

[This question paper contains 6 printed pages]

Your Roll No. :

Sl. No. of Q. Paper : **1561** **I**

Unique Paper Code : 2172581101

Name of the Paper : DSC-Inorganic
Chemistry

Name of the Course : **B.Sc.(Prog.) in Applied
Life Science with
Agrochemicals and
Pest Management**

Semester : I

Time : 2 Hours

Maximum Marks : 60

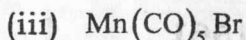
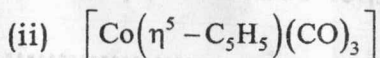
Instructions for Candidates :

- (a) Write your Roll No. on the top immediately on receipt of this question paper.
- (b) **All** questions carry equal marks. Attempt any **four** questions.

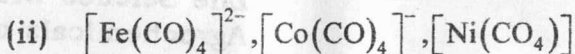
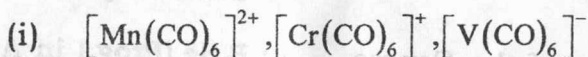
1. (a) What is 18 electron rule ? Using 18 electron rule as guide, predict which of the following compounds are stable : 5

(i) $\text{Fe}_3(\text{CO})_{12}$

P.T.O.



- (b) Arrange the following compounds in increasing order of IR stretching frequencies of C-O bond : 5



- (c) Draw MO diagram of CO and explain why CO acts as an electron pair donor and acceptor through C and not O. 5

2. (a) What are organometallic compounds ? Giving appropriate examples, explain how will you classify organometallic compounds based on nature of metal-carbon bond present in it ? 5

- (b) What is zeise's salt ? Discuss the bonding in zeise's salt on the basis of Dewar-Chatt-Duncanson model and IR studies. How is M-C bonding in zeise's salt different from that in metal carbonyl complexes ? 5

- (c) (i) Describe different factors which affects the magnitude of Δ_0 .

- (ii) Which of the following compounds have high CFSE and why ? $[\text{Cr}(\text{CN})_6]^{3-}$ or $[\text{Cr}(\text{NH}_3)_6]^{3+}$ 5

3. (a) The magnetic moment of $[\text{Fe}(\text{H}_2\text{O})_6]^{3+}$ is 5.92 B.M. and that of $[\text{Fe}(\text{CN})_6]^{3-}$ is 1.73 B.M. Explain on the basis of crystal field theory. 5

(b) Define the following terms : 5

(i) Ambidentate ligands

(ii) Crystal field stabilization energy (CFSE)

(c) Which of the following is not considered as an organometallic compounds and why ? 5

$(\text{C}_2\text{H}_5)_2\text{Zn}$, $\text{B}(\text{OCH}_3)_3$, NaCN , $\text{Ni}(\text{CO})_4$ and CaC_2

4. (a) (i) Using the valence bond method, assign hybridization, geometry and predict the magnetic moment (in Bohr magnetons) for $[\text{Cr}(\text{en})_3]^{2+}$ complex.

(ii) State two limitations of valence bond theory. 5

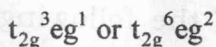
(b) Explain : 5

(i) Cu^{2+} ions are coloured and paramagnetic whereas Zn^{2+} ions are colourless and diamagnetic.

(ii) All tetrahedral complexes are high spin.

(c) Draw crystal field splitting diagram for $[\text{CoCl}_4]^{2-}$ and $[\text{Fe}(\text{CN})_6]^{4-}$. Also calculate CFSE for both. 5

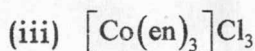
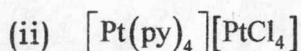
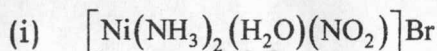
5. (a) Define Jahn-Teller theorem. Giving reason, explain in which case this effect would be observed : 5



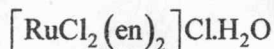
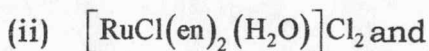
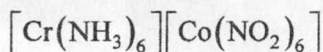
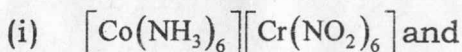
(b) Explain why crystal field splitting energy for octahedral complex is larger than square planar complex. 5

(c) $[\text{Co}(\text{NH}_3)_6]^{3+}$ is an inner orbital octahedral complex whereas $[\text{Ni}(\text{NH}_3)_6]^{2+}$ is an outer orbital complex. Explain. 5

6. (a) Write the IUPAC names of following complexes : 5



(b) Name the type of isomerism in the following pairs of isomers and discuss a method to distinguish them : 5

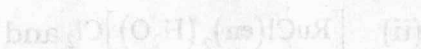


(c) (i) The vanadium-carbon bond distance is longer in $\text{V}(\text{CO})_6$ than is $[\text{V}(\text{CO})_6]^-$. Explain.

- (ii) What is meant by the term 'hapticity'. Explain with suitable examples.

5

(b) Name the type of isomerism in the following pairs of isomers and discuss a method to distinguish them:



(c) The vanadium-carbon bond distance is longer in $\text{V}(\text{CO})_6$ than in $\text{V}(\text{CO})_5$. Explain.