Problem Set  Chapter 8  Answer Key

1. a)  \((1E, 4Z)\)-1-chloro-1-iodo-4-methyl-1,4-hexadiene

b)  the three remaining isomers are

\[
\begin{align*}
&(1E, 4E) & (1Z, 4E) & (1Z, 4Z) \\
\end{align*}
\]

2. a)

b) Yes, the double bond at C5–C6.

c)

\[
\begin{align*}
&(1E, 5E) & (1Z, 5E) & (1Z, 5Z) \\
\end{align*}
\]

3. a.

This is because the E2 mechanism requires the H and the Br be anti.
4. a. The major product is the alkene. The minor product could be minimized by (1) lowering the temperature of the reaction or (2) using an RI or ROTs instead of a RCl.

b. The first one on the left.

c. It’s lowest energy (and therefore most populated, highest relative concentration) conformation is the reactive conformation with the Br on C2 and H on C1 anti to each other and both axial.

5. a) (most stable) B > D > A > C (least stable)

6. a. (There are other conformations that could be drawn)

   b. This is the reactive conformation, with the C3 Br and C4 H anti. In this conformation, the C3 H and C4 ethyl groups are anti, resulting in the observed trans relationship in the product alkene. Likewise, the C3 alkenyl substituent and the C4 methyl group are anti, resulting in the observed trans relationship in the product alkene.

   c. There’s no H on C2, so you can’t make a C=C bond by elimination of HBr between C2 and C3.

   d. Yes.

7. anti-elimination requires that double bond formation occur between carbons 2 and 3 of the ring: the H on carbon 1 is gauche to the chlorine on carbon 2.
8.

a) 

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

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

or

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

or

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

b & c) They are both tetrasubstituted alkenes, so should be of similar stability. A has no conformation without considerable eclipsing interactions about the double bond, however. So in fact B is more stable, and is the major product that forms.
10. a. 

*trans*-4-(2-chloroethyl)-3-vinyl-1-cyclohexene or *trans*-4-(2-chloroethyl)-3-ethenyl-1-cyclohexene

or, if named as a single enantiomer,

(3S,4S)-4-(2-chloroethyl)-3-vinyl-1-cyclohexene or (3S,4S)-4-(2-chloroethyl)-3-ethenyl-1-cyclohexene

b.

![Chemical structure](image)

11.

![Chemical structure with Z and E labels](image)