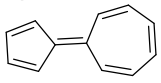
BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION MO/2024)

CLASS: IMSc **SEMESTER: 1st**
BRANCH: Mathematics **SESSION: MO/2025**

SUBJECT: CH111 CHEMISTRY-I

TIME: 02 Hours **FULL MARKS: 25**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 5 marks and total 25 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
***4*. Tables/Data handbook/Graph paper etc., if applicable, will be supplied to the candidates**

			CO	BL
Q.1(a)	Write the basic postulates of Bohr's atomic model. Find the relative energy of an electron at shells of a hydrogen like system	[2]	1	1
Q.1(b)	What is De-Broglie matter wave? Find the applicability of matter wave in macroscopic and microscopic world from the following data: i) electron (m = 9.1×10^{31} kg) of hydrogen atom moves with a velocity of 2.3×10^6 m/sec ii) A ball of mass 1.0 g moves with velocity of 2 m/sec.	[3]	1	2
Q.2(a)	What are conjugate variables? State and explain the Heisenberg's uncertainty principle.	[2]	1	1
Q.2(b)	What is Schrodinger's wave equation in quantum mechanics? What are acceptable wave functions (ψ)? Explain the significance of term ψ^2.	[3]	1	2
Q.3(a)	What is nuclear spin isomerism? Give example.	[2]	2	1
Q.3(b)	Draw the Born Haber type cycle and write the expression for the heat of formation of proton and hydride ion from HCl.	[3]	2	2
Q.4(a)	Instead of highest ionization potential among alkali metals, Li has lowest reduction potential. – Explain	[2]	2	1
Q.4(b)	Discuss the density, magnetic susceptibility and equivalent conductance of a solution of Na in liq. NH_3.	[3]	2	2
Q.5(a)	Explain the stability order of the following carbocations $+CH_3$, $+CH_2CH_3$, $+CMe_3$, $+CH(Me_3)_2$	[2]	3	2
Q.5(b)	Explain why in cyclooctatetraene two types of C-C bond lengths (0.133 nm and 0.146 nm) are observed? Explain the origin of high dipole moment (μ = 6.3D) for the following molecule 	[3]	3	2

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