

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

CLASS: IMSc
BRANCH: CHEMISTRY

SEMESTER : IV
SESSION : SP/2023

SUBJECT: CH207R1 INORGANIC CHEMISTRY-III

TIME: 3
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. 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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		CO	BL
Q.1(a)	Determine the configuration (in the form $t_{2g}^x e_g^y$ or $e^x t_2^y$ appropriately) , the number of unpaired electrons , and the CFSE as a multiple of Δ_o or Δ_T for each of the following complexes using the spectrochemical series to decide where relevant , which are likely to be strong field and which are likely to be weak field (a) $[\text{Co}(\text{NH}_3)]^{3+}$ (b) $[\text{Fe}(\text{OH}_2)_6]^{2+}$ (c) $[\text{Fe}(\text{CN})_6]^{3-}$ (d) $[\text{Cr}(\text{NH}_3)_6]^{3+}$ (e) tetrahedral $[\text{Ni}(\text{CO})_4]$	[5] 1	3
Q.1(b)	Discuss the Z in and Z out phenomenon using Jahn Teller Theorem. Bearing in mind the Jahn Teller Theorem predict the structure of $[\text{Cr}(\text{OH})_6]^{2-}$.	[5] 1	2
Q.2(a)	With reference to periodic table, sketch the first series of the d block, including the symbols of the elements. Indicate those elements for which the group oxidation number is common by C; those for which the group oxidation number can be reached but is a powerful oxidizing agent by O; and those for which the group number is not achieved by N.	[5] 2	4
Q.2(b)	Discuss the trend in the stability of the group oxidation number on descending a group of metallic elements in the d block.	[5] 2	1
Q.3(a)	Discuss about the +IV oxidation state of Lanthanide series.	[5] 3	3
Q.3(b)	Describe the separation of lanthanides by ion-exchange method.	[5] 3	4
Q.4(a)	What are the probable reasons of toxicity of the metal in biological system? Write the reasons of toxicity of mercury metal.	[5] 4	3
Q.4(b)	What is K^+/Na^+ pump? Describe the catalytic cycle of K^+/Na^+ pump.	[5] 4	4
Q.5(a)	Describe the characteristics of alpha, beta and gamma ray.	[5] 5	1
Q.5(b)	What is half life? State Geiger-Nuttal law.	[5] 5	2

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