

Seat
No.

SL-709

Total No. of Pages : 4

Shivaji University, Kolhapur
Oct. - Nov. 2023 Examination
M. Sc. (Part-I) (Semester-I)
Subject - Inorganic Chemistry (NEP2.0 pattern)
Paper Number I - Inorganic Chemistry-I
Subject Code: 92119

Day and Date : Tuesday, 28/11/2023
Time : 10:30 am to 01:30 pm

Total Marks : 80

Instructions:

- 1) Attempt in all Five questions.
- 2) Question number One is compulsory.
- 3) All questions carry equal marks.
- 4) Attempt any two questions from section - I and any two questions from section - II
- 5) All sections should be written in the same answer book.
- 6) Figures to the right indicate full marks.
- 7) Neat labeled diagram should be drawn wherever necessary.

Q.1 Answer the followings:

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- a) Define plane of symmetry
- b) To which point group does the staggered ferrocene complex belongs?
- c) Mention the symmetry element in C_{2h} point group.
- d) The plane of symmetry of PCl_5 molecule is
- e) What do you mean by organometallic compound?
- f) Which one of the following is organometallic compound?
 - (i) $[Fe(H_2O)_6]^{2+}$
 - (ii) $[Cu(CH_2COO)_2]$
 - (iii) $Be(CH_3)_2$
 - (iv) $(TiCl_4)$

- g) Which one of the following is dihapto ligand?
- | | |
|-------------------------------|---------------------------------|
| (i) $\text{CH}_2=\text{CH}_2$ | (ii) $-\text{CH}_2-\text{CH}_3$ |
| (iii) CO | (iv) None |
- h) What is the hapticity of ligands?
- i) Which of the ligand shows maximum crystal field splitting according to spectrochemical series?
- | | |
|-----------------------|--------------------|
| (i) Cl^- | (ii) F^- |
| (iii) NO_2^- | (iv) CN^- |
- j) Which of the following is an outer orbital complex?
- | | |
|---|--|
| (i) $[\text{Fe}(\text{CN})_6]^{4-}$ | (ii) $[\text{Mn}(\text{CN})_6]^{4-}$ |
| (iii) $[\text{Co}(\text{NH}_3)_6]^{3+}$ | (iv) $[\text{Ni}(\text{NH}_3)_6]^{2+}$ |
- k) Transition metal complexes are generally colored due to
- l) Mention the factors affecting CFSE value.
- m) In qualitative analysis of ion, $[\text{Fe}(\text{NO})(\text{H}_2\text{O})_5]^{2+}$ a brown-ring complex is formed.
- n) List the different ways of CO bonding with metal for forming complexes.
- o) Iron-carbonyl usually used as in motor fuel.
- p) According to magnetic property, most of the metal carbonyls are

SECTION-I

- Q.2 A) Explain the format of character table? Deduce the character table for water molecule. 08
- B) Explain 18-electron rule with illustrations. 04
- C) Explain, with its importance, Jahn-Teller Distortion. 04
- Q.3 A) Outline the classification of ligands based on the basis of hapticity. Explain with suitable examples. 08
- B) Write a note on transition metal nitrosyl complexes 04
- C) Explain with the help of suitable example: 04
- i) Improper axis of symmetry
- ii) Point of symmetry
- Q.4 A) Outline, with neat diagram, the structural bonding of transition metal carbonyls. Discuss the physical and chemical properties of at least two representative mononuclear transition metal carbonyls. 08
- B) Calculate CFSE value for d^2 -case and d^5 -case in strong octahedral fields. 04
- C) What are the reactions of organometallic compounds? 04