

BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI  
(MID SEMESTER EXAMINATION SP2023)

CLASS: IMSc.  
BRANCH: CHEMISTRY  
TIME: 02 Hours

SUBJECT: CH108R1 ORGANIC CHEMISTRY-I

SEMESTER: II  
SESSION: SP-2023  
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

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|--------|--|----|----|
| Q.1(a) | How does bond polarization differ from bond polarizability? Explain with examples. [2]   | 1  | 4  |
| Q.1(b) | Write a short note on hyperconjugation with examples. Why is the C-H bond of acetylene shorter than ethylene? [2+1]  | 2  | 4  |
| Q.2(a) | Draw the $\pi$ -MO arbitrary energy level diagram of 1,3,5-hexatriene (6- $\pi$ electron) and indicate the HOMO and LUMO. [3]  | 1  | 3  |
| Q.2(b) | Draw and demonstrate the orbital structure of carbocation and carbanion. [2]   | 1  | 2  |
| Q.3(a) | Discuss the formation and structure of free radical, carbene, and nitrene with an example reaction. [3]  | 2  | 3  |
| Q.3(b) | Indicate the symmetry element present in (i) Benzene and (ii) Di-bromomethane [2]  | 1  | 3  |
| Q.4(a) | Draw all possible stereoisomers of $\text{CH}_3\text{CH}_2\text{CH}(\text{OH})\text{CH}=\text{CHCH}_2\text{CH}_3$ and designate them by (R/S) (E/Z) notations. Label the following pairs of molecules as enantiomers and diastereomers [2+2] | 2  | 4  |
| Q.4(b) | Label the following pairs of molecules as homomers, enantiomers or diastereomers. Explain your answer: [1]   | 1  | 3  |
|        |  |    |    |
| Q.5(a) | Label the following pairs of molecules as homomers, enantiomers or diastereomers. Explain your answer: [1]   | 1  | 3  |
|        |  |    |    |
| Q.5(b) | Draw the energy profile diagram for rotation around C2-C3, bond of meso-2,3-butane-diol with proper labelling. [4]   | 2  | 4  |