) How are polymer classified ?

Q. 8 (A) Answer the following objective questions. 5

(1) Give the structural formulae of the isomers of C_3H_6O with name and write the type of isomerism.

(2) Give IUPAC names of

(i) Benzoic acid (ii) Acetanilide.

(3) Give chemical equation for the preparation of orange dye from benzene diazonium chloride. Give the structural formula and name of the main product.

(4) Why chloroform used in hospitals is mixed with 1% ethanol?

(5) Which dye is used as an antiseptic?

(B) Give equations for any three conversions 6

(1) Polythene from ethanol.

(2) Benzyl alcohol from acetophenone.

(3) Methyl cyanide from ethyl acetate.

(4) Lactic acid from acetaldehyde.

(C) Answer any three of the following questions 9

(1) Give only reactions

(i) Condensation of acetone

(ii) Preparation of acetyl chloride.

(2) Write notes on

(i) Hoffman reaction

(ii) Congo red

(3) Give the preparation and uses of

(i) Terylene

(ii) Aspirin

(4) Answer the following

(i) Name the B-complex vitamins and list their deficiency diseases.

(ii) Explain the classification of amines giving examples.

Q. 9. (A) Answer the following objective questions 5

(1) By which process and by which catalyst Industrial production of Penicillin is done ?

(2) Why Calcium phosphate is not useful as fertilizer ?

(3) Give a chemical equation to produce ethyl acetate from methyl cyanide in presence of concentrated H_2SO_4.

(4) Give IUPAC name and structural formula of the substance which is reduced into 1–phenyl 1–ethanol in presence of $LiAlH_4$

(5) Give structural Formulae : (a) Ethyl Ethanoate

(b) Aniline hydrochloride

(B) Write Chemical equations for any three conversions in two steps only of the following conversions. Also give the conditions of reactions, name and structural formulae of the main organic products.   6

(1) Acetonitrile from Ammonium acetate

(2) Benzaldehyde from Benzoic Acid

(3) m–Dichloro benzene from m–chloro Aniline

(4) Acetamide from Ethyl Chloride

(C) Answer any three of the following questions   9

(1) (a) Explain propanone and propanal give different products with N_2H_4 in different media.

(b) Explain the effect of H–bond on the physical properties of carboxylic acids

(2) (a) Give Azo–coupling Reactions.

(b) Explain Reaction Ethyl Amine with Nitrous acid.

(3) (a) Explain in detail polymerization of ethene by addition reaction.

(b) Explain principle of cleaning

(4) (a) Why 1% ethanol is added to chloroform used in surgery ? explain.

(b) Explain fat soluble vitamins in details.

Q. 10(A) Answer the following objective questions   5

(1) Give the Chemical equation for the reaction occur when aldehyde react with Tollen's reagent.

(2) Give the name and function of the hormone secreted by pancreas.

(3) Show hydrogen bonding between secondary amines and water.

(4) How aspirin is prepared ?

(5) Write Chemical name of orange–azo dye give its molecular structure.

(B) Write chemical equations for the following conversions (any three) Give the conditions of the reactions names and structure of the main organic products. There should be only two steps of each conversion. 6

(1) Ethanol from methyl cyanide

(2) Acetanilide from Benzamide

(3) Acetic anhydride from Acetaldehyde

(4) Aniline from Benzoyl Chloride

(C) Answer any three of the following questions   **9**

(1) Explain :
   (i) Sandmeyer's Reaction
   (ii) Wolff–Kishner reduction

(2) (i) What are vitamins ? Give sources and uses of vitamin C.
   (ii) Distinguish between L.D.P. and H.D.P. polymers

(3) (i) Condensation reaction of aldehyde
   (ii) Azo–coupling reaction of Aniline

(4) Explain :
   (i) Continuous etherification
   (ii) What are thermoplastic and thermosetting polymers, Give Examples

Q. 11(A) Answer the following objectives :   **5**

(1) Write chemical equation of the reaction of acetyle chloride and Acetic acid in presence of pyridine as catalyst. Name the product and give the structures of organic compounds.

(2) Complete the following reaction with necessary information :
   – when ethyl benzoate is reduced with lithium aluminium hydride

(3) Write equation with necessary details, when benzene diazonium chloride is heated with potassium iodide.

(4) Write structural formula of : (a) Phenyl isocyanide
                               (b) Diethyl Methyl amine

(5) How is Methyl Salicylate prepared ?

(B) Write the equation of any three :   **6**

(1) Phenyl isocyanide from benzamide
(2) Ethyl bromide from ethyl chloride
(3) Orange azo–dye from aniline
(4) Phenyl isocyanide from chlorobenzene

(C) Answer any three of the following :   **9**

(1) Explain the preparation of different types of alcohols from aldehydes and Ketones with the help of reduction and addition reaction.

(2) Explain Sand Meyer's reaction with equations.

(3) (A) Give method of preparation & uses of PVC.
   (B) Explain condensation reaction of ethanal.

(4) (A) Explain classification 7 amino–acids
   (B) Give characteristics of polymers.

Q. 12(A) Answer any brief :   **(5)**

(1) Complete the following reaction & name the product

$$2CH_3COOH \xrightarrow[700^0C]{AlPO_4}$$
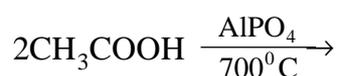
(2) Give uses of

   (a) $R_4N^+Cl^-$

   (b) DMT

(3) What are antioxidants ? Give two examples.

(4) Complete the reaction.

   $P_4 + 20 \ HNO_3 \longrightarrow$

(5) Give structure formula and IUPAC name of diphenyl ketone.

(B) Give equations for following conversions (any 3)   **(6)**

(1) Ethylamine from acetyl chloride.

(2) N–methyl aniline from Nitrobenzene.

(3) Acetaldoxime from ethanol.

(4) Phenyl cyanide from Aniline.

