FACULTY OF SCIENCE
M.Sc. II Semester Examination, April/May 2013
CHEMISTRY
Paper - I: Inorganic Chemistry

Time: 3 Hours

Note: Answer all questions.

SECTION - A

1. a) Explain the terms symmetry element and symmetry operation.
   b) Explain symmetry criteria of optical activity with suitable examples.

2. a) Write a note on L-S coupling.
   b) Derive the ground state terms for d³, d⁵ and d⁶ configurations.

3. a) Discuss the structural features of dinuclear metal-metal systems.
   b) Explain Wade's rules in polynuclear metal clusters.

4. a) Explain the structural features of myoglobin after oxygenation.
   b) Write the structure of chlorophyll.

SECTION - B

5. a) Explain descent in symmetry of molecules with substitution.
   b) Assign the point groups by mentioning the symmetry elements present in the following molecules:
      i) HCN
      ii) [PtCl₄]²⁻
      iii) C₆H₅ - Cl
      iv) H₂O₂

OR

(This paper contains 2 pages)
c) Explain the plane of symmetry and classify into different types with suitable examples.

d) Discuss the mathematical requirements for a point group.

6. a) Discuss the effect of weak fields on D and F terms.

b) Explain the Orgel diagrams for d^1, d^9 – Oh geometry and d^4, d^6 – Td geometry.

OR

c) Write a note on inter-electronic repulsion parameters.

d) What are the selection rules for electronic transitions? Mention the electronic transitions in [Ni(H₂O)₆]²⁺ based on Orgel diagram.

7. a) Discuss the structural patterns in M₄(CO)₁₂ and M₃(CO)₁₂.

b) Explain the fluxional behaviour in organometallics.

OR

c) Discuss total electron count theory in osmium carbonyl clusters.

d) Explain the factors favouring metal-metal bonding.

8. a) Explain the oxygen isotherms of hemoglobin and myoglobin.

b) What is photosynthesis and explain photosystem I and II.

OR

c) Mention the importance of metal ions in biological systems.

d) Discuss the geometric, electronic and magnetic properties of myoglobin before and after oxygen binding.