

Code No. 9220

FACULTY OF SCIENCE
M.Sc. II – Semester Examination, April / May 2014

Subject: Chemistry
Paper – I: Inorganic Chemistry

Time : 3 Hours

Max.Marks: 80

Note : Answer all questions from Part - A and Part - B. Each question carries 4 marks in Part - A and 12 marks in Part - B.

PART – A (4 x 8 = 32 Marks)
[Short Answer Type]

- 1 (a) Explain symmetry operations in D_{2d} point group with an example.
 (b) Discuss symmetry restrictions of dipole moments.
- 2 (a) Explain about Racah parameters.
 (b) Define clearly ground state terms and microstates. Explain the various terms present in p^2 configuration.
- 3 (a) What is metal carbonyl scrambling? Explain.
 (b) Explain polyhedral skeletal electron pair theory in metal clusters.
- 4 (a) Explain the basic rules in selection of elements in biological processes.
 (b) Explain the plot of metal ion concentration versus physiological effect.

PART – B (4 x 12 = 48 Marks)
[Essay Answer Type]

- 5 (a) Discuss symmetry criteria of optical activity with suitable examples.
 (b) Identify the symmetry elements present in the following molecules and assign them into point groups:
 i) Phenol ii) Carbon dioxide iii) Boron trihalide iv) Chloroform
 $\text{C}_6\text{H}_5\text{OH}$ CO_2 OR BX_3 CHCl_3
 (c) Explain improper rotational axis of symmetry by taking ethane both eclipsed and staggered configurations.
 (d) Assign the point groups based on the symmetry elements present in the following molecules:
 i) Boric acid ii) Ammonia iii) Pyridine iv) Ethene
- 6 (a) Derive the ground state terms for d^3 and d^5 configurations.
 (b) Explain the electronic spectra of octahedral nickel complex with the help of Orgel diagram.
 OR
 (c) List the terms for d^2 configuration and explain the Hund's rules with regard to ordering of energy levels.
 (d) Write a note on hole formalism.
- 7 (a) Write a note on the factors favouring metal - metal bonding.
 (b) Write the structural features of low nuclearity metal carbonyl clusters.
 OR
 (c) Write a note on capping rule with suitable examples.
 (d) Explain the fluxional behaviour in metal carbonyl clusters.
- 8 (a) What is photosynthesis and explain the structural significance of chlorophyll?
 (b) Write a note on vitamin B_6 .
 OR
 (c) Explain the role of myoglobin in respiration process.
 (d) Give a detailed note on hemoglobin and hemocyanine.
