<table>
<thead>
<tr>
<th>Comments</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>This review was interactive and engaging.</td>
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<td>The presentation volume was acceptable.</td>
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<td>The presentation was visually clear and logically oriented</td>
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<td>This review improved/reinforced your understanding of the material.</td>
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<td>The quality of the review packet was excellent.</td>
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<td>Would recommend attending review sessions.</td>
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<td>Do you use our weekly worksheets available at <a href="http://sites.uci.edu/ochemtutors/">http://sites.uci.edu/ochemtutors/</a>?</td>
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<td>Comments:</td>
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1. Below are the IR spectra for the chemical compounds of C₄H₈O.

   a. Determine what functional groups are described by the spectra
   b. Match the spectra with its corresponding chemical structure

**Compounds**

- Cyclobutanol
- 2-Butanone
- Ethyl vinyl ether
- 2-methyl-2-propen-1-ol
- 2-methylpropanal
### SN1 vs. SN2

**SN1**
- **Mechanism:** More than one step!
- **Substrate:** \( 3 > 2 > 1 > \text{methyl} \)
- **Nucleophilic Strength:** Not important! (can occur with weak Nuc)
- **Solvent:** Polar Aprotic Favored!
- **Good Leaving Group Required!**
- **Rate Law:** \( K[\text{Sub}] \)
- **Stereochemistry:** Racemic!

**SN2**
- **Mechanism:** One step!
- **Substrate:** methyl > 1 > 2 > 3
- **Nucleophilic Strength:** Strong Nuc (Typically a strong base or high electron density)
- **Solvent:** Polar Protic Favored!
- **Good Leaving Group Required!**
- **Rate Law:** \( K[\text{Sub}][\text{Nuc}] \)
- **Stereochemistry:** Inversion!

See Dr. King’s website for a handout comparing SN1 and SN2 [here](#).
2. Below is a scary looking molecule and acetic acid! Answer the following questions!

\[
\begin{align*}
\text{\textbf{a.} Predict the product(s) for the above nucleophilic substitution reaction, showing} \\
\text{proper stereochemistry. Provide a mechanism for the product(s) formation below.}
\end{align*}
\]

\[
\begin{align*}
\text{\textbf{b.} How many transition states would the above reaction have?}
\end{align*}
\]

\[
\begin{align*}
\text{\textbf{c.} Write the rate law equation for the above reaction. Is this a bimolecular or a} \\
\text{unimolecular reaction?}
\end{align*}
\]

3. Below is another scary molecule and \(N,N\)-dimethylformamide (DMF). What nucleophile is needed to produce the following product?

\[
\begin{align*}
\text{\textbf{Solvent: DMF}}
\end{align*}
\]
4. Answer the following questions about the featured molecule.

\[
\text{H}_2\text{N} - \text{\begin{tikzpicture}[baseline=(current  bounding box.center)]
\draw (0,0) -- (1,0) -- (2,0) -- (3,0) -- (4,0) -- (5,0);
\end{tikzpicture}} \text{O}^-\]

a. Draw all resonance structures.

b. Draw the resonance hybrid.

c. Indicate the major contributor to the resonance hybrid.

5. Rank the following molecules in order of strongest to weakest acid.

A: \( \text{O}_2\text{N} - \text{HO} \)
B: \( \text{NH}_2 \)
C: \( \text{O}_2\text{N} - \text{HO} \)
D: \( \text{I} - \text{HO} \)
E: \( \text{NH}_2 \)
6. Rank the following molecules in order of increasing reactivity with hydroxide ion in a substitution reaction.

- A: \( \text{Cl}_2\text{H}_2\text{H} \)
- B: \( \text{Cl}_2\text{H}_2\text{H} \)
- C: \( \text{I}_2\text{H}_2\text{H} \)
- D: \( \text{Ph}_2\text{H}_2\text{H} \)
- E: \( \text{H}_2\text{H}_2\text{H} \)

7. Rank the following molecules in order of increasing carbocation stability.

- A: \( \text{O}_2\text{N}_2\text{H}_2\text{H}^+ \)
- B: \( \text{H}_2\text{H}_2\text{H}^+ \)
- C: \( \text{H}_2\text{H}_2\text{H}^+ \)
- D: \( \text{H}_2\text{H}_2\text{H}^+ \)
- E: \( \text{H}_3\text{CO}_2\text{H}^+ \)
8. For single molecules shown (a and b), identify as chiral, achiral, or neither. More than one answer may apply. For pairs of molecules (c and d), identify as enantiomers, diastereomers, identical or neither.

a

b

c

d
9. Stereochemistry: observe the following compound.

![Chemical Structure](image)

a. Name the compound.

b. Indicate absolute configuration, \( R \) or \( S \), at any stereocenters.

![Chemical Structure](image)

c. Draw the Newman projection for the staggered conformation shown above looking down the third and second carbons.

d. Draw the Newman projection of the highest energy conformation using.

<table>
<thead>
<tr>
<th>Atom or Group</th>
<th>Van der Waal’s Radius (pm)</th>
</tr>
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<tbody>
<tr>
<td>H</td>
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</tr>
<tr>
<td>CH(_3)</td>
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<tr>
<td>Cl</td>
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<tr>
<td>I</td>
<td>198</td>
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Please fill out the evaluation forms.

Good luck on the final!