(C) Attempt any three   **(9)**

(1) Explain

   (a) Fehling's test

   (b) Give azocoupling reactions of benzene diazonium chloride

(2) Give details of production of ABS detergent.

(3) Give condensation reactions of acetone.

(4) (a) Describe alkylation and aceylation of ethylamine.

   (b) What are hyper glycemia and hypoglycemia ?

Q. 13(A) Answer the following :   **(05)**

(1) Write the reaction of preparation of Tollens reagent.

(2) Why pyridine is used as catalyst in preparation of ethyl acetate from acetyle chloride and ethanol ?

(3) State the odour of isocyanides.

(4) Write the structural formula of Nylon, 6, 6.

(5) Explain Vat dyeing.

(B) Write names and reactions of any three conversions :   **(06)**

(1) Tetramer of ethene from ethene monomer.

(2) Aniline from nitrobenzene.

(3) Methanol from propane.

(4) 2 : 4 : 6 tribromo aniline from chlorobenzene.

(C) Answer the following : (Any three)   **(09)**

(1) Explainn different methods of preparation of acid chloride with illustrations.

(2) (i) Carboxylic acids have higher boiling points compared to those of alcohols.

   (ii) Explain the charteristics of penicillin.

(3) Short notes on Glucose and amino acids.

(4) Write short notes on classification of amines.

Q. 14(A) **Answer the following short questions :** **(5)**

(1) Give the names of the diseases caused by the deficiency of water–soluble vitamins.

(2) Give the Hofmann reaction for benzamide.

(3) Give two examples, each of (a) plasticizers and (b) antioxidants, that are added to polymers.

(4) Give the route for the conversion of ethylamine to ethyl alcohol.

(5) Mention two points of difference between pigment and dye.

(B) **Write the chemical equation for ANY THREE of the following conversins. Also give the conditions of the reactions, names and structural formuale of main organic compounds. There should be only two steps of each conversion.** **(6)**

(1) Lactic acid from Acetaldehyde.

(2) Acetic anhydride from Acetone.

(3) Phenyl isocyanide from Chlorobenzene.

(4) Diethyl Ketone from Ethyl cyanide.

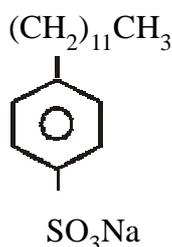**(C)** **Answer ANY THREE of the following questions :** **(9)**

(1) Explain   (a) Industrial production of LAS

(b) Preparation and uses of Terylene.

(2) Explain   (a) Detection of aldehydes.

(b) Purification of aldehydes and Ketones.

(3) Discuss the condensation reactions of aldehydes and ketones.

(4) (a) Explain the alkylation of amines.

(b) Discuss the chemical reactions of the cyanide group.

Q. 15(A) **Answer the following questions :** **(5)**

(1) Write the IUPAC name of :
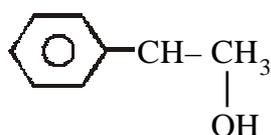
(2) Give structural formula and IUPAC name of sulphanilic acid.

(3) Give structural formula & IUPAC name of acetenilide.

(4) Distinguish between Ethylamine and aniline.

(5) Give the name of :

(B) **Write the chemical equations for any three of the following conversions. Also give the conditions of the reactions, names and structural formula of the main organic compounds.**

(There should be only two steps of each conversion) **6**

(1) Aniline to Benzonitrile

(2) Nitrobenzene to m–Chloroaniline

(3) Benzaldehyde to Benzene

(C) **Answer any three of the following :** **(9)**

(1) (a) What are vitamins ? Name the diseases caused by the deficiency of vitamin B_{12} and vitamin C.

(b) Explain Antibiotic drugs.

(2) Write the reactions involved in the preparation of benzene diazonium chloride. What happens when it reacts with (a) Cu_2Cl_2 (b) Phenol (c) hypophosphorous acid.

(3) Write short note on Tollen's test and condensation reactions of Ketones.

(4) Give the preparation and uses of PVC and Nylon – 66.

Q. 16(A) **Answer the following questions in short :** **5**

(1) What are optical brightners ? Write uses of it.

(2) Why penicillin cannot be taken by mouth ? Write its effect on bacteria.

(3) What is called Hofmann reaction ?

(4) Carboxylic acids have higher boiling points as compared to those of alcohols ? Why ?

(5) Write reaction of acetophenone in presence of $LiAlH_4$. Give chemical equations, structural formula and IUPAC name of main product.

(B) **Show any three of the following organic conversions (Each conversion should be of 2 steps only indicating name of reactions products and reaction conditions)** **6**

(1) Acetophenone from Diazonium salt

(2) Acetanilide from Benzamide

(3) Ethene from Ethyl acetate

(4) Methane from acetic anhydride

(C) **Answer any three of the following questions.** **9**

(1) Explain : (a) Industrial production of Alkyl Benzene sulphonates and its uses.

(b) Hypoglycaemia and Hyperglycaemia

(2) Explain : (a) Hormones and their classification

(b) Preparation of paracetamol and its uses.

(3) Explain : (a) Tollens test

(b) Carbylamine test

(4) Explain : (a) Classification of amines

(b) Reaction of Ethane nitrile with ethanol in presence of conc. H_2SO_4. Give chemical equation name of products and structural formula of it.

Q. 17(A) Answer the following in short. **(5)**

(1) Which drug is not taken orally ? Why ?

(2) Give uses of (i) Congo red (ii) $R_4N^+.Cl^-$ salts.

(3) Give the eqution and name of product when acetone is treated with hydrazine in basic medium.

(4) Give structural formula of (i) Benzonitrile

(ii) Acetyl Salicylic acid.

(5) State the name of product when ethyl acetate reduces in presence of $LiAlH_4$.

(B) Write chemical equations for any three of the following conversins. Also give the conditions of the reaction, names and structural formulae of the main organic compound. (Three should be only two steps of each conversion). **(6)**

(1) Aniline from benzoyl chloride.

(2) Nitro benzene from benzene diazonium chloride.

