

(For candidates admitted from 2022-2023 onwards)

M.Sc. DEGREE EXAMINATION, NOVEMBER 2022.

Chemistry

INORGANIC CHEMISTRY — I

Time : Three hours

Maximum : 75 marks

SECTION A — (20 marks)

I. Multiple Choice questions : (5 × 1 = 5)

1. An example of nido-borane from the following is

- (a) B_4H_{10} (b) B_6H_{10} β_{n+1}^{n+4}
 (c) B_6H_{12} (d) B_8H_{14}

2. The degree of _____ between the metal ion and the ligand directly influences the stability of the complex in solution.

- (a) association (b) dissociation
 (c) ionization (d) freedom

3. Which of the following metal ions has the largest magnetic moment in its low-spin octahedral complexes?

- (a) Fe^{3+}
 (b) Co^{2+}
 (c) Sc^{3+}
 (d) Cr^{2+}

4. Electron transfer from $[Cr(H_2O)_6]^{3+}$ to $[Co(H_2O)_5Cl]^{2+}$ is likely to occur via

- (a) Inner sphere electron transfer
 (b) d-d transition
 (c) S_N1 mechanism
 (d) Outer sphere electron transfer

5. The compound which shows $L \rightarrow M$ charge transfer is,

- (a) $Ni(CO)_4$
 (b) $K_2Cr_2O_7$
 (c) HgO
 (d) $[Ni(H_2O)_6]^{2+}$

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II. Fill in the blanks :

(5 × 1 = 5)

6. Lattice energy of Lithium Fluoride is high compared to Magnesium Oxide.7. If β is the formation constant, then the instability constant $\frac{1}{\beta}$.8. The compound which exhibits Jahn-Teller distortion is $CuSO_4 \cdot 5H_2O$.9. Electrons movement take place from low to high (n to n+1).10. The complexes of which d-block element are getting importance in anti-cancer therapy Pt .

III. Answer ALL the questions :

(5 × 2 = 10)

11. What is the difference between cyclophosphazanes and cyclophosphazenes?

12. Write short notes on detection of complex formation in solution.

13. What is Nephelauxetic effect?

14. What is Racemization reaction? Illustrate with an example.

15. Draw the structure of Reinecke's salt.

SECTION B — (5 × 5 = 25)

Answer ALL questions, choosing either (a) or (b).

16. (a) What are Boranes? How are they classified? Give one example for each type.

Or

(b) What is lattice energy? Explain the steps in Born-Haber cycle to find out the lattice energy in the formation of LiF.

17. (a) Explain the spectroscopic method of determination of stability constant of a metal complex.

Or

(b) Distinguish between stepwise stability constant and overall stability constant.

18. (a) Explain the Crystal Field Splitting pattern of tetrahedral complex.

Or

(b) Explain the sigma and pi-bonding in coordination compounds.

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19. (a) Explain complementary and non-complementary electron transfer reactions with mechanism.

Or

- (b) What is Template effect? Illustrate with two examples.

20. (a) Discuss the photo reduction and oxidation reaction with examples.

Or

- (b) Explain the IR stretching frequency metal carbonyls compounds with examples.

SECTION C — ($3 \times 10 = 30$)

Answer any THREE questions.

21. Discuss the classification and structural aspects of Silicates.
22. (a) What are the factors affecting the stability of the complex?
- (b) Discuss the chelate effect with examples.
23. Define John Teller effect and explain the distortion of any two complexes.

24. (a) Discuss the inner sphere and outer sphere mechanisms.

- (b) What are Inert and Labile complexes? Give examples.

25. Give a brief account on photo physics and photochemistry of Ruthenium complexes.