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

CLASS: IMSC **SEMESTER : V**
BRANCH: CHEMISTRY **SESSION : MO/19**

SUBJECT: IMC5009 INORGANIC CHEMISTRY IC II

TIME: 3 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.

Q.1(a)	What is heterocatenation?	[2]
Q.1(b)	Distinguish between homocatenation and heterocatenation using suitable examples.	[4]
Q.1(c)	Discuss the different types of silicates and their structures.	[6]
Q.2(a)	Elucidate the structure of diborane	[2]
Q.2(b)	Discuss in detail the structures of boranes and explain the terms, closo, nido and arachno with examples.	[4]
Q.2(c)	Give the methods of synthesis and the chemical reactions of Diborane.	[6]
Q.3(a)	Given that $[Ni(CN)_4]^{2-}$ ion is diamagnetic in nature , predict its structure and show whether it is an inner or outer orbital complex.	[2]
Q.3(b)	Highlight the salient features of VBT in coordination complexes and explain the principle of electroneutrality.	[4]
Q.3(c)	Does the square-planar complex ion [Pt(NH3)(N3)ClBr]– have optical isomers? Explain your answer.	[6]
Q.4(a)	What is Nephalauxetic Effect. Explain how it highlights the drawbacks of CFT	[2]
Q.4(b)	Draw the molecular orbital diagram of an octahedral complex [CoF6]3- . Explain the impact of pi bonding in this complex.	[4]
Q.4(c)	*Calculate the CFSEs for Octahedral Complexes with following Electron Configurations (in Units of Δo) : high spin, d5 d6 & d8*	[6]
Q.5(a)	Bearing in mind the Jahn Teller theorem, predict the structure of $[Cr(OH_2)_6]^{2+}$	[2]
Q.5(b)	For each of the following pairs of complexes identify the one that has the larger LFSE: a) tetrahedral $[FeCl_4]^{2-}$or tetrahedral $[CoCl_4]^{2-}$, b) $[Fe(OH_2)_6]^{3+}$ or $[Fe(CN)_6]^{2-}$	[4]
Q.5(c)	What are the selection rules that govern electronic transitions explain in terms of restrictions, allowed and forbidden transitions.	[6]
Q.6(a)	Explain why $[FeF6]^{3-}$ is colorless whereas $[CoF6]^{3-}$ is colored but exhibits only a single band in the visible region..	[2]
Q.6(b)	Of the two complexes Td $[CoCl4]^{2-}$ and octahedral [Co(H2O]2+ one is pale pink in colour while the other is intense blue in colour, absorption peaks obtained are : 550nm and 800 nm. Assign the peaks and colour to the complexes and explain the reasons for this.	[4]
Q.6(c)	Co(H2O6] 2+ showed three transition bands at 8000, 16000 and 20000 cm-1. Give the transitions and assign the bands.	[6]
Q.7(a)	Distinguish between inert and labile complexes.	[2]
Q.7(b)	Giving suitable example describe substitution nucleophilic unimolecular reactions in coordination complexes.	[4]
Q.7(c)	Discuss the factors that affect the rate of substitution reactions in coordination complexes	[6]

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