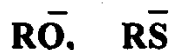




THE ANSWERS MUST BE ATTEMPTED ON THE ANSWER SHEET PROVIDED

Q.1. Answer the following short questions: (6x5=30)

- i. Among the following which is stronger base and which is better nucleophile in an aqueous solution? Briefly justify your answer.



- ii. Explain why the reaction of an alkyl halide with ammonia gives a low yield of primary amine.
- iii. What is deuterium kinetic isotope effect? Explain with example.
- iv. Would you expect acetate ion to be a more reactive nucleophile in an $\text{S}_{\text{N}}2$ reaction carried out in methanol or in dimethyl sulfoxide? Why?
- v. If 2-fluoropentane were to undergo an $\text{E}1$ reaction, would you expect the major product to be the one predicted by Zaitsev's rule? Explain.
- vi. *cis*-1-Bromo-4-*tert*-butylcyclohexane and *trans*-1-bromo-4-*tert*-butylcyclohexane both react with sodium ethoxide in ethanol to give 4-*tert*-butylcyclohexene. Explain why the *cis* isomer reacts much more rapidly than the *trans* isomer.

Answer the following questions.

Question # 2. [10]

What products (including stereoisomers if applicable) would be formed from the reaction of following compounds with OH^- under $\text{S}_{\text{N}}2$ / $\text{E}2$ conditions and under $\text{S}_{\text{N}}1$ / $\text{E}1$ conditions?

- I. 3-bromo-2-methylpentane
II. 3-bromo-3-methylpentane

Question # 3. [5+5]

A. $\text{CH}_3\text{CH}=\text{CHCH}_2\text{Cl}$ on solvolysis with 0.8 M NaOH at room temperature yields two products. With justification identify the major product. ($\text{S}_{\text{N}}1'$ reaction)

B. Explain the mechanism and synthetic applications of pyrolytic elimination reactions.

Question # 4. [5+5]

- A. What is $\text{E}1\text{cB}$ elimination reaction? Give two examples with complete mechanism.
- B. What is neighboring group participation in aliphatic nucleophilic substitution reactions? Give two examples with complete mechanism.