(3) Acetyl chloride from acetaldehyde.

(4) Benzyl chloride from ethyl benzoate.

**(C) Answer the following questions (Any three) :** **(9)**

(1) Explain with equation the reactions which distinguish aldehyde from ketone (only two)

(2) Give only equations of preparation of nitrolim and ABS.

(3) (i) Give preparation and uses of polystyrene.

(ii) Give importance of hemoglobin. What is heme ?

(4) Explain with equations

(i) Carbyl amine test of aniline

(ii) Nitration of propane.

(iii) Wolf–Kishner reduction.

Q. 18(A) Answer the objective questions. **5**

(1) Give name of two functional groups that are isomers having carbonyl carbon

(2) Give structural formula of benzoyl chloride and Acetanilide.

(3) Give IUPAC name of

and

[54]
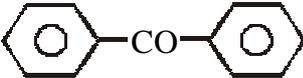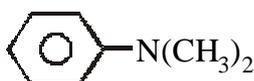
(4) Which detergents are used as cosmetics ? Why ?

(5) Name two drugs obtained from salicylic acid.

(B) Explain conversions : any three   **6**

(1) Ethanol from formaldehyde

(2) Ethyl Iodide from acetic acid

(3) Diethyl Ketone from ethyl chloride

(4) Benzene diazonium chloride from chlorobenzene

(C) Attempt any three of the following   **9**

(1) Write a note on congo red and nitrolim.

(2) Give preparation and use of ABS and nylon 6, 6.

(3) Give an account of Tollen's test and Hofman's reaction.

(4a) Give only equation for industrial preparation of aniline.
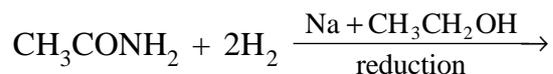
(4b) Write a note on azo–coupling reaction.

Q. 19(A) Answer the following in short :   **(05)**

(1) Give structural formula and IUPAC name of lactic acid

(2) For fermentation process to prepared pericillin which enzyme is use ?

(3) Complete the reaction

$$CH_3CONH_2 + 2H_2 \xrightarrow[\text{reduction}]{Na + CH_3CH_2OH}$$

(4) Why diazotization reaction must be carried out at $0^0 – 5^0C$ and why it cannot be obtained as a dry salt ?

(5) Give name and structural formula of a drug which is used to treat cold and cough.

(B) Write the chemical equations for Any Three of the following conversions. Give condition of the reaction, names and structures of the main organic compounds. There should be only two steps of each conversion.   **(06)**

(1) Polystyrene from ethyl benzene

(2) 2–Methyl–2–propanol from acetone

(3) ethyl isocyanide from ethyl chloride

(4) Phenol from Aniline.

(C) Answer Any Three questions from the following :   **(09)**

(1) How anhydrides are formed ? Give reaction of acetic anhydride with water, ammonia and ethanol.

(2) Write note on condensation reaction of aldehydes and Ketones.

(3) (a) Give method of preparation and use of ABS

     (b) Why CO has toxic effects and can even be fatal ?

(4) Write note on industrial production of aniline.

Q. 20(A) **Answer in bref :** **5**

(1) Write the chemical equation when acetic acid is reduced with Lithium aluminium hydride. Name the product and write the structures of organic products.

(2) Give the equation of the chemical reaction of acetaldehyde with hydrazine occuring in basic medium. Name the product in the reaction.

(3) Write the chemical name and structural formuale of yellow azo–dye.

(4) In order to avoid pain during surgery patient is given chloroform as anesthetic why ?

(5) Why are amino acids present in protein called building blocks ?

(B) **Write chemical equations for any three of the following conversions. Also give the conditions of the reactions, name and structural formula of the main organic compounds.**

(1) benzene sulphonic acid from benzoic acid.

(2) Ethyl bromide from ethyl amine.

(3) diethyl amine from nitroethane.

(4) Acetanilide from chlorobenzene.

(C) **Answer the following (any three)** **9**

(a) What are bio–soft and bio–hard detergents ? Give examples.

(b) Give the preparation and uses of urea.

(c) What are thermoplastic and thermosetting polymers ? Give examples.

Q. 21(A) **Answer the following questions in short** **5**

(1) How are crystals of hemin obtained from blood ?

(2) Give structural formula of paracetamol

(3) Write the chemical name of yellow azo dye and give its structural formula

(4) What is called Hofmann reaction ?

(5) What is called Aromatic Acid ? Give its illustration.

(B) **Answer any three of the following conversions. Give chemical equations, conditions of the reactions, names and structures of the main organic compounds. (There should be only two steps of each conversion)**

(1) Acetic Acid from Acetamide

(2) 3–pentanone from propane nitrile

(3) 1–phenyl – 1– Ethanol from benzene

(4) Methane from Acetic anhydride

(C) **Answer any three of the following :** **9**

(1) Preparation and uses of the following :
   (i) Nylon 66 (ii) Teyrelene

(2) What is called Esterification ? Explain it with illustration. Give chemical equation of Ethyl acetate reacts with (i) $LiAlH_4$ and (ii) Hydrolysis with NaOH. Give structural formula of main product.

(3) Discuss the Physical properties of Amine compounds.

(4) Explain :

(i) elemmenson reduction

(ii) Industrial production of the Antibiotic Penicillin

Q. 22(A) Answer the following questions : 5

(1) Give one example of each protein and amine harmones.

(2) What is fehling reagent ? Explain.

(3) If acetic hydride is heated with ethane...

(4) $CH_3CN + CH_3CH_2OH + H_2O \xrightarrow[\Delta]{Conc.\ H_2SO_4}$

(5) What is hyperglecemea ?

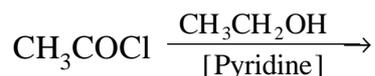**(B) Give equations for any three of the following conversions** 6

(1) Chloro benzene from Aniline

(2) Ethyl amine from Acityl chloride

(3) Polystyrene from ethyl benzene.

