

M.Sc. Examination, 2017
Semester-IV
Chemistry (Elective)
Course: CH-1021
(Inorganic Chemistry)

Time: Three Hours

Full Marks: 40

Questions are of value as indicated in the margin.

Answer **any four** questions.

1. a) Attempt any three: 3x3
 - i) $\pi^* - \pi^*$ transition is the most favourable pathway of the electron transfer in outer-sphere mechanism – explain.
 - ii) Write down the Marcus equation for outer-sphere cross electron transfer reaction. What does it signify?
 - iii) What are the possible rate determining steps in an inner-sphere electron transfer process? Illustrate.
 - iv) How can you prepare the $[(\text{H}_2\text{O})_5\text{Cr}^{\text{III}} - \text{SCN}]^{2+}$ complex by using the electron transfer reaction?
- b) Give an example where the binuclear complex formed in an inner-sphere mechanism can be characterized. 1
2. a) What is olefin metathesis? Mention its salient features. 1+1
- b) Write the product(s) of the following reaction and elucidate the mechanism involved.

(Ts = p-Toluene sulfonyl). 0.5+2.5
- c) What is Ziegler-Natta catalyst? Mention its speciality. 1+1
- d) Sketch the simplified mechanism of propylene polymerization using Ziegler-Natta catalyst. 3
3. Attempt **any four**: 4x2.5
 - a) What do you mean by zero field splitting factor in EPR spectroscopy? Explain with suitable example.
 - b) Explain with example the EPR spectroscopic results of metal complex where metal is diamagnetic but all ligands are paramagnetic.
 - c) Discuss about the isotropic factor of Mo in case of the EPR pattern of $\text{K}[\text{Mo}(\text{CN})_6]$ complex. [Given isotopes of Mo: ^{94}Mo , ^{95}Mo , ^{96}Mo & ^{97}Mo]
 - d) Show the anisotropic EPR pattern of *mer*- $[\text{Fe}^{\text{III}}(\text{N}-\text{O})_3]$ complex where 'N-O' stands for a mono-anionic chelating ligand.
 - e) What are significances of ' $A_{\perp}$ ' and ' $A_{\parallel}$ ' in EPR spectral data collected at 77 K?
4. a) Schematically illustrate the Mott-Hubbard and charge transfer insulators. 1
- b) Schematically illustrate the antiferro-orbital ordering phenomenon. 1
- c) Comment on the effect of static and dynamic Jahn-Teller distortion on magnetic properties in manganite perovskite. 3
- d) Comment on charge ordering in $\text{La}_{1/3}\text{Sr}_{2/3}\text{FeO}_3$. 2
- e) What is size disorder parameter? Describe the effect of size disorder on electrical and magnetic properties of material with suitable example. 1+2

P.T.O.

(2)

5. a) Compare the efficiency of thiocyanate, isothiocyanate and azide as the bridging ligands in inner-sphere electron transfer mechanism. 4
b) How can you distinguish the mechanism of electron transfer reaction in the following two reactions. 3
(i) $[\text{Co}(\text{NH}_3)_5(\text{N}_3)]^{2+} + \text{Cr}(\text{aq})^{2+} \rightarrow$ (ii) $[\text{Co}(\text{NH}_3)_6]^{3+} + \text{Cr}(\text{aq})^{2+} \rightarrow$
c) What do you mean by the axial symmetry in case of anisotropic EPR spectroscopic result recorded at 77 K? 3
6. a) Comment on the magnetic ground state of the LaCrO_3 and $\text{LaCr}_{0.5}\text{Fe}_{0.5}\text{O}_3$ oxides. 3
b) Why maximum magnetoresistance is expected near ferromagnetic transition? 3
c) Discuss the structural features of potassium ferrocyanide. 2
d) What is metathesis polymerization? Mention its significance. 2
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