QP CLA2 Chemistry

Chemistry (SRM Institute of Science and Technology)

Part-A (5x4=20Marks)

Answer ANY FIVE Questions

1. Give the significance of selection rule in spectroscopy?
2. Write a note on different regions in Electromagnetic spectrum.
3. Calculate magnetic moment for high spin d^5 and d^8 complexes in octahedral geometry.
4. What are Microwave active and inactive molecules? Give examples.
5. Account on the principle of X-ray photo electron spectroscopy.
6. Briefly account on the scales used to express chemical shift in NMR spectroscopy?

Part-B (2x15=30Marks)

Answer ALL the Questions

7. a. Discuss on the crystal field splitting of d-orbitals in a tetrahedral ligand field with a neat sketch. [10 marks]

   b. Determine the Miller indices for intercepts at

   i. $x = -1$; $y = \infty$; $z = 1$ and ii. $x = 1/2$; $y = 1$; $z = 2$. [5 Marks]

8. a. Discuss in detail the rotational spectra for a rigid diatomic molecule. [9marks]

   b. Explain Vander waals force of interactions with examples. [6 marks]

Answer ANY FIVE Questions

1. Calculate CFSE for high spin tetrahedral complex having d^6 configuration.
2. Give the selection rule for rotational transitions in rigid diatomic molecule.
3. Define i. Critical pressure and ii. Critical volume
4. The Miller index for a plane in a cubic cell is (121). Sketch the plane and give the intercepts at x, y and z co-ordinates.
5. What is Larmor frequency? Name two standards used in NMR spectroscopy.
6. Ion-ion interaction is stronger than dipole –dipole interactions. Give reasons.

Part-B (2x15=30Marks)

Answer ALL the Questions

7. a. Discuss on instrumentation of XPS with a neat sketch. [10 marks]

   b. What is effective nuclear charge (Z_{eff})? Calculate Z_{eff} and Slater's shielding constant for 3d electron in Zinc (Z= 30). [5marks]

8. a. Explain shielding and de-shielding effect in NMR spectroscopy with an example. [9 Marks]

   b. Write notes on i. Laporte selection rule and ii. Spin selection rule in electronic spectroscopy [6 Marks]