Chemistry

MODEL QUESTION

Grade: XII **Times: 3 hours**

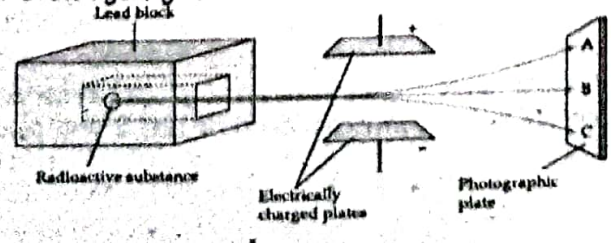
Full Marks 75 (11 marks obj. + 64 marks sub.)

1

Group A: Multiple Choice Questions

Tick the correct answer. **[11×1=11]**

1. What is the equivalent weight of H_3PO_3 in the reaction; $2NaOH + H_3PO_3 \longrightarrow Na_2HPO_3 + 2H_2O$
   a. 2M b. M/1
   c. M/2 d. M/3
2. The solubility product of chalk is 9.3×10^{-8}. What is its solubility in gram per liter?
   a. 3.04×10^{-1} b. 3.04×10^{-2}
   c. 3.04×10^{-3} d. 3.04×10^{-4}
3. What is the concentration of N_2O_5 in the following first order reaction in which the rate is 2.4×10^{-5} mol/L and rate constant is 3.0×10^{-5} S^{-1}? $2N_2O_5 \longrightarrow 4NO_2 + O_2$
   a. 0.04 b. 0.8
   c. 1.2 d. 1.4
4. What happens when the lead storage bettery is discharged?
   a. SO_2 is evolved b. $PbSO_4$ is consumed
   c. Lead is formed d. H_2SO_4 is consumed
5. What is the general electronic configuration of transition metal?
   a. $(n-1)s^2p^6d^{1-10}ns^{0-2}$ b. $(n-1)s^2p^6ns^2np^1$
   c. $(n-1)s^2p^6d^5ns^1$ d. $ns^{(0-2)}(n-1)d^{(1-10)}$
6. Which of the following ore is concentrated by forth-flotation process?
   a. Hematite b. Siderite
   c. Galena d. Malachite
7. Which of the following products is obtained when nitrobenzene is electrolytically reduced?
   a. p-aminophenol b. azobenzene
   c. azoxybenzene d. hydrozobenzene
8. Which of the following compounds is pi-bonded organo-metallic compound which has ethane as one of its component and is the first synthesized organometallic compound?
   a. Zeise's salt b. Ferrocene
   c. Dibenzene chromium d. Tetraethyl tin
9. What effect does calcium sulphate have on cement?
   a. Retards setting action b. Acts as flux
   c. Imparts color d. Reduces strength
10. Removal of which of the following leads to higher fiber-fiber bonding strength is paper?
    a. Softwood b. Hardwood
    c. Lignin d. Pulp
11. In the figure given below which one is correct?



   a. Alpha rays deviate towards A, beta rays deviate towards C and gamma rays direct towards B.
   b. Alpha rays direct towards B, beta rays deviate towards C and gamma rays towards A.
   c. Alpha rays deviate towards C, beta rays direct towards B and gamma rays towards A.
   d. Alpha rays deviate towards C, beta rays deviate towards A and gamma rays direct towards B.

Group B: Short Answer Questions

Attempt all the questions. **[8×5=40]**

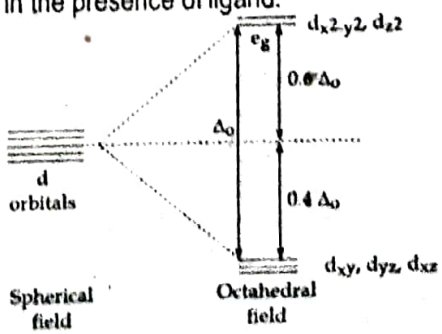
1. Standard solution of Na_2CO_3 is used to determine the strength of H_2SO_4 during titration.
   a. How is the completion of the reaction in this titration detected? Is the solution prepared from Na_2CO_3 primary standard? Why? [1+1]
   b. 2.16 g of pure Na_2CO_3 is added to 400 mL deci-normal solution of H_2SO_4. How many grams of H_2SO_4 is further required to neutralize the resultant solution completely? [3]

   OR

   a. Derive the relation $k = \log \frac{2.303}{t} \log \frac{a}{a-x}$. Show that for the first order reaction the time required for half the change (half life period) is independent of the initial concentration. [2+1]
   b. A first order reaction is 50% completed in 10 min. How much time would it take for 90% completion? [2]
2. Study the following data for the thermodynamic process $H_2O\ (l) \longrightarrow H_2O\ (s)$ at different temperatures and at 1 atmospheric pressure.

Condition	Temperature	Entropy change in J/Kmol^{-1}	
		Entropy of system	Entropy of surrounding
1	−1°C	−25.68	+25.72
2	0°C	−26.55	+26.88
3	+1°C	−27.62	+27.42

   a. Calculate the total entropy of the universe at given condition 3. [1]
   b. Can we predict the spontaneity of the given reaction at 0°C? [1]
   c. Calculate the equilibrium constant for the fusion of ice at 1°C. What is the effect of temperature for the entropy change of reaction? [2+1]
3. The figure shows the octahedral distortion of d-block orbital in the presence of ligand.



a. Why does octahedral distortion occur in the presence of ligand? Explain on the basis of CFT. [2]
b. On the basis of the given distortion, how can you explain $[Cu(H_2O)_6]^{++}$ is blue colored complex. [1]
c. Out of Fe^{++} and Fe^{+++} which one is more stable? Explain on the basis of distortion seen in the above figure. [1]
d. Why do such elements which give such splitting show good catalytic properties? [1]

4. X is an ore of a metal M. X on calcination gives black precipitate (W) of metal oxide which belongs to group II of basic radical in qualitative analysis. X on roasting gives the metal (M) and a gas as major byproduct. The gas when passed through an acidified $K_2Cr_2O_7$ solution turns green.
a. Identify the metal ore X. [1]
b. Write the reaction involved during calcination of X. [1]
c. Write the action of the gas on acidified $K_2Cr_2O_7$. [1]
d. Convert metal M into it's vitriol. [2]

5. The given table shows the compounds and their molecular formula. How can you convert P to Q, where Q is a compound in which two methyl groups are substituted at adjacent carbons? How is P obtained from T, where T is secondary alcohol? Write the reactions involved in the conversion of P into R and S? [5x1=5]

Compounds	Molecular formula
P	C_3H_7Br
Q	C_6H_{14}
R	CH_2O
S	C_2H_4O
T	C_3H_8O

OR

An aromatic compound [A] in which one chlorine atom is substituted at benzene ring. When the compound [A] is heated with 2, 2, 2-trichloro ethanal in presence of conc. H_2SO_4 gives an insecticide [B]. The compound [A] when treated with an acid chloride containing two carbon atoms in the presence of anhydrous $AlCl_3$ gives [C].
a. Identify B and C. [1 +1]
b. Reaction of aq. NaOH on the compound [A] is more difficult than with chloroethane, justify with a suitable explanation. [2]
c. How would you obtain compound [A] from benzene diazonium chloride? [1]

6. A list of compounds are given as follows:
p-hydroxyazobenzene, $C_6H_5N_2Cl$, $C_6H_5NH_2$, $C_6H_5NO_2$, C_6H_6
From the above list of compounds, prepare a sequence of reaction chain with suitable conditions and reactions. [1+1+1+1+1]