(4) Acetone cyno hydrine from iso propyl alcohol.

(C) Answer any three of the following 9

(1) A note on (i) Blenkofor

(ii) An account of water soluble Vitamins.

(2) Explain (i) Condensation reaction of Aldehyde

(ii) Azo coupling reaction.

(3) Explain (i) Chemical properties of Ester

(ii) Acylation of Amine.

(4) (i) Compare the physical properties of Keton And Carboxylic acid

(i) Explain : Preparation of polyster

Q. 23(A) Answer the following objective questions : (5)

(1) Give uses of barium sulphate and oleic acid in polymer industry.

(2) Write IUPAC names (i) $C_6H_5NH.CH_3$ (ii) $C_2H_5N^+ \equiv C$

(3) What is esterification ? Give example.

(4) Write the reaction when benzoic acid is heated with thionyl chloride. Name and write the structure of organic product.

(5) Complete the equality and name the product

$CH_3COCl \xrightarrow[\text{[Pyridine]}]{CH_3CH_2OH}$

(B) Give conditions, names and the structure of the main organic compounds of any THREE reactions for the following conversions : (6)

(1) Ethene from ethanal

(2) Phenyl isocyanide from benzamide

(3) Orange azodye from aniline

(4) 1–Phenyl–1–ethanol from benzene

(C) **Answer ANY THREE of the following questions :** **(9)**

(1) Write short note :

    (i) Clemmenson Reduction

    (ii) Decarboxylation Reaction.

(2) Explain : ABS and LAS detergents.

(3) Write a short note on Tollens and Fehling test.

(4) Discuss the methods for the industrial production of Aniline.

Q. 23(A) **Answer the following questions in short.** **(5)**

Give chemical equations for the following giving name and structure of main organic products for question (1) and (2).

(1) Acetaldeyde when condensed with phenyl hydrazine in the presence of acid.

(2) Benzene diazonium chloride when heated with hypophosphorous acid.

(3) Give use of – Acriflavin and Blonkophor.

(4) Give structural formula and IUPAC name of N – N – dimethyl aniline.

(5) What is called a Hofmann reaction as ? Give example.

(B) **Write chemical equations for any THREE of the following conversions. Also give the condisions of the reactions names and structural formulae of the main organic compounds. There should be only two steps of each conversion.** **(6)**

(1) 2–Hydroxy 2 methyl propanoic acid from acetone.

(2) Ethyl acetate from acetic acid.

(3) Acetanilide from nitrobenzene.

(4) Paracetamol from p–nitrophenol.

(C) **Answer any THREE of the following questions.** **(9)**

(1) Wrtie the methods to prepare alcohol from aldehyde and ketone.

(2) Write a short note on

    (i) Sandmeyer reaction.

    (ii) Preparation of nitrolim

(3) Write a method of preparation of acetic anhydride and give its properties.

(4) Answer the following :

    (i) Give the name of various types of vitamins and the diseases cause by the deficiency of them.

    (ii) Amines are basic – explain giving examples.

Q. 24(A) **Answer the following questions in short :** **(5)**

(1) Complete the reaction :

$$CH_3CONH_2 \xrightarrow[P_4O_{10}]{\Delta}$$
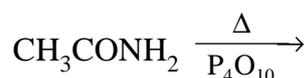
(2) Give structural formuale :

(a) N, N dimethyl aniline (b) paracetamol

(3) What is role of Leuco salt in dyeing with indigo.

(4) What is retinol ? Where it is present ?

(5) Chloroform used in hospitals is mixed with 1% ethanol. Comment why ?

(B) Write chemical equations for ANY THREE of the following conversions. Also give the conditions of the reactions, names and structural formuale of the main organic compounds. (Only two steps). **(6)**

(1) 2–methyl 2–propanol from acetone.

(2) Benzamide from Benzoic acid.

(3) Phenylcyanide from Aniline.

(4) Acetanilide from Nitrobenzene.

(C) Answer ANY THREE of the following questions : **(9)**

(1) Write a brief note on : (1) Hofmann reaction (2) Sodalime test.

(2) Write a brief note on Diazotization and diazomium salts.

(3) a. Amines have lower bioling points than the corresponding alcohols.

b. Write short note on Hormones and Haemoglobin

(4) a. Give information of CND & CNS drug.

b. Differentiate between HDP & LDP.

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Q. 1. [A] Answer the following :   **5**

  (1) N^{+5} ion is not formed. Why ?

  (2) Give the structure of

      (a) pyrophosphoric acid   (b) Pyrophosphorous acid.

  (3) What is Vanadates ?

  (4) What is d–d transition ?

  (5) What is co–ordination site ?

[B] Answer the following :   **6**

  (1) $CrCl_3$ is Paramagnetic while $CrCl_6$ is diamagnetic Explain.

  (2) Give IUPAC name : (a) $Na_3 [Co(CN)_3Cl_3]$

                     (b) $Mg [Cr(OX)_2(H_2O)_2]$

  (3) Explain Reactivity of Nitrogon group elements.

[C] Answer any three :   **9**

  (1) Compare the Geometry and magnetic properties of $K_2[NiCl_4]$ and $K_2[Ni(CN)_4]$

  (2) Explain :

      (a) Physical properties of transition elements.

      (b) oxy salts of Arsenic acid

  (3) How nitrogen differs from elements of VA group ? Explain.

  (4) What is ligand ? Explain the classification of ligands giving examples.

Q. 2. (A) Answer the following objective questions :   **5**

  (1) How is red phosphorous prepared ?

  (2) What are transition elements ?

  (3) On which factors, does the oxidation state of transition elements depend ?

  (4) Name the transition metal, which is present in vitamin B_{12} complex.

  (5) Write IUPAC name of $[Cr (H_2O)_4 Cl_2] Br$

(B) Answer the following questions (any two)   **6**

  (1) What are interstitial compounds ?

  (2) Transition elements form compounds in more than one oxidation states. Give reasons.

  (3) Write special characteristics of Nitrogen.

