1. Determine the R or S configuration of each of the chiral centers in the molecule shown below. Clearly number the priority of each group. (10 points, 8 minutes)

2. Give the IUPAC name of the following molecule. (8 points, 6 minutes)

3. Show the product or products of the following reaction. (8 points, 6 minutes)
4. What is the relationship between these two molecules (identical, enantiomers, diastereomers, unrelated)? You are not required to determine R and S. (8 points, 6 minutes)

5. Draw both chair conformations of the following molecule. Indicate which conformer is lower in energy. (8 points, 6 minutes)

6. Draw one reasonable resonance structure for each of the following molecules. The resonance structure you draw should be a major contributor, a stable resonance structure. (8 points, 6 minutes)
7. Give a step by step mechanism for each of the following TWO reactions. (15 points, 12 minutes)
8. Give the product or products of each of the following reactions. Be sure to include stereochemistry and to show all products that form. (7 pts each, 5 min each)

a. \[
\text{\begin{align*}
\text{\text{Reaction 1}} \\
\text{OCH}_3 \\
\end{align*}}
\]

b. \[
\text{\text{Reaction 2}} \\
\text{Cl}_2 \\
\text{meso} \\
\end{align*}}
\]

c. \[
\text{\text{Reaction 3}} \\
\text{Et} \\
\text{Me} \\
\text{D} \\
\text{Pr} \\
\end{align*}}
\]

1. OsO_4
2. NaHSO_3

\[
\text{\text{Reaction 4}} \\
\text{cis} \\
\text{trans} \\
\text{both achiral} \\
\end{align*}}
\]

1. BH_3
2. OH, H_2O_2

e. \[
\text{\text{Reaction 5}} \\
\text{excess H}_2 \\
\text{Pd} \\
\text{6} \\
\end{align*}}
\]

- \[
\text{\text{Product 1}} \\
\text{\text{Product 2}} \\
\text{\text{Product 3}} \\
\end{align*}}
\]