Alkyl Halides: Elimination reaction with (chloromethyl)cyclohexane

Part A

Draw the major product obtained when the following alkyl halide undergoes an E1 reaction. If you expect no reaction to occur, submit the starting material as your answer.

Interactive 3D display mode

Draw the molecule on the canvas by choosing buttons from the Tools (for bonds), Atoms, and Advanced Template toolbars. The single bond is active by default.

ANSWER:

Correct

Primary alkyl halides do not undergo E1 elimination reactions.

Alkyl Halides: Elimination reaction with 1-chloro-1-methylcyclohexane

Part A
Draw the major product obtained when the following alkyl halide undergoes an E1 reaction. If you expect no reaction to occur, submit the starting material as your answer.

Interactive 3D display mode

**ANSWER:**

Correct

A more substituted alkene is formed. The proton is removed from the β C atom that is bonded to the fewest H atoms (Zaitsev's rule).

**Problem 7-19**

The solvolysis of 2-bromo-3-methylbutane potentially can give several products, including both E1 and S_N1 products from both the unrearranged carbocation and the rearranged carbocation.

**Part A**

Indicate which carbocation each product came from.

Drag the appropriate products to their respective bins.

**ANSWER:**
Problem 7-20

Give the substitution and elimination products you would expect from the following reactions.

Part A

Draw the substitution product for the reaction of 3-bromo-3-ethylpentane heated in methanol.
Draw the molecule on the canvas by choosing buttons from the Tools (for bonds and charges), Atoms, and Templates toolbars.

ANSWER:

Part B

Draw the elimination product for the reaction of 3-bromo-3-ethylpentane heated in methanol.

Draw the molecule on the canvas by choosing buttons from the Tools (for bonds and charges), Atoms, and Templates toolbars.

ANSWER:
Part C

Draw the substitution product for the reaction of 1-iodo-1-phenylcyclopentane heated in methanol.

Draw the molecule on the canvas by choosing buttons from the Tools (for bonds and charges), Atoms, and Templates toolbars.

ANSWER:

Part D

Draw the elimination product for the reaction of 1-iodo-1-phenylcyclopentane heated in methanol.

Draw the molecule on the canvas by choosing buttons from the Tools (for bonds and charges), Atoms, and Templates toolbars.

ANSWER:
Part E

Draw the substitution product for the reaction of 1-bromo-2-methylcyclohexane + silver nitrate in water ($\text{AgNO}_3$ forces ionization) heated in methanol. (Assume no rearrangement.)

Draw the molecule on the canvas by choosing buttons from the Tools (for bonds and charges), Atoms, and Templates toolbars.

ANSWER:
Part F

Draw the elimination product for the reaction of 1-bromo-2-methylcyclohexane + silver nitrate in water (AgNO₃ forces ionization) heated in methanol. (Assume no rearrangement.)

Draw the molecule on the canvas by choosing buttons from the Tools (for bonds and charges), Atoms, and Templates toolbars.

ANSWER:

Alkyl Halides: Elimination reaction with 1-chloro-2-methylcyclohexane

Part A

Draw the major product obtained when the following alkyl halide undergoes an E1 reaction. If you expect no reaction to occur, submit the starting material as your answer.

Interactive 3D display mode

Draw the molecule on the canvas by choosing buttons from the Tools (for bonds), Atoms, and Advanced Template toolbars. The single bond is active by default.

ANSWER:
Alkyl Halides: Elimination reaction with 2-bromobutane

Part A

Draw the major product obtained when the following alkyl halide undergoes an E1 reaction. If you expect no reaction to occur, submit the starting material as your answer.

Interactive 3D display mode

Draw the molecule on the canvas by choosing buttons from the Tools (for bonds), Atoms, and Advanced Template toolbars. The single bond is active by default.

ANSWER:
Correct
The major product is the trans isomer of the more substituted alkene.

Alkyl Halides: E2 reaction with (chloromethyl)cyclohexane

Part A
Draw the major product obtained when the following alkyl halide undergoes an E2 reaction. If you expect no reaction to occur, submit the starting material as your answer.

Interactive 3D display mode

Draw the molecule on the canvas by choosing buttons from the Tools (for bonds), Atoms, and Advanced Template toolbars. The single bond is active by default.

ANSWER:
Correct
The proton is removed from a C atom that is adjacent to the C atom bonded to the halogen.

Alkyl Halides: E2 reaction with 2-bromobutane

Part A
Draw the major product obtained when the following alkyl halide undergoes an E2 reaction. If you expect no reaction to occur, submit the starting material as your answer.
Interactive 3D display mode

Draw the molecule on the canvas by choosing buttons from the Tools (for bonds), Atoms, and Advanced Template toolbars. The single bond is active by default.

ANSWER:
Chapter 7 Reading Quiz Question 7

Part A
Which compound is the major product of the treatment of \((1R,2R)\)-1-bromo-1,2-dimethylcyclohexane with NaOCH$_3$ in CH$_3$OH solvent?

\[ \text{Pr}_{\text{NaOCH}_3} \xrightarrow{} \ ? \]

\[ \text{A} \quad \text{B} \quad \text{C} \quad \text{D} \]

**Hint 1. Reactions of alkyl halides under basic/nucleophilic conditions**

When an alkyl halide is treated with a species that is both strongly basic and nucleophilic, in principle both substitution (S$_N$2) and elimination (E2) reactions are possible. In such cases the nature of the substrate and the solvent are important in determining which process predominates. See 7-12.