(C) Answer any three of the following questions :   **9**

  (1) Explain special characteristics of position of inert gases in the periodic table.

  (2) Discuss various oxidation states of Titanium and Vanadium element.

  (3) In the ions of transition metals, the experimental values of magnetic moments are sometimes larger or smaller than calculated values. Explain with reasons.

(4) Explain the magnetic properties and geometry of the complex $K_3[Fe(CN)_6]$

Q. 3. (A) Answer the following questions in short   **5**

(1) Give two examples for negative ligands.

(2) Give electronic configuration of Cr^{3+}, Co^{3+}.

(3) Which equation is used to calculate the value of Magnetic moment of a complex ?

(4) What is meant by co–ordination site of a ligand ?

(5) How many electrons are there in 3d–orbitals of K^+ in $K[MnO_4]$

(B) Answer the following questions   **6**

(1) Cu^{2+} ion like other transition element ion is coloured. While Cu^{1+} ion is colourless.

(2) Explain the electron configuration of Chromium and Copper.

(3) Write structural formula of the following.
    i) Chloric acid
    ii) Chlorine heptoxide
    iii) Metaphosphorus acid
    iv) Hypophosphorus acid

(C) Answer any three of the following questions   **9**

(1) (i) Give the IUPAC names of the following complexes :
    (a) $Na_3[Fe(OX)_3]$
    (b) $K_3[Fe(CN)_5 (CO)]$
    (c) $[Cr(NH_3)_6]Cl_3$
    (ii) Write short note on :
        Complexes occuring in nature

(2) What are the main reasons for the transition metal ions to form complexes ?

(3) What are the main points of Werner's Theory ?

(4) What are interstitial compounds ? Give information about the interstial and stoichiometric compounds of the transition elements and explain giving examples.

Q. 4. (A) Answer the following questions   **5**

(1) What happens when nitrous acid is boiled in presence of air.

(2) What are the methods to isolate inert gases from air

(3) Give IUPAC name of $[Cr(NH_3)_4 Cl_3]NO_3$

(4) Write primary and secondary valency of metal ion cobalt in the complex $[Co(H_2O)_6]Cl_3$

(5) Give names and fomulae of two complexes in which the oxidation state of Ni metal is zero.

(B) Answer the following questions.   **6**

(1) Give the properties of transition elements which bear a direct relation with the oxidation state.

(2) The geometric configuration of $K[MnO_4]$ cannot be determined from values of magnetic moment. Why ?

(3) Write balanced chemical equations of the following reactions.
   (a) Reaction of Arsenic trioxide with nitric acid
   (b) Reaction of Tin with HNO_3

(C) Answer any three of the following   9

(1) Explain : (a) Nature of bonding of VA group elements
              (b) Bonding capacity of zero group elements

(2) Discuss various oxidation states of Titanium and Vanadium elements.

(3) Give Reason :
   (a) $[NiCl_4]^{2-}$ is paramagnetic where as
       $[Ni(CN)_4]^{2-}$ is diamagnetic
   (b) $[Fe(H_2O)_6]^{3+}$ possesses greater magnetic moment than $[Fe(CN)_6]^{3-}$
       Why ?

(4) "The transition metal ions have a greater tendency to from complexes than other elements." Give main reasons to justify the statements.

Q. 5. (A) Answer the following questions in short :   5

(1) Write the factors responsible for formation of ions from transition metals.

(2) Generally, transition elements give coloured ions. Explain.

(3) Give the IUPAc name of the complex $K_4[Cr(CN)_5(NO)]$

(4) Define co–ordination number

(5) Write the balanced chemical equation reaction of phosphorous with NaOH

(B) Answer the following questions   6

(1) Give the oxidation number of the transition metal ions in the following complex compounds.
   (i) $[V(H_2O)_6]Cl_2$
   (ii) $[Cr(NH_3)_4\ CO_3]\ NO_3$

(2) $CrCl_3$ is paramagnetic while $CrCl_6$ is diamagnetic. Give reason.

(3) Explain allotropes of phosphorus

(C) Answer any three of the following questions :   9

(1) Explain the geometry and magnetic property of $[Co(NH_3)_6]^{2+}$ complex

(2) Explain : (1) Importance of Chlorophyll
             (2) Inert gases occupy zero–group also known as VIII[th]A
                 group in periodic table

(3) What are interstitial compounds ? Give information about the interstitial and non–stoichiometric compounds of the transition elements.

(4) Give reaction for preparation of HNO_3 and write equations showing nitric acid as an oxidising agent.

Q. 6. (A) Answer the following questions in brief   5

(1) Nitrogen molecule is very stable. Why ?

(2) Molecules like NH_3, PH_3 have pyramidal shape. Why ?

(3) What is the importance of Mg in human body ?

(4) Explain the term spin–orbit coupling

(5) Arrange the following ligands in the order of their strength
H_2O, NH_3, CN^-, Cl^-

(B) Answer the following   **6**

(1) Give IUPAC names of (a) $K[Cr(NH_3)_2(CO_3)_2]$

                        (b) $[Fe(CO)_6]SO_4$

(2) (a) What are methods to isolate inert gases from air.

      (b) State two chemical reactions of halogens

(3) Magnetic moment value of an ion of iron is 5.92 B.M. Find the no. of unpaired electrons in it and give its electronic configuration.

(C) Answer any three of the following   **9**

(1) Explain the geometry & magnetic properties of $K_4[Fe(CN)_6]$

(2) Write names, molecular formulae, structural formulae and oxidation states of oxyacids of chlorine.

(3) Give reasons :

     (a) $[Co(NH_3)_6]^{3+}$ is more stable than $[Co(NH_3)_6]^{2+}$

     (b) Zero group is a bridging group between VII A & IA group in the periodic table.

(4) What is a ligand ? Explain the classification of ligands giving examples.

Q. 7. (A) Answer the following objective questions.   **5**

(1) Which is the most stable form of phosphorus? How is it prepared ?

