

CHEMISTRY Code-04

Time: 3 Hours

Maximum Marks: 150

Note: Attempt FIVE question in all. All questions carry equal marks. Question No. 1 is compulsory. Answer two questions from part –I and two questions from part part –II. The parts of same question must be answered together and must not be interposed between answers to other questions.

1. Write notes on any FIVE of the following: (5 × 6 =30)
- Lanthanide Contraction
 - Radius ratio rule
 - Conducting Polymers
 - Solvent effect in reaction mechanism of organic compounds
 - Jahn Teller Effect
 - Fluorescence and phosphorescence
 - IR Spectroscopy

PART-I

2. a) (5 + 5 =10)
- Write down the Schrodinger wave equation for wave mechanical model of an atom. Name the three quantum numbers of an electron which are yielded by the equation. Explain significance of each quantum number.
 - Discuss the departure of real gases from ideal behaviour
 - When Pressure is not too high.
 - When pressure is too high.
- b) Explain the reasons: (4 × 2.5 = 10)
- SO₂ has dipole moment while CO₂ does not.
 - NF₃ has zero dipole moment but NH₃ has high value of dipole moment.
 - LiCl has higher boiling point than HCl why?
 - AgF, AgCl and AgBr have similar structure. Explain their hardness.
- c) Explain the following: (5+5 = 10)
- Schottky & Frenkel defects.
 - Band Theory
3. a) (5+5=10)
- Explain what do you understand by heat capacities C_p and C_v. Derive the relation between them.
 - Explain Hess's Law

- b) Derive Clausius-Clapeyron equation in its integrated form and discuss its importance in phase equilibria giving at least two examples. (10)
- c) Discuss briefly with example main applications of electrochemical series. (10)
4. a) (5+5 = 10)
- What is Beer Lambert's law. Explain various term involved in it.
 - Explain the term Quantum yield
- b) (5+5 = 10)
- Write the formula of the following:
 - Dibromodiaquodiammine cobalt (III) chloride
 - Tetrahydroxodiaquoaluminate (III) ion
 - Illustrate with an example each of the following, with respect to coordination compounds:
 - Linkage isomerism
 - Geometrical isomerism
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- c) Give a brief comparison between Collision theory and transition state theory. (10)

PART-II

5. a) Describe preparation and properties of Styrene and Nylon. (10)
- b) Give the mechanisms of Reimer Tiemann and Reformatsky reactions. (10)
- c) Explain in respect of NMR spectroscopy: (5 + 5 = 10)
- Chemical shift.
 - Shielding and deshielding of protons.
6. a) Define spectroscopy and explain its basic principle. Differentiate the energy levels for electronic, vibrational and rotational energy changes. (10)
- b) Define the terms reduced viscosity and intrinsic viscosity. Explain how you can determine the molecular mass of the polymer from viscosity measurements. (10)
- c) Give the mechanisms of Pinacol-pinacolone and Beckmann rearrangements. (10)

7.

a) How is vulcanization of rubber done? Explain clearly its effect on the property of rubber. (10)

b) (5+5=10)

- How do bulky groups effect S_N^1 reactions?
- Comment on the stability of carbocations.

c) Write short note on: (5+5=10)

- Hyperconjugation
- Resonance