

Post Graduate Teaching Department of Chemistry
Rashtrasant Tukadoji Maharaj Nagpur University, Campus Nagpur

Semester II: Paper V (Inorganic Chemistry) (Code: CH-201), (June 22, 2022)

Time: 3h

Max. Marks = 60

Note: 1. all questions are compulsory.

2. All questions carry equal marks.

Q1 a) Give the significance of Laporte 'orbital' selection rule and spin selection rule? **5 M**

Q1 b) Comments on High spin-low spins crossover with suitable example? **4M**

Q1 c) Discuss some abnormal magnetic properties of transition metal complexes. **3 M**

Or

Q1 d) Give the Orgel diagrams for octahedral metal complexes with suitable example? **4M**

Q1 e) Comments on electronic spectra and structure of tetrahalocobalt(II) complexes? **4M**

Q1 f) Discuss Spin-orbit (L-S) coupling and Hund's rule applied in electronic spectra of transition metal complexes. **4 M**

Q2 a) Give the type of electron transfer reaction possible in transition metal complexes **4M**

Q2 b) Comments kind of effects in the substitution reaction of square planer complex? **4M**

Q2 c) Write a note on following. **4 M**

- i) Tunneling effect, ii) Marcus-Hush theory.

Or

Q2 d) Discuss the trans-effect, and cis-effect observed in transition metal complexes. **4M**

Q2 e) Comments on outer sphere and inner sphere mechanisms involved in substitution reaction of square planer complexes? **5M**

Q2 f) Comments on Tunneling effect with suitable example. **3 M**

Q3 a) Give the morphological aspects involved in metal carbonyls? **5 M**

Q3 b) Give the classification of the metal carbonyl clusters with suitable example? **4M**

Q3 c) Discuss EAN rule with respect to metal carbonyls with suitable examples. **4 M**

Or

Q3 d) Is metal carbonyl exists as homoleptic or heteroleptic (or both). Give examples? **4 M**

Q3 e) Comments on aspects of polynuclear carbonyls with suitable example? **4M**

Q3 f) Why dicobalt octacarbonyl shows about 13 ν_{CO} FTIR/Vibrational bands, quite more than expected? Explain this complexity arise due to with & without bridging CO ligands. **4 M**

Q4 a) Are metal nitrosyl complexes exist isoelectronic & can they obey 18-electron rule? **4M**

Q4 b) Comments on linear and bent metal nitrosyl complexes with suitable example? **4M**

Q4 c) Is the nitrosyl cation isoelectronic with carbon monoxide? Discuss structural aspects of metal nitrosyl with suitable examples. **4 M**

Or

Q4 d) Is metal carbonyl exists as homoleptic or heteroleptic (or both). Give examples? **4 M**

Q4 e) Comments on aspects of polynuclear carbonyls with suitable example? **4M**

Q4 f) Explain the complexity arise due to with and without bridging of CO ligands involved in dicobalt octacarbonyl complex showing 13 ν_{CO} IR-bands quite more than expected? **4 M**

Q5. Each question carries equal mark (1.5 Marks)

- a) Draw Tanabe- Sugano Diagram of octahedral complexes with d^2 configuration.
- b) Give structure of tetrahedral and octahedral complexes of Ni(II) cations.
- c) Draw structure of cis and trans platin complex.
- d) What factors affects the rate of substitution reaction in square planar complexes?
- e) Draw the resonance structures of a metal carbonyl complex.
- f) Name metal complex with CO ligand is uniquely stable 17-electron metal carbonyl?
- g) Sketch the structure of Sodium-nitroprusside complex.
- h) Give the complex wherein nitric oxide also serves as a bridging ligand.