

1127
M.Sc. (Applied Chemistry/Pharmaceutical)
1st Semester
Paper-102: Inorganic Chemistry

Time allowed: 3 Hours

Max. Marks: 60

NOTE: Attempt five questions in all, including Question No. IX (Unit-V) which is compulsory and selecting one question each from Unit I-IV.

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UNIT - I

- I. (a) Draw molecular orbital energy level diagram of NO molecule. Calculate bond order and also tell magnetic behavior.
(b) Write a complete note on Nephelauxetic effect.
(c) Explain crystal field stabilization energy. Calculate CFSE for the following:
(i) d^6 high spin octahedral
(ii) d^4 tetrahedral (4+4+4)
- II. (a) What are Wade's rules? Discuss the applications of these rules in classifying carboranes in closo, nido and arachno carboranes.
(b) What are heteropoly anions? Tell with help of examples. (7+5)

UNIT - II

- III. (a) What is alkene hydrogenation? Discuss its mechanism with help of catalytic cycle using Wilkinson's catalyst.
(b) Explain briefly bonding in organometallic compounds. (7+5)
- IV. (a) What are inner transition elements? Discuss their magnetic properties and also compare these with transition elements.
(b) Discuss with help of examples Pi-acid metal complexes. (7+5)

UNIT - III

- V. (a) Draw structures of the following: -
(i) Dibenzo-18-crown-6
(ii) Benzo-15-crown-5
(iii) 2,2,2,-crypt ligand
(b) Differentiate crown ethers and cryptands
(c) Write a note on natural ionophores. (6+3+3)

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- VI. (a) Discuss in detail about cold-lime softening process for water. Also draw neat sketch.
 (b) What is meant by industrial water conditioning? (8+4)

UNIT – IV

- VII. (a) Explain synthesis and structures of the following metal carbonyls:
 (i) $\text{Re}_2(\text{CO})_{10}$
 (ii) $\text{Fe}(\text{CO})_5$
 (iii) $\text{Os}_3(\text{CO})_{12}$
 Show that these obey EAN rule.
 (b) Write a note on dinitrogen complexes. (8+4)
- VIII. (a) Discuss hybridization, geometry shapes of the following: -
 (i) XeF_6 (ii) XeOF_4 (iii) ClF_3 (iv) $(\text{SO}_4)^{2-}$
 (b) Write a note on carbides. (8+4)

UNIT-V

- IX. Do as directed:
 (a) Draw crystal field splitting of octahedral, tetragonal and square planar complexes.
 (b) Hydroformylation using cobalt catalyst
 (c) Note on carboxylic ionophores
 (d) How is S_4N_4 prepared? Discuss its structure. (4×3)

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