(8 pts) 1. Label each of the following as being E or Z isomers.

\[
\begin{align*}
\text{Cl} & \quad \text{OH} \\
\text{H}_3\text{C} & \quad \text{O} \\
\text{Br} & \quad \text{Cl}
\end{align*}
\]

(8 pts) 2. Name each of the following.

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

(8 pts) 3. Draw unambiguous pictures for each of the following compounds.

- allylchloride
- (Z)-3-chloro-3-heptene

(8 pts) 4. Draw a Newman projection for the most stable conformation of 2,2,-dimethyl-3,4-dichloro pentane along the C3-C4 bond. **Name** the two forces that are minimized in this conformation.

Draw the least stable conformation of 2,2,-dimethyl-3,4-dichloropentane.

(10 pts) 5. Draw the most stable conformation of trans-1-isopropyl-3-methylcyclohexane.

Draw the least stable chair conformation of trans-1-isopropyl-3-methylcyclohexane.
6. Draw the important product forming intermediate and the major product(s) expected for each of the following.

a. 

b. 

c. 

d. 

7. Draw the major product(s) expected from each of the following. Be sure to show any pertinent stereochemistry.

a. 

b. 

8. Draw the major products expected from each of the following and check the box next to the reaction that would proceed with the greater rate constant. Explain your rate prediction.

a. 

b. 

(6 pts) 9. Write out the steps involved in the mechanism for chlorination of cyclopentane.

Give an example of one possible termination step.

(5 pts) 10. Draw an arrow mechanism for the following reaction.

(5 pts) 11. The following transformation cannot be completed with a single reaction (set of reagents) but would require a sequence of reactions. Write the equations for a sequence of reactions/reagents that would permit the synthesis of 1-bromo-1-methylcyclohexane from trans-2-methylcyclohexanol.