7. Write down the isomeric alcohols of C_3H_8O and their IUPAC name. How would you apply Victor Meyer's test to distinguish these isomers? [2+3]

8. a. Define condensation polymerization. Write the molecular structures of monomers of Bakelite. [1+2]
b. Differentiate between OPC and PPC cement. [2]

Group C: Long Answer Questions **[3x8=24]**

9. a. What amount of $Zn(OH)_2$ will be precipitated out at 25°C if 100 mL of 0.22g NaOH is added to 1 liter of a saturated solution of $Zn(OH)_2$? Precipitate is obtained in this reaction, why? [Solubility product of $Zn(OH)_2$ at 25°C is 1.8×10^{-14}.] [4+1]
b. Potassium hydroxide having pH 8 is diluted 1000 times. Calculate the pH of the diluted base. [3]

OR

a. Calculate heat of formation of ethyl alcohol from the given data. [4]

Heat of combustion of ethyl alcohol	-330 kcal
Heat of formation of Carbondioxide	-94 kcal
Heat of formation of water	-68.5 kcal

b. The standard electrode potential for the following electrode reaction at standard state is given.
$Cu(s) \longrightarrow Cu^{++}(aq) + 2e^-$... $E^0_{Cu^{++}/Cu} = +0.34V$
$Ag^+(aq) + e^- \longrightarrow Ag(s)$ ... $E^0_{Ag^+/Ag} = +0.80V$
i. Write the cell notation indicating anode and cathode. [1]
ii. With 1M solution of ion at 25°C and 1atm. pressure, what will be the cell potential? [1]
iii. Calculate the free energy change in the reaction. [1]
iv. Can we store $AgNO_3$ solution in a copper vessel? [1]

10. a. A primary alcohol with molecular wt. 46 is boiled with sodium hydroxide and iodine. When the same alcohol is heated with ethanoic acid in presence of conc. H_2SO_4, one of the derivatives of carboxylic acid is obtained. Write the reactions involved in both conditions. What would be the product obtained when the same alcohol is heated with conc. H_2SO_4? How would you distinguish the above alcohol from methanol? [1+1+1+1+1=5]
b. An aromatic compound known as oil of mirabane is prepared from benzene.
i. What product would you obtain when the compound is electrolyzed in acidic medium? [1]
ii. Give the complete reaction for the conversion of the compound into yellow dye. [2]

11. a. An organic compound is used in the given figure to preserve museum specimens and also to prepare urinary antiseptics.

i. Write the reaction when the compound is heated with concentrated sodium hydroxide. [1]
ii. Draw the structure of urinary antiseptic [1]
iii. Write the chemical reaction that would occur when the given preservative is treated with phenol in acidic medium. [2]
iv. How would you obtain the preservative from methanol? [1]
b. A carbonyl compound with molecular formula C_3H_6O (it does not give silver mirror test) has treated with a compound Y which gives Z. Z on hydrolysis in acidic medium gives 2- hydroxy-2-methyl propanoic acid. Identify the carbonyl compound, Y and Z with proper reactions. [1+1+1]

OR

a. Starting from compound P, how do the reactions proceed ahead to obtain T which gives benzene where R is aniline? Complete the reaction sequence with suitable conditions. [5x1=5]

b. Arrange the given compounds according to their ascending order of acidic strength and justify your order. CH_3CH_2COOH, C_6H_5COOH, $ClCH_2CH_2COOH$

2

Group A: Multiple Choice Questions

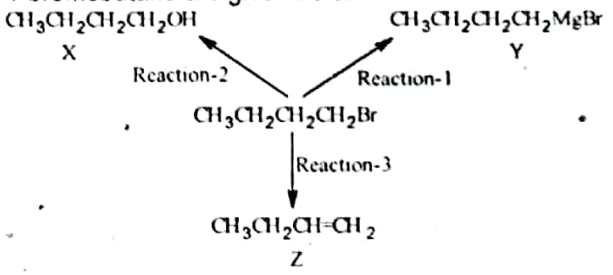
Tick the correct answer. [11×1=11]

1. 10 mL of 10M H_2SO_4 is diluted to 250 mL, the strength of the diluted solution is
   a. 0.80 N b. 0.40 N
   c. 1.0 N c. 0.60 N
2. What will be the pH of the solution obtained by mixing 100 c.c. of $\frac{N}{10}$ HCl and 100 c.c. of $\frac{N}{10}$ KOH ?
   a. 0 b. 7
   c. 4 d. 14
3. The rate of a gaseous reaction is given by k[A][B]. If the volume of vessel containing these gases is reduced to 1/4th of initial volume, the rate of reaction relative to the original rate would be
   a. $\frac{16}{1}$ b. $\frac{1}{16}$
   c. $\frac{4}{1}$ d. $\frac{1}{8}$
4. Transition metals are generally coloured because
   a. they absorb electromagnetic radiations
   b. their penultimate d-sub shells are fully filled
   c. of d-d transition
   d. of their high density
5. What happens when lead storage battery is discharged?
   a. SO_2 is evolved b. $PbSO_4$ is consumed
   c. Lead is formed d. H_2SO_4 is consumed
6. Which product is formed when nitrobenzene is reduced electrolytically?
   a. Azobenzene b. Azoxybenzene
   c. Hydrazobenzene d. p-aminophenol
7. Which grade of cement is generally used for construction work?
   a. 33 grade b. 53 grade
   c. 22 grade d. 73 grade
8. .....is the mixture of pulp, filler and other papermaking materials.
   a. PCC b. Fillers
   c. Stock d. Dyes
9. Zinc metal is extracted from the ore.....
   a. Cinnabar b. Argentite
   c. Copper pyrites d. Calamine
10. Which type of radiation is the least penetrating?
    a. alpha b. beta
    c. gamma d. X-ray
11. Which of the following compounds does not give a tertiary alcohol upon reaction with methyl magnesium bromide?
    a. 3-methylpentanal
    b. ethyl benzoate
    c. 4,4-dimethylcyclohexane
    d. 4-heptanone

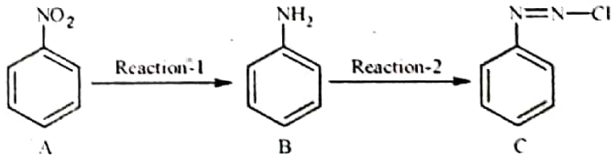
Group B: Short Answer Questions

Attempt all the questions. [8×5=40]

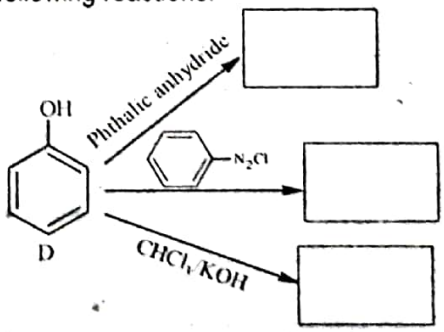
1. Haloalkanes have many chemical uses, particularly as intermediate in organic reactions. Three reaction of 1-bromobutane are given below. [1+1+1]



   a. For each of the reaction, state the reagent and solvent used. [3]
   b. What happens when compound Z on ozonolysis? [1]
   c. Write one use of compound Y. [1]
2. This question is concerned with organonitrogen compounds State the reagent needed to produce the two compounds A and B.



