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

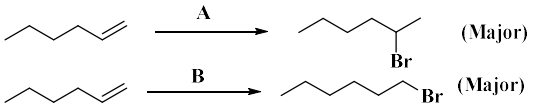
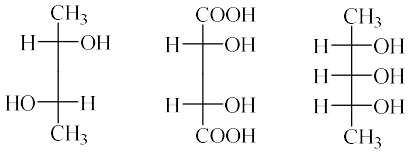
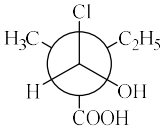
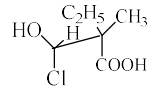
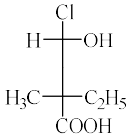
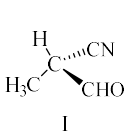
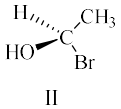
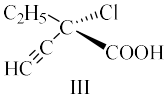
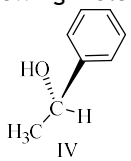
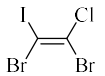
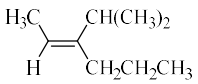
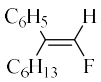
CLASS: IMSc **SEMESTER: I**
BRANCH: Mathematics & Computing **SESSION: MO/2025**

SUBJECT: CH111 CHEMISTRY-I

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.**

			CO	BL
Q.1(a)	Correlate Bohr's theory of atomic structure with de Broglie's matter wave. Validate Pauli's exclusion principle considering any two 3d electrons of Mn^{2+}.	[3+2]	1	1
Q.1(b)	What is atomic orbital? What is radial probability distribution function? Draw the radial probability distribution curves for 1s, 2s, 2p and 3p orbitals.	[5]	1	1
Q.2(a)	How the electron deficiency in boron is satisfied? With the diagram discuss the structure and bonding in binary compound of boron and hydrogen.	[5]	2	2
Q.2(b)	Draw the structure of diborane and discuss the bonding.	[5]	2	1
Q.3(a)	Explain S_N1 and S_N2 reactions with suitable examples.	[5]	3	1
Q.3(b)	 Identify the reagents A and B and explain the product formation with suitable examples.	[5]	3	2
Q.4(a)	For the crystalline solids, find the minimum radius ratio to attain tetrahedral and planar trigonal lattice.	[5]	4	1
Q.4(b)	From Fajan's Rule, predict i) thermal stability of alkaline earth metal carbonates ii) Acidity of aqueous solution of hydrated salt of Fe(II) and Fe(III).	[5]	4	2
Q.5(a)	What is optical activity? Are the following molecules optically active?  Carry out the following interconversions  (Newman to Fischer)  (Sawhorse to Newman)  (Fischer to Sawhorse)	[5]	5	3
Q.5(b)	Determine the R/S and E/Z nomenclature of the following molecules.  I  II  III  IV  V  VI  VII	[5]	5	3

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