

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

CLASS: IMSc  
BRANCH: Mathematics & Computing

SEMESTER : I  
SESSION : MO/2023

SUBJECT: CH111 CHEMISTRY-I

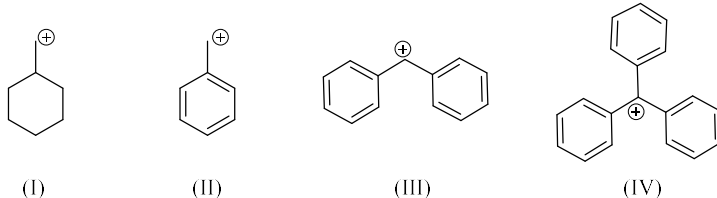
TIME: 3 Hours

FULL MARKS: 50

**INSTRUCTIONS:**

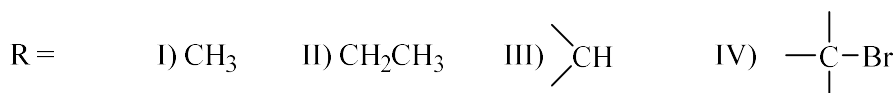
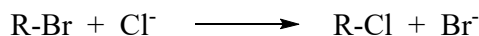
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
4. Before attempting the question paper, be sure that you have got the correct question paper.
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

- |  | CO      | BL |
|--|---------|----|
| Q.1(a) Write the postulates of Bohr's atomic theory. State and explain the Heisenberg uncertainty principle  | [2+3] 1 | 1  |
| Q.1(b) Write down the Schrodinger wave equation for hydrogen-like system. What is atomic orbital? Draw the probability distribution and radial probability distribution curves for 1s and 2s orbitals? | [2+3] 1 | 2  |
| Q.2(a) Write short note on Inert Pair Effect.  | [5] 2   | 1  |
| Q.2(b) Draw the structure and discuss the bonding in B <sub>2</sub> H <sub>6</sub>   | [5] 2   | 2  |
| Q.3(a) Explain the order of stability for the following carbocations.  | [3+2] 3 | 2  |

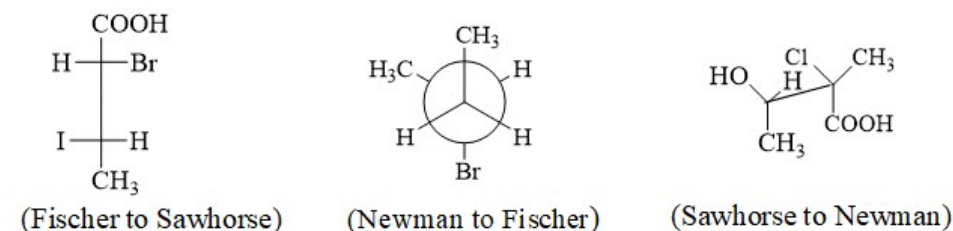


Explain, why does the addition of singlet carbene to cis-2-butene lead to stereospecific addition, while it is stereoselective if it is triplet carbene.

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|---|---------|---|
| Q.3(b) Explain the relative reaction rate ( $K_r$ ) of the following S <sub>N</sub> 2 reaction. | [3+2] 3 | 3 |
|---|---------|---|

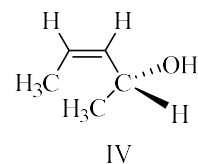
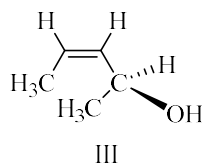
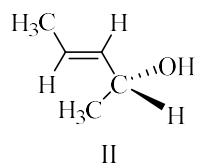
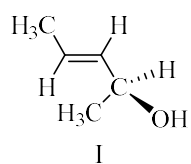


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|---|---------|---|
| Q.4(a) Give example of different types of stoichiometric defects in ionic solids. Differentiate between n type and p type semiconductor | [2+3] 4 | 1 |
| Q.4(b) Draw the Born Haber cycle for CaCl <sub>2</sub> . According to VSEPR theory, draw the structure of ICl <sub>3</sub>              | [3+2] 4 | 2 |
| Q.5(a) Carry out the following conversion   | [3+2] 4 | 2 |



Draw the structure of Z and E 2-pentene.

Q.5(b) Draw both the enantiomers (R & S) of the chemical formula 1,2-dibromo-2-methylbutane. Explain the relationship between following molecules [2+3] 4 2



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