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**B. Sc. Course (CBCS) Ordinance Sem-VI
EXAMINATION APRIL-2023
CHEMISTRY - INORGANIC CHEMISTRY**

[Time:2:00 Hours]

[Max. Marks:80]

- Instructions:**
- All questions are compulsory
 - Answers to the two sections should be written on separate answer book.
 - Use of calculator is allowed.

SECTION- A

(40 Marks)

Q.1 Answer any four of the following

16

- Write and explain following reaction shown by ferrocene.
 - Mannich Condensation
 - Friedel - Craft Alkylation.
- Write any two methods of preparation and two properties of Aryl compounds of Hg.
- Define EAN rule and apply it to determine stability of following metal carbonyls
 - $\text{Mn}_2(\text{CO})_{10}$
 - $\text{Co}_2(\text{CO})_8$
 - $\text{Fe}(\text{CO})_5$
- State Laporte, selection rule. When is the rule relaxed?
- Write short note on-
 - Ferromagnetism
 - Curie point.
- Describe Gouy's method of determining magnetic susceptibility, using suitable diagram.

- Q.2** A. i) Differentiate between mononuclear and polynuclear metal carbonyl. **03**
 ii) Explain how magnetic property of Fe^{+3} octahedral complex vary with crystal field splitting. **03**

OR

- Describe any two methods of synthesis of $\text{Ni}(\text{CO})_4$ **03**
- Explain on the basis of crystal field splitting why $[\text{Co}(\text{NH}_3)_6]$ is orange **03**
 $[\text{Co}(\text{CN})_6]$ is yellow.

- B. i) Differentiate between terminal and bridging carbonyl group **03**
 ii) Discuss different types of charge transfer transition. **03**

- Q.3** A. i) Explain with the help of suitable diagram, the structure and bonding involved in $\text{Fe}(\text{CO})_5$ **03**
 ii) Assign the ground state terms to following d orbital configuration. **03**
 - d^2
 - d^5
 - d^7

OR

- Give reason why the length of M-C bond is slightly smaller than single bond and C-O bond length is slightly larger than free CO molecule in metal Carbonyls. **03**

iv) Define magnetic moment. What is the significance of its measurement for a complex. 03

B. i) Draw the LGO of the two Cp ring system in ferrocene which will overlap with following orbitals on Fe atom 03

a) dz^2 b) Pz c) dx_2

ii) With the help of Suitable example explain how electronic spectra can be used to determine geometry of a complex. 03

SECTION B

(Marks:40)

Q.4 4) Answer ANY FOUR of the following: 16

- What is "Trans Effect"? Design a route for the synthesis of cis and trans $[\text{Pt}(\text{NH}_3)\text{NO}_2\text{Cl}_2]^-$ complex starting from $[\text{PtCl}_4]^{2-}$
- 'Base hydrolysis reaction of octahedral complexes follows $\text{S}_{\text{N}}1\text{CB}$.' Justify the statement with a suitable example.
- Explain the classification of solvents.
- Identify, giving reason, each of the following reactions in liquid sulphur dioxide:
 - $\text{SbCl}_3 + 3\text{KCl} \rightarrow \text{K}_3[\text{SbCl}_6]$
 - $\text{SOCl}_2 + \text{Cs}_2\text{SO}_3 \rightarrow 2\text{CsCl} + 2\text{SO}_2$
 - $\text{AlCl}_3 + 3\text{NaI} \rightarrow 3\text{NaCl} \downarrow + \text{AlI}_3$
 - $\text{PCl}_5 + \text{SO}_2 \rightarrow \text{POCl}_3 + \text{SOCl}_2$
- What is meant by 'levelling effect of a solvent'? Why is acetic acid as strong an acid as HCl in liquid NH_3 ?
- Define 'Mirror Plane'. Explain this symmetry element with reference to H_2O molecule.

Q.5 A) Answer the following questions:

- What is acid hydrolysis? How does the steric factor suggest $\text{S}_{\text{N}}1$ mechanism for acid hydrolysis? 03
- Although 'water-like', ammonia is a better solvent for covalent solutes. 03

OR

- Distinguish between thermodynamic and kinetic stabilities of complexes. 03
- Define, with suitable example, an acid and a base on the basis of: 03
 - Lewis concept
 - Lux-Flood concept

B) Answer the following questions:

- Classify, giving reason, the following complexes as labile or inert: 03
 - $[\text{V}(\text{H}_2\text{O})_6]^{2+}$
 - $[\text{Co}(\text{NH}_3)_6]^{3+}$
 - $[\text{Mn}(\text{H}_2\text{O})_6]^{2+}$
- List the different symmetry elements for trans dichloro ethylene. To which point group does it belong? 03

Q.6 A) Answer the following questions:

- What is a conjugate acid-base pair? Explain with a suitable example. 03
- Explain the symmetry element 'Rotation Axis' as observed in BCl_3 molecule. 03

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OR

- iii) Why is liquid HF a 'water-like' solvent? Explain, giving reactions, the amphoteric nature of HClO_4 in liquid HF. 03
- iv) Define 'Centre of Symmetry'. Draw to illustrate centre of symmetry in (a) ethylene and (b) benzene. 03
- ..0
- B) Answer the following questions: 03
- i) Explain: $[\text{Cu}(\text{en})_2]^{2+}$ is more stable than $[\text{Cu}(\text{NH}_3)_4]^{2+}$. 03
- ii) Explain the meaning of the symbols (a) i and (b) C_{2v} , and draw an example to illustrate.