   i. What is the reagent for reaction-1 and reaction-2? [2]
   ii. Write the product when compound C is hydrolyzed? [1]
   iii. What product would you get when compound A is reduced with $LiAlH_4$? [1]
   iv. Convert compound B into p-aminoazobenzene. [1]
3. a. Draw the structural formula of the organic product of the following reactions. [3]



   b. How can you prepare methoxybenzene from phenol? [2]
4. This question is related to the organic compound containing hydroxyl as functional group.
   i. Write a reaction which distinguish primary alcohol from secondary alcohol. [2]
   ii. Write the isomer of alcohol having molecular formula C_3H_8O which gives positive iodoform test. [2]

iii. How can you prepare ethanol from cane sugar? Write a reaction only. [1]

OR

i. Write the functional isomer of C_3H_6O which gives positive Tollen's test. [2]

ii. Write the name of one derivatives of carboxylic acid which gives methanamine by heating with Br_2 and KOH. [2]

iii. Write one example of organic compound which gives aldol condensation reaction. [1]

5. a. Define addition and condensation polymer with example. [2]

b. Write one example of azo dye and antibiotics. [1]

c. Write two difference between PPC and OPC. [1]

d. What do you mean by insecticide? Draw the structure of DDT. [1]

6. This question is about iron and iron compounds.

a. Name the main ore of iron. [1]

b. Write the reaction which are involved in blast furnace for the extraction of iron. [3]

c. How can you prevent rusting of iron? [1]

OR

The metal 'M' has an ore 'X' which on calcination gives balck ppt of metal oxide 'Y'. This metal oxide belongs to Group II of basic radical in salt analysis. The metal ore 'X' on roasting gives metal 'M' with the evolution of a gas. The gas when passed through acidified solution of $K_2Cr_2O_7$, turns green.

a. Identify the metal ore. [1]

b. Write a reaction involving in the calcination of ore. [1]

c. Write the action of gas on acidified solution of $K_2Cr_2O_7$. [1]

d. Convert metal 'M' into its vitriol. [2]

7. a. How is normality differed from molarity? [1]

b. Write two difference between acid-base titration and redox titration. [2]

c. 0.715 gram of $Na_2CO_3.xH_2O$ required 20 mL of seminormal HCl solution for complete reaction. Find the value of x. [2]

8. a. How does surface area and concentration of reactants affect the rate of chemical reaction? [2]

b. The experimental data for the reaction $2A+B_2 \longrightarrow 2AB$ are as below.

Exp.	[A] mol L^{-1}	[B] mol L^{-1}	Rate mol $L^{-1}s^{-1}$
1	0.50	0.50	1.6×10^{-4}
2	0.50	1.00	3.2×10^{-4}
3	1.00	1.00	3.2×10^{-4}

i. Find the overall reaction and rate constant. [1]

ii. Calculate the rate of formation of AB when the initial concentration of A and B are 2 mol L^{-1} and 4 mol L^{-1} respectively. [2]

Group C: Long Answer Questions **[3×8=24]**

9. a. For a cell:

$Mg(s)/Mg^{++}(1M)//Cu^{++}(1M)/Cu(s)$

$E^{\circ}_{Mg^{++}/Mg} = -2.37V$ and $E^{\circ}_{Cu^{++}/Cu} = +0.34V$

i. Indicate anode and cathode. [1]

ii. Write the reaction taking place at electrode [1]

iii. Calculate the EMF at 1M solution of its ion. [1]

b. State Ostwald's dilution law and mention its limitation. [2]

c. What mass of KOH should be dissolved in 1 L of solution to prepare a solution having pH 12 at 25°C? [3]

OR

a. What will be the resultant pH when 200 mL of aqueous solution of HCl (pH=2) is mixed with 300 mL of an aqueous solution of NaOH (pH =12) [4]

b. Define degree of ionization. [1]

10. a. An aliphatic compound (A) react with $SOCl_2$ to give (B).The compound (B) on dehydrohalogenation yield (C). The compound (C) on ozonolysis gives a mixture of ethanal and methanal. If the compound (A) is an alcohol and gives positive iodoform test. Wtite the IUPAC name of A,B,C. [3]

b. What product would you expect when benzaldehyde is heated with NaOH solution? [2]

c. Write one example of coupling reaction. [1]

d. How can you separate 1° amine from 2° amine? Write a reaction only. [2]

OR

a. What happens when propanone is treated with PCl_5? [1]

b. What is major product when benzaldeyde is heated with NaOH? Write the name of reaction. [2]

c. Complete the following reaction. [2]

$$CH_3CHO \xrightarrow{HCN} A \xrightarrow{H_2O/H^+} B$$

d. Formic acid gives positive Tollen's test but acetic acid does not, why? Give reason with suitable reaction. [2]

e. What is the major product when acetic acid heated with P_2O_5? [1]

11. An organic compound (X) which is used as preservative of biological specimen and also used to prepare urinary anticeptic.

a. Write the name and formula of compound (X). [2]

b. What product would you expect when the compound (X) is heated with concentrated NaOH solution? [2]

c. A polymer is obtained by heating (X) with phenol in acidic medium, write the structure of polymer. [2]

d. What happens when compound (X) is treated with Grignard reagent followed by hydrolysis? [2]

3

Group A: Multiple Choice Questions

Tick the correct answer. **[11×1=11]**

1. How many mmols of NaOH will be used in the titration with 33mL of 3 M HCl to form NaCl and water?

a. 10 mmol b. 100 mmol

c. 3 mmol d. 33 mmol

2. Ionisation constant of formic acid is 1.8×10^{-4} at 298 K. In 0.1 N HCOOH the percentage ionisation of HCOOH acid is

a. 0.18 b. 42.4

c. 4.24 d. 2.89

3. $3A \longrightarrow B + C$, it would be a zero order reaction when

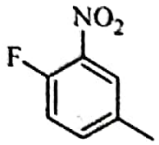
a. the rate of reaction is proportional to square of concentration of A

b. the rate of reaction remains same at any concentration of A

c. the rate remains unchanged at any concentration of B and C

d. the rate of reaction doubles, if concentration of B is increased to double

4. The standard emf is .....for hydrogen-oxygen fuel cells.
   a. 3.96 V b. 1.23V
   c. 0.58V d. 2.54V
5. Ligand which can form two coordinate bonds from each ion or molecule to the transition metal ion known as
   a. ligand ion b. dentate ligand
   c. monodentate ligand d. bidentate ligand
6. The method of zone refining of metals is based upon the principle of.....
   a. greater solubility of the impurity in molten state than in solid
   b. greater mobility of pure metal than impurity
   c. higher melting point of impurity than that of pure metal
   d. greater noble character of solid metal than that of the impurity
7. The IUPAC name of the compound



is
   a. 4-fluoro-1-methyl-3-nitrobenzene
   b. 1-fluoro-4-methyl-2-nitrobenzene
   c. 2-fluoro-5-methyl-1-nitrobenzene
   d. 4-methyl-1-fluoro-2-nitrobenzene
8. Which of the following compounds does not give a tertiary alcohol upon reaction with methylmagnesium bromide?
   a. 3-methylpentanal
   b. Ethyl benzoate
   c. 4, 4-dimethylcyclohexanone
   d. 4-heptanone
9. The grade 43 OPC shall be rejected if it remains in bulk storage in the factory for
   a. More than 3 months b. More than 1 months
   c. More than 6 months d. More than 4 months
10. Which of the following has highest penetration action?
   a. α-ray b. β-ray
   c. Y-ray d. cathode ray
11. The ..... is a device for continuously forming, pressing, and drying a web of paper fibers.
   a. Paper machine b. Pulp extractor
   c. Lignin formation d. Jach machine

