Exercise 13: - Elimination reactions

1. When 3-bromo-2,2-dimethylbutane is heated with a dilute solution of sodium ethoxide in ethanol, reaction follows first-order kinetics. Along with substitution, elimination occurs to yield 2,3-dimethyl-2-butene and 2,3-dimethyl-1-butene. Propose a mechanism for their formation.

2. Propose a mechanism for the formation of (*Z*)-2-bromo-2-butene from both (*R,R*) and (*S,S*)-2,3-dibromobutane via a dehydrobromination reaction.

3. Partial dehydrohalogenation of (1R,2R)-1,2-dibromo-1,2-diphenylethane gives (Z)-1-bromo-1,2-diphenylethene.

    a. Draw the structure of (1R,2R)-1,2-dibromo-1,2-diphenylethane.

    b. Draw the structure of (Z)-1-bromo-1,2-diphenylethene.

    c. Propose a mechanism for this reaction.

4. The rate of dehydrohalogenation of *cis*-1-bromo-4-*tert*-butylcyclohexane is proportional to the concentration of both the bromide and the base whereas the rate of dehydrohalogenation of the *trans* isomer is only proportional to the concentration of the bromide.

    a. Draw the structure of *cis*-1-bromo-4-*tert*-butylcyclohexane.

    b. Propose a mechanism for the dehydrohalogenation of the *cis*-1-bromo-4-*tert*-butylcyclohexane.

    c. Draw the structure of *trans*-1-bromo-4-*tert*-butylcyclohexane.

    d. Propose a mechanism for the dehydrohalogenation of the *trans*-1-bromo-4-*tert*-butylcyclohexane.

    e. Explain why the *trans*-1-bromo-4-*tert*-butylcyclohexane cannot react by a second order mechanism.

5. Base treatment of (*2R,3S*)-2-bromo-3-deuteriobutane gave, in addition to the deuterated 1-butene, only (*Z*)-2-deuterio-2-butene and (*E*)-2-butene. Explain.