(2) Why is the eighth group in the periodic table called zero group ?

(3) From which type of non-stoichiomeiric interstitial compounds, hydrocarbons are prepared ? How ?

(4) What are poly nuclear complexes? Give an example.

(5) What is the geometry of $[Ni(CN)_4]^{-4}$? Give the type of hybridization of the metal ion in it.

(B) Answer the following questions   **(6)**

(1) Explain with reactions two methods for the preparation of arsenic acid.

(2) Give IUPAC names of

     (i) $K_3[Co(NH_2)_2(OX)_2]$ (ii) $[Cr(H_2O)_4(OH)_2]$ Br.

(3) Ti^{3+} is coloured like any other transition metal ion, but Ti^{4+} is colourless. Explain giving reasons.

(C) Answer any three of the following questions   **9**

(1) Complete the reactions and balance.

     (i) $KI + HNO_3$

     (ii) $P_4 + NaOH + H_2O \rightarrow$

     (iii) $K_2Cr_2O_7 + H_2SO_4 + HNO2 \rightarrow$

(2) Explain

    (i) The oxidation states of Vanadium and Cobalt.

    (ii) The requirements for the formation of complex.

(3) Explain the geomeiry and magnetic property of $[Co(NH_3)_6]^{2+}$ by hybridization theory.

(4) Write notes on:

    (i) Nature of bonding in group five elements.

    (ii) Strength of ligands.

Q. 8. (A) Answer the following objective questions   **5**

(1) The decrease in energy of different orbitals is irregular. Why ?

(2) Which of the following is expected to be a paramagnetic complex ?

    (a) $[Ni(H_2O)_6]^{2+}$ (b) $[Ni(CO)_4]$

    (c) $[Zn(NH_3)_6]^{2+}$ (d) $[Co(NH_3)_6]^{3+}$

(3) Give IUPAC name of the following complexes

    (a) $Fe_4[Fe(NH)_6]_3$

(4) Which one of Fe^{2+} and Fe^{3+} is more peramagnetic ? Why ?

(5) Which of the following is not known ?

    NCl_5, $SbCl_3$

(B) Answer the following questions   **6**

(1) Explain bonding capacity of Inert gas elements

(2) The oxidation state of the elements at the two ends of the transition elements series are lowest, where as those for the element in the centre are the highest. Explain this fact giving reasons.

(3) Draw the structure and state hybridization of the central atom of each in the following.

    (a) $[Co(NH_3)_6]^{3+}$ (b) $[NiF_4]^{2-}$

(C) Answer any three of the following questions   **9**

(1) Give balanced chemical equation for the following reactions.

    (i) Reaction of Nitric acid with Arsenic Trioxide

    (ii) Reaction of Carbon with Nitric acid

    (iii) Reaction of yellow phosphorous with sodium hydroxide (Hydrolysis)

(2) Explain : Calculative and theoretical values of magnetic moments of Cr^{+3} Cu^{+2} and Ni^{+2} ion.

(3) (a) Explain Reactivity of Nitrogen family elements

    (b) $[Co(NH_3)_6]^{3+}$ is more stable than $[Co(NH_3)_6]^{2+}$ Why ?

(4) $[Ni(CN)_4]^{2-}$ is more stable than $[NiCl_4]^{2-}$.

Q. 9. (A) Answer the following questions   **5**

(1) Write structural formula for :

    (i) Chlorine trioxide (b) Nitrogen sesquioxide

(2) Give structural formula for Sulphido bis (propylene diamine) cobalt (III) chloride

(3) Give chemical reaction for preparation of stibine

(4) Can inert gas element be said elements of 8th group ? Why ?

(5) Give oxidation state of Iron in $Fe(CO)_5$

(B) Answer the following questions   **6**

(1) Give balanced chemical equations for the following reactions :

    (i) Reaction of Sodium phosphide with water

    (ii) Oxidation of ferrous sulphate by Nitric acid in acidic medium.

(2) Write short note on the strength of ligands and its order.

(3) Cuprous chloride is colourless while cupric chloride is coloured" Explain the statement giving reason.

(C) Answer any three of the following questions   **9**

(1) Explain the geometry and magnetic properties of complex $K_2[Ni(CN)_4]$

(2) Explain :

    (i) Bonding capacity of zero group elements

    (ii) Characteristics of lithium metal

(3) Write a short note on coloured ions of transition elements.

(4) Explain the chemical properties of halogen elements with equations of the reactions.

Q. 10(A) Answer the following objective questions :   **6**

(1) Give molecular formula   (a) Trisodium Orthophosphate

                               (b) Bismuthine

(2) Explain : All static compounds of Scandium are diamagnetic

(3) Which properties of transition metals are changed in their interstitial compounds ?

(4) Give name and structure of hex dentate negative ion ligand.

(5) Give IUPAC name $[Mn(en)_3] Cl_3$.

(B) Answer the following equations :   **6**

(1) Write balanced chemical equations for the following reactions :

    (a) Reaction of potassium dichromate with nitrous acid in acidic medium

    (b) Reaction of acidic ferrous sulphate with nitric acid

(2) The ionization of the transition elements decreases as atomic number increases. Give reasons.

(3) $[Ni(H_2O)_4]^{2+}$ is paramagnetic whereas $[Ni(CN)_4]^{-2}$ is diamagnetic. Explain.

(C) Answer any three of the following :   **9**

(1) Explain : (i) Bonding capacity of nitrogen group

               (ii) Reactivity of the elements of nitrogen family

     (2) Write a short note on positive and negative oxidation states of transition elements.

     (3) State the main points of Werner's theory.

     (4) Explain the geometry, hybridization & magnetic properties of complex ion $[CO(NH_3)_6]^{+3}$.

Q. 11(A) Answer the following : (05)

     (1) Give IUPAC name $[Cr(H_2O)_4 (OH)_2] NO_3 2H_2O$

     (2) Write formula of Potassium hexacyano ferrate (III)

     (3) How copper hydride is made ?