**ANSWER:**

- A
- B
- C
- D

Correct
Problem 7-25 - Enhanced - with Feedback

You may want to reference (Page) Section 7.13 while completing this problem.

For each reaction, decide whether substitution or elimination (or both) is possible, and predict the products you expect.

**Part A**

Draw the major product from the following reaction: 1-bromo-1-methylcyclohexane + NaOH in acetone.

**Draw the molecule on the canvas by choosing buttons from the Tools (for bonds and charges), Atoms, and Templates toolbars.**

**ANSWER:**

![Molecule](image)

**Correct**

Since NaOH is not a bulky base, the major product formed from the elimination will be the Zaitsev product, the most highly substituted alkene possible, 1-methylcyclohex-1-ene. The minor product would be methylenecyclohexane, while no SN2 product would be observed for this tertiary alkyl halide.

**Part B**

Draw the major product from the following reaction: 1-bromo-1-methylcyclohexane + triethylamine (Et3N:).

**Draw the molecule on the canvas by choosing buttons from the Tools (for bonds and charges), Atoms, and Templates toolbars.**

**ANSWER:**

---
Correct

Elimination commonly results when a base or nucleophile is used with a poor $S_N 2$ substrate such as a $3^-$ or hindered $2^-$ alkyl halide. $Et_3N$: is considered a bulky base and elimination reactions using bases that are sterically hindered abstract a less hindered proton, often the one that leads to formation of the least highly substituted product, or the Hoffman product, methylenecyclohexane. The minor product would be 1-methylcyclohex-1-ene, while no $S_N 2$ product would be observed for this tertiary alkyl halide.

Part C

Draw the major products from the following reaction: chlorocyclohexane + NaOCH$_3$ in CH$_3$OH. (with two products being equally likely to be formed).

Draw the molecule on the canvas by choosing buttons from the Tools (for bonds and charges), Atoms, and Templates toolbars.

ANSWER:
Correct

The major product is difficult to predict for unhindered 2° halides and strong, unhindered bases or nucleophiles. Both elimination (E2) and substitution (SN2) products are likely, so both cyclohexene (E2) and methoxycyclohexane (SN2) are formed as products.

Part D

Draw the major product from the following reaction: chlorocyclohexane + NaOC(CH₃)₃ in (CH₃)₄COH.

Draw the molecule on the canvas by choosing buttons from the Tools (for bonds and charges), Atoms, and Templates toolbars.

ANSWER:

Correct

Since NaOC(CH₃)₃ is a bulky base and poor nucleophile, the substitution (SN2) is less likely than the elimination (E2) reaction to occur. The major product formed is cyclohexene.

Alkyl Halides: Elimination reaction with (2R,3R)-2-chloro-3-methylpentane

Part A

Draw the product formed when the structure shown below under-goes an elimination reaction with NaOCH₃. Indicate the stereochemistry of the product.

Interactive 3D display mode
Draw the molecule on the canvas by choosing buttons from the Tools (for bonds), Atoms, and Advanced Template toolbars. The single bond is active by default.

ANSWER:

\[
\begin{align*}
&H_3C \quad \text{H} \\
&\text{CH}_3 \\
&\text{CH}_3 \\
\end{align*}
\]

Correct
Under these basic conditions, the reactant undergoes an E2 elimination to make the more substituted product (Zaitsev's rule). The major diastereomer obtained is the one that is derived from the conformer of the starting material in which the breaking C-H and C-Cl bonds are anti.

Problem 7-33 (a-e, g)

Predict the major product of the following reactions.

Part A

1-bromohexane + sodium ethoxide in ethanol

Draw the molecule on the canvas by choosing buttons from the Tools (for bonds and charges), Atoms, and Templates toolbars.

ANSWER:
Part B

2-chlorohexane + NaOCH$_3$ in methanol

Draw the molecule on the canvas by choosing buttons from the Tools (for bonds and charges), Atoms, and Templates toolbars.

ANSWER:
Part C

2-chloro-2-methylbutane + NaOH in ethanol

Draw the molecule on the canvas by choosing buttons from the Tools (for bonds and charges), Atoms, and Templates toolbars.

ANSWER:

![Molecule Image]

Correct

Part D

2-chloro-2-methylbutane heated in ethanol

Draw the molecule on the canvas by choosing buttons from the Tools (for bonds and charges), Atoms, and Templates toolbars.

ANSWER:
Part E

isobutyl iodide + KOH in ethanol/water

Draw the molecule on the canvas by choosing buttons from the Tools (for bonds and charges), Atoms, and Templates toolbars.

ANSWER:
Part F

1-bromo-1-methylcyclopentane + NaOEt in ethanol

Draw the molecule on the canvas by choosing buttons from the Tools (for bonds and charges), Atoms, and Templates toolbars.

ANSWER:

Correct

Score Summary:
Your score on this assignment is 89.3%.
You received 10.72 out of a possible total of 12 points.