Group B: Short Answer Questions

Attempt all the questions. **[8×5=40]**

1. This question is related to volumetric analysis.
   a. How do you prepare deci-normal solution of hydrated Oxalic acid? Is this solution a primary or secondary standard? Why? [1+1]
   b. 50 cc of a deci-normal solution of HCl solution required 80 cc of a solution of Na_2CO_3 for complete neutralization. Calculate of strength of Na_2CO_3 in terms of: (i) Normality (ii) Molarity (iii) G/L (iv) % by volume. [3]

   OR

   A first-order reaction is 38.5% complete in 480 s.
   a. Calculate the value of the rate constant. [2]
   b. What is the value of the half-life? [1]
   c. How long will it take for the reaction to reach 95% completion? [2]
2. This question is related to thermochemistry.
   a. $A+B \rightarrow C+D$, $\Delta H = -10{,}000\ J\ mol^{-1}$, $\Delta S = -33.3\ mol^{-1}K^{-1}$.
      i. At what temperature the reaction will occur spontaneously from left to right? [2]
      ii. At what temperature, the reaction will reverse? [1]
   b. For a reaction both ΔH and ΔS are positive. Under what condition will the reaction occur spontaneously? [2]
3. A metal 'M' is good conductor of electricity which has mass number 65 and forms white vitriol with sulphuric acid.
   a. Write two important ores of 'M' [1]
   b. How can you obtain Rinman's green from 'M'? Write its one use. [2]
   c. Write a proper reaction which is involved in extraction of 'M'. [2]
4. A secondary haloaknae (X) having molecular mass 78.5 which is obtained by the reaction of PCl_5 with secondary alcohol (Y).
   a. Which one 'X' or 'Y' gives positive iodoform test? Write its one use. [1]
   b. What product would you obtain when 'X' is heated with sodium metal in the presence of dry ether? [2]
   c. How can you convert 'X' into 2-methylpropanoic acid? [2]
5. An aromatic compound (A) which gives common insecticide with 2,2,2-trichloroethanal in the presence of conc. H_2SO_4.
   a. How can you prepare 'A' with diazonium salt? [1]
   b. Reaction of aqueous NaOH on 'A' is more difficult than aliphatic haloalkane. Give reason. [2]
   c. Write a product when 'A' is heated with sodium metal in the presence of dry ether. [2]
6. The compound (P) is amino substituted aromatic compound which is prepared from haloarene with ammonia. Complete the reaction sequence. Identify the compound P, Q, R, S, T

$$P \xrightarrow[\text{cold}]{NaNO_2 + HCl} Q \xrightarrow[\Delta]{H_2O} R \xrightarrow[\Delta]{CHCl_3 / KOH} S \xrightarrow[[O]]{K_2Cr_2O_7 / H^+} T$$

7. Copper forms three common complex ions: $[Cu(H_2O)_6]^{2+}$, $[Cu(NH_3)_4(H_2O)_2]^{2+}$ and $[CuCl_4]^{2-}$
   a. What is the general name given to groups such as water, ammonia or chloride ions which surround the central metal ion? [2]
   b. How are these groups bound to the central metal ion? [2]
   c. What colours are the $[Cu(H_2O)_6]^{2+}$ and $[Cu(NH_3)_4(H_2O)_2]^{2+}$ ions? [1]
8. a. What are the monomer of Teflon and nylon-6,6? [2]
   b. Write the name and structure of antipyretic drug which is used as lowering body temperature. [1]
   c. Write two difference between OPC and PPC cement and which one is best for construction work? [2]

   OR

   List of some compounds are given below. [1+1+1+1+1]

   C_6H_5OH, C_6H_5Cl, C_6H_5CN, C_6H_5COOH, $(C_6H_5CO)_2O$

   From the above list, prepare a sequence of reaction with suitable condition and reagent.

Group C: Long Answer Questions **[3×8=24]**

9. a. Two half-cell reactions of an electrochemical cell are given below:

   $MnO_4^-(aq) + 8H^+(aq) + 5e^- \longrightarrow Mn^{2+}(aq) + 4H_2O(l)$, $E^\circ = +1.51\ V$

$Sn^{2+}(aq) \longrightarrow 4\ Sn^{4+}(aq) + 2e^-,\ E^\circ = +0.15\ V$

i. Construct the redox equation from the two half-cell reactions. [2]

ii. Predict if this reaction favours formation of reactants or product. [1]

b. Can a solution of 1 M $ZnSO_4$ be stored in a vessel made up of copper? If not why?

[$E^0_{Zn^{+2}/Zn} = -0.76\ V$, $E^0_{Cu^{+2}/Cu} = 0.34V$]

c. Enthalpy of formation of compounds are given below:

Benzene	55 kJ
Water	-395 kJ
Carbon dioxide	-285 kJ

Calculate the enthalpy of combustion of benzene. [3]

OR

a. What is pH of 1M CH_3COOH solution? To what volume must one litre of this solution be diluted so that the pH of resulting solution will be twice the original value? Given : $K_a = 1.8 \times 10^{-5}$ [1+4]

b. How much AgBr could dissolve in 1.0 L of 0.4 M NH_3? Assume that $[Ag(NH_3)_2]^+$ is the only complex formed given, $K_f [Ag(NH_3)_2^+] = 1.0 \times 10^8$, Ksp (AgBr) $= 5.0 \times 10^{-13}$ [3]

10. a. An organic compound (A) with molecular formula C_8H_8O forms an orange-red precipitate with 2,4-DNP reagent and gives yellow precipitate on heating with iodine in the presence of sodium hydroxide. It neither reduces Tollens' or Fehlings' reagent nor does it decolourise bromine water or Baeyer's reagent. On drastic oxidation with chromic acid, it gives a carboxylic acid (B) having molecular formula $C_7H_6O_2$. Identify the compounds (A) and (B) and explain the reactions involved. [2.5+2.5]

b. An organic compound 'Z' is known as oil of mirbane which is prepared by the nitration of benzene.

i. What product would you expect when 'Z' is reduced in $LiAlH_4$? [2]

ii. Convert 'Z' into p-hydrazobenzene. [1]

11. a. An organic compound 'A' which has characteristic odour, on treatment with NaOH forms two compounds 'B' and 'C'. Compound 'B' has the molecular formula C_7H_8O which on oxidation with CrO_3 gives back compound 'A'. Compound 'C' is the sodium salt of the acid. 'C' when heated with soda lime yields an aromatic hydrocarbon 'D'. Deduce the structures of 'A', 'B', 'C' and 'D'. [4]

b. Give reasons:

i. Electrophilic substitution in Benzoic acid takes place at meta position. [2]

ii. Carboxylic acids do not give characteristic reactions of carbonyl group. [2]

