

Roll No.

DD-455

M. Sc. (Second Semester)
EXAMINATION, May-June, 2020

CHEMISTRY

Paper No. CH—7

(Transition Metal Complexes)

Time : Three Hours

Maximum Marks : 80

- Note : (i) Attempt four questions only.
(ii) One question from each Unit is compulsory.
(iii) All parts of question should be answered at one place.
(iv) Be precise and to the point in your answer.
(v) All questions carry equal marks.

Unit—I

- (a) What are inert and labile complexes ? Show that lability and inertness of the complexes are different with thermodynamic properties of the complexes in solution.
(b) Explain the effect of substitution on ethylene diamine in equation reaction of $[\text{Co}(\text{NH}_3)_5\text{Cl}]^{2+}$.

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- (c) Name the mechanism involved in one-electron transfer and discuss the inner sphere mechanism of such reaction.
2. (a) Discuss various factors that affect the rate of substitution reaction in square-planar complexes.
- (b) Explain the nature of bridging group. How does it affect redox reaction ?
- (c) Discuss at least one evidence in favour of dissociation conjugate base mechanism.
- (d) What is annation reaction ?

Unit—II

3. (a) MnO_4^- $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$ are coloured ions but reasons for their colours are different. Explain.
- (b) How are ground state terms determined ? Discuss with taking example of d^2 metal ion.
- (c) Why does tetrahedral complex of an element give much more intense $d-d$ spectra than octahedral complexes ?
- (d) What is anomalous magnetic moment ? Give *one* explanation to account this behaviour.
4. (a) What is Tanabe-Sugano diagram ? Illustrate T. S. diagram for V^{3+} ion.
- (b) What is laborte-orbital selection rule ?
- (c) Discuss the effect of temperature on the corrected value of magnetic suceptibility of paramagnetic substances. Describe any *two* laws that governs the effect of temperature.

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- (d) Explain Jahn-Teller effect on the ground state of transition metal complexes with example of Ti^{3+} ion. How does this affect related the geometry of the complexes ?

Unit—III

4. (a) Free cyclobutadiene is antiaromatic while cyclobutadiene co-ordinated to metal atom is aromatic. Explain clearly with suitable example.
- (b) Discuss molecular orbital energy level diagram of Ferrocene.
- (c) Discuss the structure and bonding in the anion of Zeise's salt.
5. (a) Discuss at least *two* methods for the preparation of cyclobutadiene complex.
- (b) Write physical and chemical properties of η^6 -arene complexes.
- (c) Explain the following reactions of Ferrocene :
- (i) Acylation
 - (ii) Mannich reaction
 - (iii) Addition reaction

Unit—IV

7. (a) What is β -elimination ? What are its favourable conditions ? Show that transition metal alkyl which obeys $18 e^-$ rule do not take part in β -elimination.
- (b) Discuss the reaction mechanism of synthesis of transition metal alkyl via. Vilsmeier synthesis.

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- (c) Explain the following terms :
- (i) Time averaged signal
 - (ii) Berry pseudorotation
8. (a) Give methods of preparation, structure and bonding of Fischer-Carbene complexes.
- (b) Discuss the reaction of organolithium cuprate with α , β unsaturated carbonyl compounds.
- (c) Discuss the fluxionality rate of stereochemistry non-rigid molecule.