     (4) What is the colour of β–antimony ?

     (5) The inert gases are good conductors of electricity at low temperature, true or false ?

(B) Answer the following : (06)

     (1) Explain oxyacids of arsenic.

     (2) Fe^{+3} state is more stable than Fe^{+2} state, why ?

     (3) What are requirement for the formatin of complex ?

(C) Answer the following : (Any three) (09)

     (1) Write short notes on complexes occurring in nature.

     (2) Discuss the magnetic properties of the M^{+2} ions of the elements of the first transition series.

     (3) (i) Write electronic configuration of the elements of zero group.
         (ii) Write the characteristics of nitrogen molecule.

     (4) Explain chemical properties of nitric acid.

Q. 12(A) Answer the following : 5

     (1) Why phosphorous form PF_5 while nitrogen does not form NF_5.

     (2) Arrange the following in increasing order of basic character : PH_3, NH_3, SbH_3, AsH_3.

     (3) What is the theoretical magnetic moment of Ti^{3+} ion ?

     (4) Explain why copper (I) compounds are diamagnetic while copper (II) compounds are paramagnetic and coloured ?

     (5) What makes Ti^{+4} co–valent ?

(B) Answer the following : 6

     (1) Write the formula of the following complex –
        Hexaammine Cobalt (II) and give the hybridisation of central metal ion in this complex.

     (2) Why does Mn (II) ion show maximum paramagnetic character among the divalent ions of the first transition series ?

     (3) Give preparation of Nitric acid. Also give two equations showing properties as oxidising agent.

(C) Answer any three of the following : 9

(1) (a) Discuss oxyacids of Arsenic

    (b) Properties of Inert gases

(2) (a) Explain why $K_4[Fe(CN)_6]$ is dimagnetic while $[Fe(H_2O)_6]Cl_3$ is paramagnetic ?

    (b) Strength of Ligands and its order.

(3) (a) Indicate the central metal atom, Ligands, co– ordination number and oxidation state of central metal atom in the complex; $[Cr(H_2O)_2(NO_2)_2I_2]$

    (b) Postulates of Werner's Co–ordination theory.

(4) (a) The oxidation states of the elements at the two ends of the transition elements series are lowest where as those for the elements in the centre are highest. Why ?

    (b) Write names, molecular formula and oxidation states of the different oxides of nitrogen.

Q. 13(A) Answer the following questions :   **5**

(1) Copper is considered as transition metal. Why ?

(2) What are different allotropes of antimony ?

(3) Write the electron–configuration of elements of zero group.

(4) $KMnO_4$ is a powerful oxidizing agent. Why ?

(5) Give IUPAC names of the following complexes
(a) $Na_2[Fe(CN)_5(NO)]$ (b) $[Cr(H_2O)_4Cl_2]Br$

(B) Answer the following questions :   **6**

(1) What are the basic requirements for complex formation ?

(2) Give balance chemical equations :

    (a) Reaction of potassium iodide with nitric acid.

    (b) Reaction of water with calcium phosphide

(3) $TiCl_2$ is paramagnetic while $TiCl_4$ is dimagnetic. Why ?

(C) Answer any three of the following :   **9**

(1) What are interstitial compounds. Give information about stoichiometric & non–stoichiometric compounds of the transition elements and explain giving appropriate example.

(2) Why is Nitrogen different from other elements of its group ?

(3) Explain the geometry and magnetic properties of $[Fe(H_2O)_6]^{3+}$ complex ion.

(4) Answer the following :

    (i) Which metal is present in chlorophyl. Explain its importance.

    (ii) Give the names and formulae of salts of arsenic acid.

Q. 14(A) Answer the following question in short.   **5**

(1) How is black phosphorous prepared ? Give its characteristics.

(2) Give IUPAC name of complex $K[Co(NH_3)_2(OX)_2]$

(3) What are called Transition elements ? Give the electronic configuration of chromium.

(4) Write the balanced chemical equation reaction of antimony with nitric acid.

(5) Give the molecular formula of the substance obtained by the reduction of aqueous copper sulphate with sodium hypo–phosphide. Also indicate its colour.

(B) Answer the following questions :   **6**

(1) What is a ligand ? Give structure of hexadentate ligand.

(2) Give balanced equation for the following reactions.

    (a) Reaction of ferrous sulphate with HNO_3 in presence of sulphuric acid

    (b) Reduction of potassium nitrate by sodium–mercury amalgam.

(3) Cu^{+2} ion like other transition element ions is coloured, while Cu^{+1} ion is colourless.

(C) Answer any three of the following questions :   **9**

    (1) Give preparation of arsenic acid, molecular formula and name its sodium salts.

    (2) Explain d^2sp^3 hybridisation with example of potassium ferrocyanide and discuss its geometrical structure and magnetic property.

    (3) Give electronic configuration of vanadium and manganese elements. Discuss their different oxidation states.

    (4) Explain :

        (a) Complexes in nature.

        (b) physical properties of the inert gas elements.

Q. 15(A) Answer the objective questions.   **5**

(1) Give IUPAC name of $Na_2[Fe(CN)_5(CO)]$.

(2) Give structural formula of Ammonium hexa chloro cobaltate (III)

(3) Name elements of zero group of periodic table.

(4) On what does magnetic moment of transition metal ion depend ?

(5) Which factors are involved in formation of transition metal ion ?

(B) Answer the following :   **6**

(1) Give important points of werner's theory.

(2) Write a note on coloured ions of transition metal.

(3) Explain hybridisation in ML_4 complex.

(C) Attempt any three :   **9**

(1) Give equations in which nitrous acid acts as oxidising agent.

(2) Give name, formula, oxidation state, Basicity and structure of phosphorus acid.

(3) Write a note on industrial compounds.

(4) Explain geometry, magnetic property and hybridisation in hexa amine cobalt (II) complex ion.

Q. 16(A) **Answer in brief :** 5

(1) Yellow phospherous has to be kept under water why ?

(2) When does a σbond form between metal and ligand ?