OR

a. Arrange the following compounds in an increasing order of basic strengths in their aqueous solutions: NH_3, CH_3NH_2, $(CH_3)_2NH$, $(CH_3)_3N$. [1]

b. Give a chemical test to distinguish between ethylamine and aniline. [2]

c. How may methyl bromide be preferentially converted to methyl isocyanide? [2]

d. Complete the following reaction equations: [3]

i. $C_6H_5N_2Cl + H_3PO_2 + H_2O \longrightarrow$

ii. $C_6H_5NH_2 + Br_2\ (aq) \longrightarrow$

4

Group A: Multiple Choice Questions

Tick the correct answer. [11×1=11]

1. 0.1 M acetic acid ionise to an extent of 1.34%. Ionisation constant of acetic acid is
   a. 0.00134 b. 1.182
   c. 1.82×10^{-5} d. 2.8×10^{-6}
2. Half-life of a 1st order and zero order reaction are same. Then the ratio of the initial rates of 1st order reaction to that of the ero order reaction is
   a. $\frac{1}{0.693}$ b. 2×0.693
   c. 0.693 d. $\frac{2}{0.693}$
3. What is the molarity of the solution of barium hydroxide, if 35 mL of 0.1 M HCl is used in the titration of 25 mL of the barium hydroxide solution?
   a. 0.35 b. 0.07
   c. 0.28 d. 0.14
4. The reaction, $3ClO^-(aq) \longrightarrow ClO_3^-(aq) + 2Cl^-(aq)$ is an example of
   a. Oxidation reaction
   b. Reduction reaction
   c. Disproportionation reaction
   d. Decomposition reaction
5. Different ions will split up by different compounds to give
   a. same coloured complex
   b. different coloured complex
   c. same density complex
   d. same temperature complex
6. Which of the following are the correct matching of metals with the most commonly employed ores for their extraction?
   a. Fe: Chalcocite: Al: Bauxite
   b. Fe: Siderite; Al: Clay
   c. Fe: Haematite; Al: corundum
   d. Fe: Haematite; Al: Bauxite
7. In the nitration of benzene using a mixture of conc. H_2SO_4 and conc. HNO_3, the species which initiates the reaction is...
   a. NO_2 b. NO_2^+
   c. NO^+ d. NO_2^-
8. Which of the following compounds gives a secondary alcohol upon reaction with methylmagnesium bromide?
   a. Butyl formate b. 3- pentanone
   c. Pentanal d. Methyl butanoate
9. The specific gravity of cement is.....
   a. 2.5 b. 1.44
   c. 3.15 d. 30
10. ..... is utilized for applying the pulp slurry to a screen.
    a. Draining b. Pressuring
    c. Drying d. Forming
11. In nuclear reactor the control rods are made of
    a. graphite rod b. cadmium rod
    c. Au d. None of these

Group B: Short Answer Questions

Attempt all the questions. **[8×5=40]**

1. 20 cm^3 of a solution containing 7g/dm^3 of a metal hydroxide, XOH, were exactly neutralized with 25 cm^3 of 0.10M hydrochloric acid.
   i. Write a balanced chemical equation for the neutralization of the metal hydroxide, XOH, with hydrochloric acid. [1]
   ii. Calculate the concentration of the metal hydroxide in moles per dm^3. [2]
   iii. Calculate the molar mass of XOH. [1]
   iv. Identify element X. [1]

   OR

   Consider the exothermic reaction between reactants A and B?

   $A + B \longrightarrow E$ (fast)

   $E + B \longrightarrow C + D$ (slow)

   a. What is the order with respect to reactants A and B? [1]
   b. What is the rate law for the reaction? [2]
   c. Sketch a potential energy diagram for this reaction. Identify the activation energy for the overall forward reaction. Identify the location of reactants, intermediate(s), activated complex(es), and products. [2]
2. This question related to thermodynamics.
   a. How is free energy change of a reaction related to enthalpy change and entropy change? [2]
   b. Calculate the enthalpy of formation of ethane at 298K, if the enthalpies of combustion of C, H and C_2H_6 are - 94.14, - 68.47 and - 373.3 K cal. respectively. [3]
3. A metal 'M' can be extracted from haematite ore. Steel is an alloy of metal 'M.
   a. Write the principle involved in the manufacture of steel by Open-Hearth process. [2]
   b. How is metal 'M' rust by exposing in moist air? [2]
   c. What is the function of lime stone in the smelting of metal 'M' [1]
4. a. A haloalkane Ⓟ reacts with aq. KOH to give Q. The compound Ⓠ on oxidation with $K_2Cr_2O_7 + H^+$ gives Ⓡ and Ⓡ undergoes Clemmenson reduction to peoduce Ⓢ. The compound Ⓟ react with sodium in presence of dry ether to form 2, 3–dimethylbutane, write chemical reactions involved and identify P, Q, R and S. [1+1+1+1]
   b. What product would you expect when compound Ⓡ is treated with hydrocyanide? [1]
5. a. Write down the Isomeric alcohols of C_3H_8O and IUPAC name. Explain Victor-Meyer's method to distinguish them. [2+2]
   b. What happens when the product obtained by dehydrogenation of ethanol is allowed to react with Tollen's reagent? [1]
6. a. An aromatic compound 'P' on treatment with aqueous ammonia and heating forms compound 'Q' which on heating with Br_2 and KOH forms a compound 'R' of molecular formula C_6H_7N. Write the structures and IUPAC names of compounds A, B and C. [3]
   b. How can you prepare p-hydroxazobenzene from compound 'R'? [2]
7. a. Write the name of one drug which relief pain and also draw structure. [2]
   b. How can you distinguish addition and condensation polymer? [1]
   c. What is the function of CaO in the manufacture of cement? [2]
8. a. A monohydroxyl substituted benzene (A) is prepared from hydrolysis of diazonium salt. Compound (A) is heated with zinc dust gives (B). The compound (B) on Friedel-Craft alkylation with methyl chloride to give (C) which on oxidation with CeO_2 yield compound (D). Write the reaction involved and IUPAC name of A,B,C,D. [3]
   b. Convert compound A into m-nitrobenzoic acid. [2]

   OR

   Transition metals and their compounds are frequently used as catalysts.
   a. Name the catalyst in the Haber process for the manufacture of ammonia. [1]
   b. Name the catalyst used in the hydrogenation of carbon-carbon double bonds. [1]
   c. Name the catalyst in the Contact Process for the manufacture of sulphuric acid. [1]
   d. Draw the structure of: $[Cu(H_2O)_6]^{2+}$ and $[CuCl_4]^{2-}$ and write the shape of ion. [2]

Group C: Long Answer Questions **[3×8=24]**

9. a. Consider the reaction,

   $2Ag^+ + Cd \longrightarrow 2Ag + Cd^{2+}$

   The standard electrode potentials for $Ag^+ \longrightarrow Ag$ and $Cd^{2+} \longrightarrow Cd$ couples are 0.80 V and -0.40 V, respectively.
   i. What is the standard potential E^o for this reaction? [2]
   ii. For the electrochemical cell in which this reaction takes place which electrode is negative electrode? [2]
   b. How is single electrode potential originated? [1]
   c. Heat of combustion of compound are given as: [3]

CH_4	-210 Kcal
C	-94 Kcal
H_2	-68 Kcal

   Calculate the heat of formation of CH_4.

   OR

   a. Equal volumes of 0.02 M $AgNO_3$ and 0.02 M HCN were mixed. Calculate $[Ag^+]$ at equilibrium given, $K_{sp}(AgCN) = 2.2 \times 10^{-16}$ $K_a(HCN) = 6.2 \times 10^{-10}$. [4]
   b. A solution contains a mixture of Ag^+ (0.1M) and Hg_2^{2+} (0.1M) which are to be separated by selective precipitation. Calculate the maximum concentration of iodide ion at which one of them gets precipitated almost completely. What percentage of that metal ion is precipitated?

