

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

CLASS: BSc
BRANCH: CHEMISTRY

SEMESTER : III
SESSION : MO/2025

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)	Discuss Heisenberg's uncertainty principle.	[5] CO1	1
Q.1(b)	Derive the commutator between any two components of the angular momentum.	[5] CO1	4
Q.2(a)	Compare the Wolff-Kishner reduction with the Clemmensen reduction. Discuss the differences in reaction, reagents, mechanisms, and the types of substrates each method is suitable for.	[5] CO2	2
Q.2(b)	What are interhalogen compounds? Describe their types, structure and methods of preparation with suitable examples.	[5] CO3	1
Q.3(a)	(i) Compare and discuss the structure and bonding in $[\text{ICl}_2]^-$ and $[\text{ICl}_2]^+$ ions. (ii) Comment on the inertness of Noble Gas with examples.	[5] CO3	2
Q.3(b)	Differentiate between bidentate and ambidentate ligand with example. Explain why $[\text{CoF}_6]^{3-}$ is high-spin while $[\text{Co}(\text{CN})_6]^{3-}$ is low-spin, although both contain Co^{3+} . Discuss your answer in terms of crystal field theory and ligand field strength.	[5] CO5	2
Q.4(a)	How do you obtain the bond length of a rigid heteronuclear diatomic molecule using pure rotational spectroscopy.	[5] CO4	3
Q.4(b)	Explain the origin of the fundamental and overtone bands in vibrational spectra.	[5] CO4	1
Q.5(a)	Discuss Born-Oppenheimer approximation.	[5] CO4	1
Q.5(b)	With the help of molecular orbital energy diagram discuss how addition or removal of electrons affects bond length and magnetism of O_2 , O_2^{2+} and O_2^{2-} .	[5] CO5	2

::::::20/11/2025::::::E