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

CLASS: BSc **SEMESTER : III[rd]**
BRANCH: CHEMISTRY **SESSION : MO/2024**

SUBJECT: CH222 BASIC CHEMISTRY-IV

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.

			CO	BL
Q.1(a)	Derive the expression for the energy of a particle in a 1D box of length 'a'.	[5]	1	2
Q.1(b)	What are the corresponding wavefunctions?	[5]	1	3
Q.2(a)	Explain the bonding in a) $[Cr(NH_3)_6]^{3+}$ and b) $[CoF_6]^{3-}$ metal complexes using valance bond theory (VBT) and predict whether the complex is an outer orbital complex or inner orbital complex. Also, comment on its magnetic properties.	[5]	2	2
Q.2(b)	Write the IUPAC Nomenclature of the following metal complexes- (i) $[Co(NH_3)_6]Cl_3$ (ii) $Ca_2[Fe(SCN)_6]$ (iii) $K_3[Fe(CN)_4Br_2]$ (iv) $K[PtCl_3(NH_3)_2(H_2O)]$ (v) $[Co(NCS)_4]^{2-}$	[5]	2	3
Q.3(a)	Using the VSEPR model predict the geometry, shape, and hybridization (of the central atom) of the following compounds i) XeO_2F_2 ii) XeF_2 iii) $XeOF_4$ iv) XeO_6^{2-} v) XeF_4	[5]	3	3
Q.3(b)	(i) What are interhalogen compounds? Give two examples of interhalogen compounds. (ii) what are Pseudohalogen and polyhalide ions? Give examples in each case.	[5]	3	2
Q.4(a)	State and explain the Born-Oppenheimer approximation.	[5]	4	3
Q.4(b)	Obtain the forms for the rotational line positions and the maximum intensity spectral line.	[5]	4	2
Q.5(a)	Discuss the rotational fine structure of fundamental vibrational transition belonging to the same electronic state.	[5]	5	3
Q.5(b)	By means of balanced chemical equations and a statement of conditions, describe a suitable synthesis of (i) xenon difluoride, (ii) xenon hexafluoride, (iii) xenon trioxide.	[5]	5	2

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