   $K_{sp}(AgI) = 8.5 \times 10^{-17}$, $K_{sp}(Hg_2I_2) = 2.5 \times 10^{-26}$. [4]
10. a. Arrange the compound in the complete reaction sequence with suitable reagent. [4]

    Aniline, benzenediazonium chloride, Benzonitrile, Benzamide, Benzoic acid

    b. Write the name of aldehyde with gives Tolles's test and shows aldol condensation reaction. [2]
    c. How is 2-hydroxypropanoic acid obtained from ethanal? [2]
11. a. An organic compound (A) which has characteristic odour, on treatment with NaOH forms two compounds

(B) and (C). Compound (B) has the molecular formula C_7H_8O which on oxidation with CrO_3 gives back compound (A). Compound (C) is the sodium salt of the acid. Compound (C) when heated with soda lime yields an aromatic hydrocarbon (D). Deduce the structures of (A), (B), (C) and (D). Write chemical equations for all reactions taking place. [4]

b. Why $-NH_2$ group of aniline is protected before nitration? [2]

c. Write a product which is obtained by the reduction of acetic anhydride. [2]

OR

a. Write the structures A, B and C in the following: [4]

$$C_6H_5\text{-}CONH_2 \xrightarrow[\Delta]{Br_2 / KOH} A \xrightarrow[0-5\,^\circ C]{NaNO_2 / HCl} B \xrightarrow{KI} C$$

b. What happens when compound C is heated with sodium metal in the presence of dry ether? [2]

c. What product would you get when compound A and B are heated? [2]

5

Group A: Multiple Choice Questions

Tick the correct answer. **[11×1=11]**

1. K_{sp} for AgCl (mol. Wt. 143.5) is 17×10^{-11} at 298K. The molar solubility of AgCl at 298 K is
   a. 18.7×10^{-5} b. 2.3×10^{-3}
   c. 9.90×10^{-3} d. 1.3×10^{-5}
2. The rate of reaction between two specific time intervals is called
   a. instantaneous rate b. average rate
   c. specific rate d. ordinary rate
3. Find the concentration of HCl, if 10 mL of 0.5 M $Ca(OH)_2$ is required to titrate 50 mL of HCl.
   a. 5M b. 1/10M
   c. 10M d. 1/5M
4. The emf of the cell:
   Ni / Ni^{2+} (1.0 M) // Au^{3+} (1.0 M) / Au (E° = -0.25 V for Ni^{2+}/Ni; E° = 1.5 V for Au^{3+}/Au) is
   a. 1.25V b. -1.25V
   c. 1.75V d. 2.0V
5. Ions which are produced from the ligand are
   a. cation b. anion
   c. complex ion d. none of above
6. An alloy which does not contain copper is
   a. Bronze b. Magnalium
   c. Brass d. Bell metal
7. $CHCl_3$ reacts with conc. HNO_3 to give
   a. CCl_3NO_2 b. CH_3NO_2
   c. CH_3CN d. $CH_3CH_2NO_2$
8. Which of the following reagents, when treated with phenylmagnesiuim bromide followed by acid workup, will yield 2-phenylethanol?
   a. Ethanol b. Diethylether
   c. Ethanal d. Oxirane
9. Which element is the end product of natural radioactive series?
   a. Pb b. Sn
   c. C d. Bi
10. ..... is for further de-watering by squeezing water from the sheet.
    a. Draining b. Drying
    c. Pressuring d. Forming
11. The initial setting time of cement is not less than.....
    a. 30 sec b. 300 sec
    c. 30 min d. 300 min

Group B: Short Answer Questions

Attempt all the questions. **[8×5=40]**

1. a. What is the importance of calculating normality factors of solution during titration? [2]
   b. 5.1g of impure sodium carbonate solution was dissolved in water to make 500 cm^3 of solution. 20 cm^3 of this solution was titrated against 20.45 cm^3 of 0.04M hydrochloric acid. Calculate the percentage purity of the sodium carbonate solid. [3]

   OR

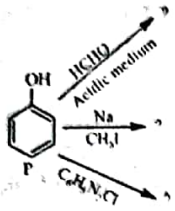
   Consider the reaction: $SO_2 + O_3 \longrightarrow SO_3 + O_2$. A rate study of this reaction was conducted at 298 K. The data that were obtained are shown in the table.

$[SO_2]$ mol/L	$[O_3]$ mol/L	Initial Rate mol/(L,s)
0.25	0.40	0.118
0.25	0.20	0.118
0.75	0.20	1.062

   a. What is the order with respect to: SO_2 and O_3 ? [2]
   b. Write rate law equation. [1]
   c. Determine the value and units of the rate constant, k. [2]
2. a. How would you predict whether a reaction is spontaneous, non-spontaneous and equilibrium in term of free energy change? [2]
   b. Heat of formation of ethyl alcohol, water and carbon dioxide are -64.1 Kcal, -68.5 Kcal and -95 Kcal. Calculate the heat of combustion of ethyl alcohol. [3]
3. A metal 'M' is known as quick silver and it is used in thermometer.
   a. Write a reaction which is involved in the extraction of metal 'M'. [2]
   b. The one of the compound of metal 'M' having valency two, write the name of this compound which is used as electrode. [1]
   c. What happens when the above compound of metal 'M' is heated with KI solution? [2]
4. a. Write one example of each bidentate and polydentate ligang. [2]
   b. Draw the structure of square planar and tetrahedral metal complex ion. [1]
   c. What are the main factor that affect d-orbital splitting in energy? [2]
5. An haloakane having molecular formula C_3H_7Br.
   a. What happens when the secondary structure of above haloalkane is heated with sodium metal in the presence of dry ether? [1]
   b. Convert primary structure to secondary structure of above haloalkane. [2]
   c. How can you prepare butanoic acid from the primary structure of above haloalkane? [2]
6. a. Why is it difficult to undergo nucleophilic substitution in haloarene? [2]

b. What product would you expect when diazonium salt is heated with copper powder in the presence of HCl? [2]
c. Write the name of reaction in which chlorobenzene is converted into toluene. [1]

7. a. Draw the structural formula of the organic product of the following reactions. [3]



b. Convert compound P into benzaldehyde. [2]

8. a. Name the monomer of Nylon-6,6 and what type of polymer is Nylon-6,6? [2]
b. Write one example of each natural and synthetic dyes. [1]
c. What are main challenge to establish the cement factory in Nepal? How many grades of cement are available in Nepal? [2]

OR

An organic compound having molecular formula C_3H_9N.

a. Write primary and secondary structure of above formula. [1]
b. How can you separate primary structure from secondary structure by Hoffmann's method? [2]
c. How can you test these two class of compound? [2]

