Total No. of printed pages = 4

63/2 (SEM-2) CHM 203

2022

CHEMISTRY

(Theory Paper)

Paper Code : CHM 203

(Inorganic Chemistry – II)

Full Marks – 80

Time – Three hours

The figures in the margin indicate full marks for the questions.

1. Answer any *two* of the following questions : 5×2=10

   (a) Explain the rhombic and trigonal distortions in octahedral complexes with suitable example.

   (b) Draw the structure of a ligand having seven binding sites. What is the shape of the nine-co-ordinating complex $[ReH_9]^{2-}$?

   (c) X-ray analysis showed that the co-ordination number of Cu in $CsCuCl_3$ is 4 and not 3. Explain how this is possible. What conditions a metal must fulfil in order to show co-ordination number more than seven.

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2. Answer any *four* of the following questions : 5×4=20

(a) The 10 Dq, value of the complex $[coF_6]^{3-}$ is 13100 cm^{-1}. Illustrate the meaning of D and q. What should be the expected value of Δ_0 for the complex $[RhF_6]^{3-}$ and Δ_t for a Co (II) complex ? Assign the transition for Co (III) complex ?

(b) In a metal complex of tetrahedral field symmetry, why the energy of t2 orbitals are lower compare to that in the hypothetical spherical field symmetry ? "The electron pairing energy is composed of two terms". Explain the statement.

(c) Construct orgel diagram for d^5 ions in octahedral field and show every possible electronic transitions.

(d) From the d-d electronic transitions, justify the appearance of the yellow colour in the complex $[Co(en)_3]^{3+}$ in comparison to green colour of the complex $[Co(Ox)_3]^{3-}$.

(e) What are the factors that affect the crytal field stabilizing energy of metal ions ? Explain with examples.

3. Answer any *four* of the following questions : 5×4=20

(a) Explain the bonding and structure of the complex $Re_2Cl_8^{2-}$.

(b) What are metal carbonyl hydrides and metal carbonyl clusters ? Compare their structures and bonding.

(c) Write down the synthesis methods available for the synthesis of metal alkene and alkynes. What are the similarity found in the structures of metal alkene and alkynes ?

(d) What is π acid ligands ? How many types of bonds are present in a M—CO complex ? Explain with appropriate diagrams .

(e) How many conformational isomers are possible in Fe $(C_5H_5)_2$? Discuss their structures and explain which conformational isomer is more stable and why ?

4. Answer any *two* of the following questions : 5×2=10

(a) Write short notes on stability constant and chelate effect.

(b) Explain the mechanism of substitution reactions in octahedral complexes with appropriate example.

(c) How many types of electron transfer reactions are possible in metal complexes ? Explain with suitable mechanism.

5. Answer any *four* of the following questions : 5×4=20

(a) How can radioactive tracer be used to determine the mechanism of Friedel-Craft reaction ?

(b) A radioactive element having initial mass M_0 decays with half life of 6 years. If the decrease between 18th and 24th years is 4g, find M_0.

(c) Explain the characteristics of lanthanide ions towards complex formation which are in contrast to transition series metal ions.

(d) Compare the spectral and magnetic properties of actinides and lanthanides.

(e) Actinides have a greater tendency to form complexes than lanthanides. Explain.