

Instructions:

- The question paper has four parts A, B, C and D. All the parts are compulsory.
- Write balanced chemical equations and labelled diagram wherever necessary.
- Use log table and simple calculators if necessary (use of scientific calculators is not allowed)

PART - A

10×1=10

I Answer all the questions in one word or in one sentence each.

- Express 0.00035 in scientific notation.
- State Boyle's law.
- Give an example of heterogeneous equilibrium.
- Write the IUPAC name of the element with atomic number 104.
- What is the oxidation number of Mn in MnO_4^- ?
- Which alkali metal is the strongest reducing agent?
- What is the composition of producer gas?
- Name the allotropic form of carbon whose structure resembles soccer ball.
- Write the bond line structure of $\text{HC} \equiv \text{C} - \text{CH} = \text{CH}_2$.
- Complete the following equation $3\text{CH} \equiv \text{CH} \xrightarrow[\text{Iron tube, 873K}]{\text{red hot}} \text{-----}$

PART - B

5×2=10

II Answer any FIVE of the following questions. (Each question carries two marks)

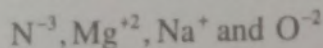
- Mention any two postulates of Dalton's atomic theory.
- Give the expression for
 - Van der Waal's equation for 'n' moles of a gas.
 - Compressibility factor (z)
- Write the lewis dot structure for (i) CO_2 (ii) CH_4
- Give any two anomalous behaviour of Beryllium.
- How do you prepare diborane in the laboratory?
- State Markovnikov's rule.
- Write the Newman's projections of ethane.
- How is "Ozone layer" formed in the stratosphere? Name a chief chemical that causes its depletion.

PART - C

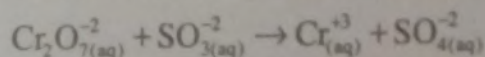
5×3=15

III Answer any FIVE of the following questions. (Each question carries three marks)

- What are Iso-electronic species? Arrange the following in the increasing order of their ionic radius:



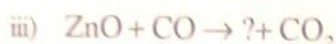
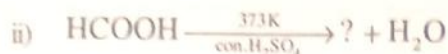
- Explain the structure of methane molecule on the basis of hybridisation
- Define hydrogen bond. Give an example for the molecule having
 - intermolecular hydrogen bond
 - intramolecular hydrogen bond
- Write any three postulates of Molecular orbital theory.
- Balance the following redox reaction by using Oxidation number method



(in acidic medium)

- What are ionic hydrides? Give one example.
 - Write any one use of heavy water.
- Explain the manufacture of sodium carbonate by Solvay's process.

26) Complete the following equations.



PART - D

IV Answer any FIVE questions. (Each question carries five marks)

5×5=25

- 27a) A sample of a compound contains 4.07% hydrogen, 24.27% carbon and 71.66% chlorine. Its molecular mass is 98.96g. What are its empirical and molecular formulae? (Given atomic masses of H=1, C=12 and Cl = 35.45) 4
 b) Define molarity of a solution. 1
 28a) Write any three postulates of Rutherford's nuclear model of an atom. 3
 b) Calculate the energy of one mole of photon of radiation whose frequency is 5×10^{14} Hz. (Given $h = 6.626 \times 10^{-34}$ JS) 2
 29a) State i) Pauli's exclusion principle (ii) Hund's rule (iii) Heisenberg's Uncertainty principle 3
 b) Describe the orbital with following quantum numbers using s, p, d or f notations 2
 i) when $n = 2, l = 0$
 ii) when $n = 4, l = 2$
 30a) Write any four postulates of kinetic theory of gases 4
 b) Define critical temperature 1
 31a) Calculate the standard enthalpy of formation of liquid benzene (C_6H_6). Given the enthalpies of combustion of Carbon_(s), Hydrogen_(g) and Benzene_(l) are -393.5 kJ, -285.83 kJ and -3267.0 respectively. 4
 b) What is an Intensive property? 1
 32a) What is a spontaneous process? Write the criteria for spontaneity of a process in terms of ΔG 2
 b) Find out the value of equilibrium constant for the following reaction at 298K. 3

$$2\text{NH}_{3(g)} + \text{CO}_{2(g)} \rightleftharpoons \text{NH}_2\text{CONH}_{2(aq)} + \text{H}_2\text{O}_{(l)}$$

 Standard Gibbs energy change ΔG° at the given temperature is $-13.6 \text{ kJ mol}^{-1}$ (Given $R = 8.314 \text{ JK}^{-1} \text{ mol}^{-1}$)
 33a) What is chemical equilibrium? Write Kp and Kc for the reaction. 3

$$\text{N}_{2(g)} + 3\text{H}_{2(g)} \rightleftharpoons 2\text{NH}_{3(g)}$$

 b) Explain Lewis acid-base concept with an example 2
 34a) What is meant by a buffer solution? Write an example.
 b) State LeChatelier's principle.
 c) Mention the conjugate base of H_2SO_4 2+2+1

V Answer any TWO questions (Each question carries five marks)

2×5=10

- 35a) Mention the IUPAC name of the following compound

$$\begin{array}{c} \text{CH}_2 - \text{CH}_2 - \text{CH}_2 - \text{C} - \text{CH}_3 \\ | \quad \quad \quad || \\ \text{OH} \quad \quad \quad \text{O} \end{array}$$

 b) What is position isomerism? Give an example.
 c) Write the chemical equations when sodium fusion extract is prepared from an organic compound containing nitrogen and sulphur. 1+2+2
 36a) Give any two differences between inductive effect and electromeric effect.
 b) Write the principle and formula involved in the estimation of halogen by Carius method 2+3
 37a) How is ethene prepared from bromoethane?
 b) Explain the mechanism of nitration of benzene. 2+3