Group C: Long Answer Questions **[3×8=24]**

9. a. Why is Ostwald's dilution law not applicable to strong electrolyte? [1]
b. Is an aqueous solution containing hydroxyl ion concentration 3.33×10^{-10} mol/L acidic, basic or neutral? [2]
c. What is the pH of the buffer composed of 0.1M solution of HCN in 0.1M KCN? The dissociation constant of HCN is 0.01. [2]
d. The solubility product of Ag_2CrO_4 at 25°C is 1.29×10^{-11} mol lit^{-3}. A solution of $K_2C_2O_4$ containing 0.1520 mole in 500 mL water is shaken with excess of Ag_2CO_3 till the following equilibrium is reached:
$Ag_2CO_3 + K_2C_2O_4 \rightleftharpoons Ag_2C_2O_4 + K_2CO_3$
At equilibrium the solution contains 0.0358 mole of K_2CO_3. Assuming the degree of dissociation of $K_2C_2O_2$ and K_2CO_3 to be equal, calculate the solubility product of Ag_2CO_3. [3]

OR

a. The standard electrode potential for the following electrodes are
$Mg^{2+} + 2e^- \longrightarrow Mg$, $E^o = -2.37$ V
$Fe^{3+} + e^- \longrightarrow Fe^{2+}$, $E^o = 0.77$ V
i. Represent a galvanic cell and point out which one is anode? [1]
ii. With 1M solution of ions what will be EMF? [2]
iii. Will the reaction $Mg^{2+} + 2Fe^{2+} \longrightarrow Mg + 2Fe^{3+}$ occur? Give reason. [2]
b. Calculate the bond energy of HCl. The bond energy of H_2 and Cl_2 are 430 kJ/mol and 242 kJ/mol respectively and standard enthalpy of formation of HCl is -91kJ/mol. [3]

10. a. How will you carry out the following conversions? [2×2]
i. Acetylene to Acetic acid
ii. Toluene to m-nitrobenzoic acid
b. An organic compound A(C_3H_6O) is resistant to oxidation but forms compound B (C_3H_8O) on reduction which reacts with HBr to form the bromide (C). C forms a Grignard reagent which reacts with A to give D ($C_6H_{14}O$). Give the structures of A, B, C and D and explain the reactions involved. [4]

11. a. An organic compound A(C_4H_8O) forms phenylhydrazone with phenylhyrazine and reduce Fehling's solution. It has negative iodoform test. Identify the organic compound A. [3]
b. Give reasons: [1.5+1.5]
i. Boiling point of ethanol is higher than ethanal having same molecular weight.
ii. pH of reaction should be carefully controlled while preparing ammonia derivatives of carbonyl compounds.
c. How do you obtain benzaldehyde from phenol? [2]

OR

a. The list of organic compounds are given as: [5]
$C_3H_6O_2$, C_3H_5OCl, C_3H_7ON, C_2HH_7N, C_2H_6O
Write the sequence of reaction with proper reagent used.
b. Give one application of each: DNP test and Tollen's test with proper example. [1.5+1.5]

6

Group A: Multiple Choice Questions

Tick the correct answer. **[11×1=11]**

1. Solubility of calcium carbonate is 0.0305 g/L. K_{sp} for $CaCO_3$ is
a. 0.000305 b. 193×10^{-8}
c. 9.3×10^{-8} d. 93.05×10^{-5}

2. For the reaction $2N_2O_5 \longrightarrow 4NO_2 + O_2$. The rate of reaction is
a. $\frac{1}{2}\frac{d}{dt}[N_2O_5]$ b. $2\frac{d}{dt}[N_2O_5]$
c. $\frac{1}{4}\frac{d}{dt}[NO_2]$ d. $4\frac{d}{dt}[NO_2]$

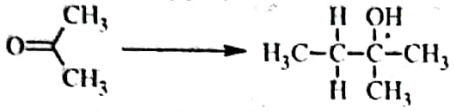
3. What is the concentration of the sulphuric acid solution, if 100 mL of the solution is neutralised by 50 mL of 0.5 M $Ba(OH)_2$ solution?
a. 0.25 M b. 50 M
c. 0.5 M d. 100 M

4. If $E°_{Fe^{2+}/Fe} = -0.441$ V and $E°_{Fe^{3+}/Fe^{2+}} = 0.771$ V, the standard EMF of the reaction, $Fe + 2Fe^{3+} \longrightarrow 3Fe^{2+}$ will be
a. 1.212V b. 0.111V
c. 0.330V d. 1.653V

5. Transition elements exhibit variable valency because they release electrons from
a. ns orbitals b. np orbitals
c. (n-1)d orbitals d. (n-1)d & ns orbitals

6. For which of the following ores froth floatation method is used for concentration?
a. Haematite b. Zinc blende
c. Magnetite d. Camallite

7. Reduction of aromatic nitro compounds using Fe and HCl gives....
   a. Aromatic oxime b. Aromatic hydrocarbon
   c. Aromatic primary amine d. Aromatic amide
8. Which of the following reaction sequence that will best carry out the following preparation?



   a. i. I + MeONa + CH_3H_2Br
      ii. neutralize
   b. i. I + EtONa
      ii. CH_3CH_2Br
      iii. neutralize
   c. i. CH_3CH_2Br + Mg, Et_2O
      ii. Add I
      iii. neutralize
   d. i. I + CH_3CH_2OH + Mg
      ii. neutralize
9. In radioactive decay, electron is emitted from
   a. nucleus of atom
   b. inner orbit or atom
   c. outermost orbit of atom
   d. orbit with principal quantum number
10. ..... pulp slurries at 3 percent consistency don't even flow well. Therefore, the entire purpose of the paper machine is to remove all of this water that one is forced to use to give paper that's uniform.
    a. Softwood b. Groundwood
    c. Hardwood d. Beetewood
11. What is released during the production of clinker?
    a. $CaCO_3$ b. CO_2
    c. $Ca(OH)_2$ d. CO

Group B: Short Answer Questions

Attempt all the questions. **[8×5=40]**

1. a. 3.15 g of an acid HX was dissolved in water and its solution made to 250 cc. If 30.2 cc of this acid solution neutralized 25 cc of 0.115 M KOH, calculate.
      i. Molarity of HX. [1]
      ii. Molecular weight of HX. [1]
      iii. Name of radical X [1]
   b. What volume of water must be added to 70 mL of 0.5N acid solution in order to make it exactly decinormal? [2]

   OR

   a. Determine the rate law for the reaction 2A + B ⟶ product from the following data
      i. On the doubling initial concentration of both A and B, the reaction rate becomes 32 times. [2]
      ii. On doubling the concentration of B keeping that of A fixed, the reaction rate becomes 4 times. [2]
   b. What is meant by instantaneous rate of reaction? [1]
2. a. The latent heat of fusion of ice is 336 Jg^{-1}. Calculate the molar entropy of fusion of ice at its normal melting point. [2]
   b. The standard enthalpy of formation of:

H_2O	-286 kJ
CO_2	-393.5 kJ
C_6H_6	+49.02 kJ

   Calculate the standard enthalpy of combustion of C_6H_6. [3]
3. a. Zn^{+2} salts are white while Cu^{+2} salts are coloured, Why? [2]
   b. Why do transition elements show variable oxidation states? In 3d series (Sc to Zn), which element shows the maximum number of oxidation states and why? [2]
   c. How would you account for transition metals and their compounds show catalytic properties? [1]
4. a. Out of C and CO, which is a better reducing agent at the lower temperature range in the blast furnace to extract iron from the oxide ore? [1]
   b. What are the collectors used in froth floatation process? Name a substance that can be used as such. [1]
   c. What is the role of NaCN in the extraction of silver from a silver ore? [2]
   d. Why is copper matte put in silica lined converter? [1]
5. The list of organic compound are given as:

