

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

CLASS: IMSC
BRANCH: CHEMISTRY

SEMESTER : VII
SESSION : MO/19

SUBJECT: SAC1105 METAL CHEMISTRY

TIME:3:00 HOURS

FULL MARKS: 60

INSTRUCTIONS:

1. The question paper contains 7 questions each of 12 marks and total 84 marks.
 2. Candidates may attempt any 5 questions maximum of 60 marks.
 3. The missing data, if any, may be assumed suitably.
 4. Before attempting the question paper, be sure that you have got the correct question paper.
 5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.
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- Q.1(a) Draw the molecular orbital diagram for NO and HF molecules. Predict the bond order and magnetic behavior of the molecules. [6]
- Q.1(b) Define equivalent and non-equivalent hybrid orbital and discuss δ bonding with example. [6]
- Q.2(a) Schematically represent tetragonal distortion in octahedral geometry. [6]
- Q.2(b) For an octahedral crystal field obtain the potential at any point. [6]
- Q.3(a) Discuss about the aluminosilicates and their importance. [6]
- Q.3(b) Name the oxoacids of phosphorous, mention their oxidation state along with the structure. [6]
- Q.4(a) Show the SN^1CB mechanism in octahedral Co(III) complexes. The large difference between the rate data of acid hydrolysis and base hydrolysis of $[Co(NH_3)_5Cl]^{2+}$ can only explained by SN^1CB mechanism. -Explain [3+3]
- Q.4(b) Describe outer sphere mechanism in the light of Marcus theory. [6]
- Q.5(a) Discuss at least three factors affecting acid hydrolysis in octahedral cobalt(III) complexes. [6]
- Q.5(b) Rate of substitution in the presence of a strongly trans directing group is very much faster than the corresponding reaction in the presence of a group having low trans effect - discuss in the light of π -bonding theory [6]
- Q.6(a) Electronic spectrum of aqueous solution of $Cr(H_2O)_6^{+3}$ has one broad band at $17,000\text{ cm}^{-1}$ and one sharp band of low intensity at 16000 cm^{-1} ; Assign the peaks in terms of Frank Condon Principle. [6]
- Q.6(b) CN^- and Cl^- have same position in Nephelauxetic series but opposite positions in Spectrochemical series - Explain [6]
- Q.7(a) Electronic spectrum of $[Co(en)_3]^{3+}$ and *trans*- $[Co(en)_2F_2]^+$ shows different nature- Explain. [6]
- Q.7(b) $Cr(H_2O)_6^{3+}$ shows broad bands, whereas MnF_2 gives very sharp bands- Explain the characteristics by Tanabe Sugano diagram [6]

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