

**BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)**

**CLASS: MSC/IMSC
BRANCH: CHEMISTRY**

**SEMESTER: I / VII
SESSION: MO/2022**

SUBJECT: CH401 BASIC INORGANIC CHEMISTRY

TIME: 03 HOURS

FULL MARKS: 50

INSTRUCTIONS:

1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
4. Tables/Data handbook/Graph paper etc., if applicable, will be supplied to the candidates

	Marks	CO	BL
Q.1(a) Mention the condition of EOS for the effective overlap in LCAO model.	[2]	CO1	2
Q.1(b) Mention the different corrections incorporated into the trivial solutions of the energy expression of an one electron system e.g., H_2^+ according to LCAO-MO treatment.	[4]	CO1	2
Q.1(c) From the hybrid MO diagram, explain the π acidic character of CN^- .	[4]	CO1	3
Q.2(a) Explain on the basis of Valence Bond Theory, the cause of lability and inertness of the octahedral complexes.	[5]	CO2	2
Q.2(b) What is trans effect? Discuss various theories of trans effect.	[5]	CO2	1
Q.3(a) Discuss the mechanism involved in the base hydrolysis of octahedral Co(III) complexes. Derive rate law for Nucleophilic Substitution Reaction in square planar complexes.	[5]	CO3	2
Q.3(b) b. Discuss the outer - sphere and inner-sphere mechanism of electron transfer reaction. Why is the electron transfer in the system $[Co(NH_3)_6]^{+2} - [Co(NH_3)_6]^{+3}$ is slower than the system $[Fe(CN)_6]^{4-} - [Fe(CN)_6]^{-3}$?	[5]	CO3	3
Q.4(a) Predict the double structured electronic spectrum of $TiCl_3 \cdot 6 H_2O$.	[4]	CO4	1
Q.4(b) For the octahedral complexes of Ni^{+2} with glycine, ammonia, ethylenediamine, bipyridyl and phenanthroline how the intensity of spin allowed and spin forbidden transition vary. In this context highlight the phenomenon of Intensity Stealing.	[4]	CO4	2
Q.4(c) Identify the Symmetry Point Group of the following: $Cr(NH_3)_5Cl$	[2]	CO4	2
Q.5(a) In the electronic spectra of $[Cr(H_2O)_6]^{2+}$, along with the sharp peak at $14,000\text{ cm}^{-1}$ one shoulder is obtained at $15,000\text{ cm}^{-1}$ - Interpret the spectrum with the electronic transition in ORGEL Diagram.	[5]	CO5	3
Q.5(b) cis $Co(en)_2F_2$ shows two peaks, whereas trans $Co(en)_2F_2$ shows three peaks - Explain	[5]	CO5	2

:::21/11/2022:::E