   C_2H_5Br, C_3H_5N, $C_3H_6O_2$, C_3H_7ON, C_2H_7N

   Write the compound in the proper reaction sequence.
6. An organic compound 'A' having molecular formula C_6H_5Cl. It is prepared by the chlorination of aromatic hydrocarbon.
   a. How can you prepare azo dye form 'A'? [2]
   b. An insecticide is prepared from 'A'. Write the name and structure. [2]
   c. Is 'A' give product by Wurtz Fittig reaction? [1]
7. a. What type of polymer is Teflon? Write its two uses. [2]
   b. Is picric acid dye or pesticides or polymer? What is the type? [1]
   c. What is fineness of cement and how can you test? [2]
8. An organic compound 'Z' having molecular formula C_6H_6O and having molecular mass 94. It is also knows as carbolic acid.
   a. How can you prepare an indicator which is used in acid base titration from 'Z'? [2]
   b. Is aromatic hydrocarbon prepared from 'Z'? [1]
   c. An azo dye is prepared from 'Z'. Write a suitable reaction and use. [2]

   OR

   An organic compound 'X' having molecular formula C_3H_7N and molecular mass 57. It is the derivatives of ammonia.
   a. Write the possible isomers of 'X' [1]
   b. How can you convert one isomer to another? [2]
   c. How can you test these to isomer? [2]

Group C: Long Answer Questions **[3×8=24]**

9. a. Which of the following are Lewis Acids? H_2O, BF_3, H^+ and NH_4^+ [1]
   b. The ionization constant of HF, HCOOH and HCN at 298 K are is 6.8×10^{-4}, 1.8×10^{-4} and 4.8×10^{-9} respectively, Calculate the ionization constant of the corresponding conjugate base. [3]
   c. The first ionization constant of H_2S is 9.1×10^{-8}. Calculate the concentration of HS^- ions in its 0.1 M solution and how will this concentration be affected if the solution is 0.1 M in HCl also? If the second dissociation constant of H_2S is 1.2×10^{-13}, calculate the concentration of S^{2-} under both conditions. [4]

   OR

   a. Ethanol boils at 78.4°C. The enthalpy of vaporization of ethanol is 42.4 kJ/mol. Calculate the entropy of vaporization of ethanol. [2]

b. State Hess law of constant heat summation and write its one limitation. [1]

c. Can a solution of 1 M $CuSO_4$ be stored in a vessel made up of nickel? If not why? [2]

[$E^0_{Ni^{++}/Ni} = -0.25$ V, $E^0_{Cu^{++}/Cu} = +0.34$V]

10. a. An alkene (A) undergoes ozonolysis to give two carbonyl compounds (B) and (C). The compound (B) on reduction with Zn–Hg/H^+ gives propane. The compound (C) reacts with HCN and followed by hydrolysis to produce 2-hydroxy propanic acid as the major product. Write chemical reactions involved and give the IUPAC name of A, B and C. [4]

b. How can you prepare compound 'A' from alcohol? [2]

c. Does compound 'B' give Fehling solution test? If yes, write a reaction and why? [2]

11. a. An organic compound (A) (molecular formula $C_8H_{16}O_2$) was hydrolysed with dilute sulphuric acid to give a carboxylic acid (B) and alcohol (C). Oxidation of (C) with chromic acid produced (B). (C) on dehydration gives but-1-ene. Write the equation for the reaction involved in it. [4]

b. What product would you expect when compound 'C' is heated with ammonia? [2]

c. Write the name of common test of compound 'B' and 'C'. Can both 'B' and 'C' react with sodium carbonate solution? [2]

OR

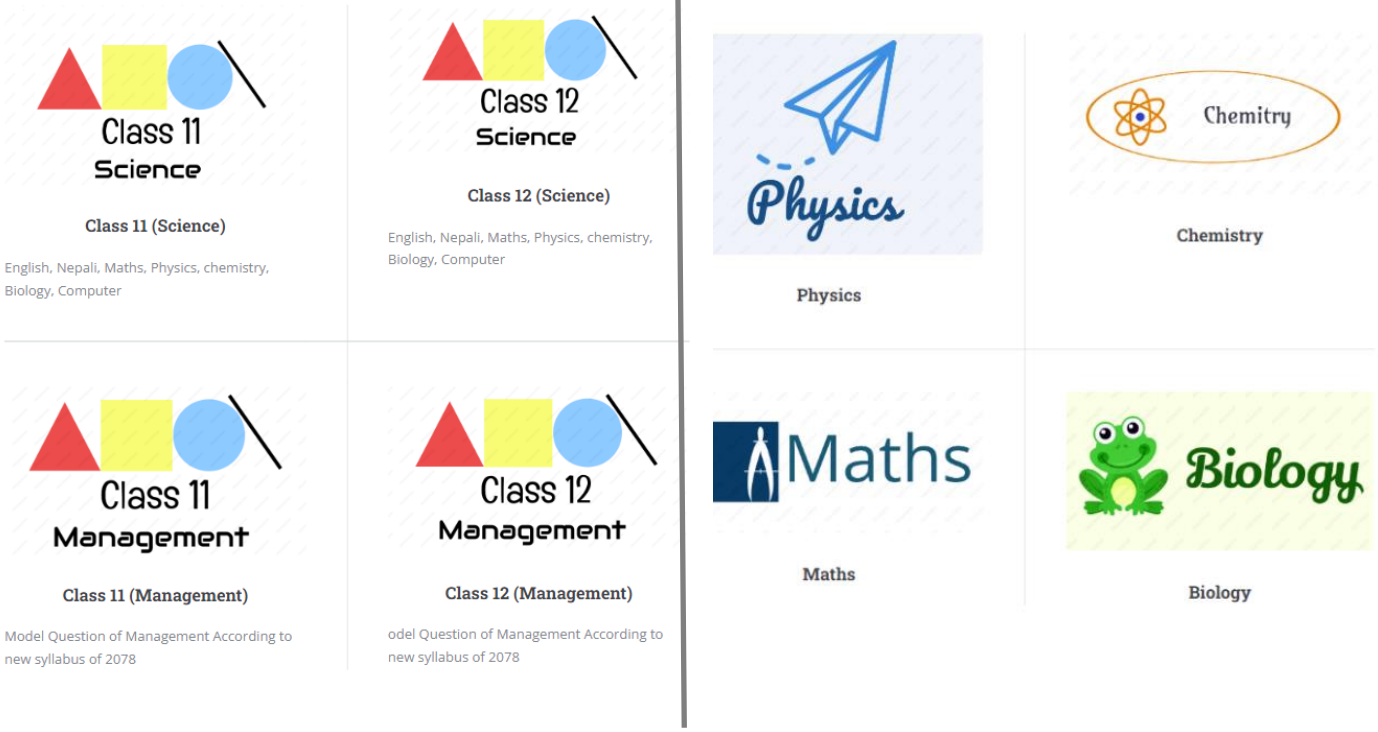
a. An aromatic compound 'A' on treatment with aqueous ammonia and heating forms compound 'B' which on heating with Br_2 and KOH forms a compound 'C' of molecular formula C_6H_7N. Write the structures and IUPAC names of compounds A, B and C. [4]

b. Compare the basicity of compound 'C' with ethanamine and ammonia. [2]

c. How can you prepare benzoin product from compound 'A'? Write a reaction with suitable reagent used. [2]

BIPO's notes

Class 12 complete notes and paper collection and solutions.



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