(3) Why are interstitial compounds called nenstoichiometric campounds ?

(4) State the characteristics of primary valency of metal ions.

(5) Why do metals form different types of compleres ?

(B) **Answer the following :** 6

(1) Define : Bidentate and tridentate ligands. Give examples of organic ligands.

(2) Explain screening effect.

(3) Give the preparetion of nitric acid. Also give two equations showing properties as oxidizing agents.

(C) **Answer the following : (any three)** 9

(1) Discuss the magnetic properties of transition metals ions.

(2) Write name, molecular formula, structual formula basicity and oxidation states of different acids of phsphorus acid and phosphoric acid series.

(3) Explain the geometry of four and six co–ordinate number of complexes giving examples.

(4) (a) $[NiCl_4]^{2-}$ is paramagnetic where as $[Ni(CN)_4]^{2-}$ is diamagnetic. Explain.

(b) Define – $d^2 SP^3$ hybridization.

Q. 17(A) **Answer the following questions in short :** 5

(1) What is chelate ?

(2) What is called d–d transition ?

(3) Write balanced chemical equation of calcium phosphide reacts with water.

(4) Give IUPAC name of $[Co(en)_3]Cl_3$

(5) Which type of compounds are not formed by inert gases ?

(B) **Answer the following questions :** 6

(1) The electronic configuration of chromium is $3d^5 4s^1$ and not $3d^4 4s^2$.

(2) Write balanced chemical equations of the following reactions.

(i) Sulphur dioxide reacts with Nitrous Acid.

(ii) Hydrolysing of yellow Phosphorus with NaOH

(3) How does Hemoglobin provide energy to our body ?

(C) **Answer any three of the following questions :** 9

(1) Explain Werner's theory with illustrations.

(2) Explain : (i) $d^2 sp^3$ hybridization

(ii) Basic requirement for complex formation.

(3) Explain : (i) Non–metallic and metallic characters of the Nitrogen family

(ii) isolation of inert gas elements.

(4) Explain : (i) Energy of 4s and 3d

(ii) Complex compounds and co–ordinate bond

Q. 18(A) Answer the following questions in short : (5)

(1) Give reason : "Zero group elements do not form ionic compounds."

(2) Why is the electron configuration of chromium $3d^5 4S^1$ and not $3d^4 4S^2$?

(3) Give the formula

Carbonate tetraamine chromium (iii) nitrate.

(4) How much quantity of Magnesium is required per day of a body of a grown–up person ?

(5) What are Vanadates ? Give example.

(B) Answer ANY THREE of the following questions : (6)

(1) In what ways the nitrogen element is different from the elements of the same group ?

(2) Write a short note on magnetic properties of transition elements.

(3) What is 'Chelate' ? Give any two examples of chelating ligand.

(4) Give the IUPAC names of the following completes.

(i) $K[Co(NH_3)_2 (OX)_2]$

(ii) $[Co(H_2O)_5 (NO_3)] Cl_2$

(C) Answer ANY THREE of the following questions : (9)

(1) Transition elements give coloured ions. Explain this fact giving reasons.

(2) Explain the geometry and magnetic property of $[Ni(Cl)_4]^{-2}$ complex ion.

(3) (i) Explain special characteristics of the position of inert gases in the periodic table.

(ii) Give physical properties of the inert gase elements.

(5) Write short note on interstitial and non–stoictiometric compounds.

Q. 19(A) Answer the following questions : (5)

(1) Which form of phosphorous is most stable ? How is it obtained ?

(2) What happens when electric current is passed through the inert gases ?

(3) Give the electron configuration of Cr^{+3} and Ni^{+2} ions.

(4) What is chelate ? Give one example.

(5) Give IUPAC name of $K[Co(NH_3)_2 (OX)_2]$

(B) Answer the following : (6)

(1) Give the preparation of nitric acid. Also give two equations showing propertics as oxidizing agent.

(2) Cu^{+2} ion like other transition element ions is coloured, while Cu^+ ion is colourless.

(3) Write a short note on strength of ligand and its order.

(C) Answer any THREE of the following : (9)

(1) Define transition element. Discuss their electron configuration.

(2) Answer the following :
   (i) Explain – Nature of bonding of V A group elements.
   (ii) Discuss the physical properties of rare gases.
(3) Answer the following :
   (1) Give structural formual of potassium hexacyano ferrate (II).
   (2) Give the chemical reaction of Arsenic with nitric acid.
   (3) Explain : d–d transition.
   (4) Explain the type of hybridisation, geometry and magnetic property of $[Ni(CN)_4]^{-2}$ complex ion.

Q. 20(A) **Answer the following questions in short :** (5)
   (1) Give the molecular formula of :
      (a) nitrogen sesequioxide (b) Sodium meta arsenide
   (2) Between which groups the zero group form the bridging group ? Give reason.
   (3) The value of magnetic moment of a compound of manganese is 4.90 BM than state the oxidation state & the electron configuration of Mn.
   (4) Nickel is used as a catalyst in hydrogenation of unsatunated organic substances give reason.
   (5) Write the primary and secondary valencies of $k_3[Fe(OX)_3]$
   (B) **Answer the following questions :** (6)
   (1) Discuss the physical properties of the elements of zero group.
   (2) "$CuCl_2$ is coloured while Cu_2Cl_2 is colourless", give reason to explain.
   (3) Write a brief note on : Order & Strength of ligands.
   (C) **Answer ANY THREE of the following questions :** (9)
   (1) a. The +3 state of Cr is stable where as the +4 & +5 state of Cr are not stable.
      b. Cr_2O_3 is paramagnetic, where as CrO_3 is diamagnetic.
   (2) a. Explain the reactivity of nitrogen.
      b. State the inert gas elements do not form convalent and ionic compounds.
   (3) Give information about the interstitial and Non-stoichiometric compounds of transition elements.
   (4) Explain the geometry and magnetic properties of four and six co-ordinated complexes giving illustrations.

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