a) Show the alkyl bromide and alcohol used to make methyl t-butyl ether using the Williamson ether synthesis to the right of the retrosynthetic arrow.

b) Complete the general mechanism by adding curved arrows and drawing the final organic product. (Note that R is an abbreviation for any alkyl group and can be found on the bottom row in the pull down periodic table in the drawing tools menu.)

Unsymmetrical ethers can be made by the Williamson synthesis, in which an alkoxide ion reacts with an alkyl bromide. Draw the structure of the alkoxide and the alkyl bromide needed to produce 2-ethoxy-2-methylpropane (a.k.a t-butyl ethyl ether), shown below. Show charges where appropriate.

Indicate whether the following reaction involves C–O or O–H bond cleavage of the alcohol molecule.
Predict the neutral organic product of the following reaction. Include hydrogen atoms in your structure.

When drawing hydrogen atoms on a carbon atom, either include all hydrogen atoms or none on that carbon atom, or your structure may be marked incorrect.

Select the descriptor (A, B, C, D):

that best describes the relationship between the "reactants" and "products" below:
Diisopropyl ether reacts with concentrated aqueous HI to form two initial organic products (A and B). Further reaction with HI produces organic product C from product B. Draw the structures of these three products.

2-Ethoxy-2,3-dimethylbutane reacts with concentrated aqueous HI to form two initial organic products (A and B). Further reaction with HI produces organic product C from product B. Draw the structures of these three products.

Predict the oxidation product of treating the given alkene with a peroxycacid reagent. Omit byproducts.
Question 9 of 25

**Sapling Learning**

Draw the major organic product of the following reaction.

\[
\begin{array}{c}
\text{CH}_3\text{CH}_2\text{MgBr} \\
\text{H}^+ \\
\end{array}
\]

Question 10 of 25

**Organic Chemistry**

Use the curved-arrow notation to indicate the flow of electrons in the reaction.
(To draw the arrows, click on the reaction to enter the edit mode, then click on the curved-arrow icon.)

Question 11 of 25

**Sapling Learning**
Question 12 of 25

Predict the oxidation product of treating the given alkene with the reagent shown below. Include stereochemistry where applicable. Include H’s on chirality centers. (mCPBA = meta-chloroper oxybenzoic acid)

```
  mCPBA, CH₂Cl₂
```

oxidized product

Question 13 of 25

Draw the major product formed in the following reaction of an epoxide with methoxide in methanol.

```
  H₂C  O  CH₃
  H₃C
  CH₃O⁻  CH₃OH
```

Question 14 of 25
Draw the major product formed when the following epoxide reacts with aqueous acid. Use wedge/dash bonds, including H's at each stereogenic center, to show the stereochemistry of the product.

![Epoxide Reaction with Aqueous Acid](image)

Question 15 of 25

Draw the major product formed when the following epoxide reacts with methanol in the presence of sulfuric acid. Use wedge/dash bonds, including H's at each stereogenic center, to show the stereochemistry of the product.

![Epoxide Reaction with Methanol](image)

Question 16 of 25

Predict the oxidation product of treating the given alkene with the reagents shown below. For any generated stereocenter, specify the configuration via wedge-and-dash bonds; only draw one enantiomer if more than one is possible. Include H's on chirality centers. (THF = tetrahydrofuran)

![Alkene Oxidation Reaction](image)

Question 17 of 25

Predict the organic products of the following reaction. Show stereochemistry clearly. The (R) or (S) designation for each stereocenter carbon atom is specified adjacent to the answer box, please draw the products accordingly.

![Alkene Oxidation Reaction](image)
1) OsO₄, pyridine
2) Na₂SO₃ or NaHSO₃ in H₂O

Predict the oxidation product of treating dihydronaphthalene with the reagents shown below. Only draw one enantiomer if more than one is possible. Include H's on chirality centers.
(mCPBA = meta-chloroperoxybenzoic acid)

dihydronaphthalene

Predict the neutral products of the following reaction. Show stereochemistry clearly. The (R) or (S) designation for each stereocenter carbon atom is specified adjacent to the answer box, please draw the products accordingly.
Question 20 of 25

Predict the neutral product of treating the given alkene with the reagents shown below. Only draw one enantiomer if more than one is possible. Include H's on chirality centers.

Question 21 of 25

Provide the missing reagents and organic structures needed to most efficiently produce the target product. The starting material is a cycloalkene, C_8H_{10}. Chirality centers must be shown using wedge and hatched bonds (as shown in the product); include hydrogen on any chirality centers.
Question 22 of 25

Sapling Learning

Construct a three-step synthesis of 3-bromo-3-methyl-2-butanol from 2-methyl-2-butene by dragging the appropriate formulas into the bins. Note that each bin will hold only one item, and not all of the given reagents or structures will be used.

<table>
<thead>
<tr>
<th>Reactant (2-methyl-2-butene)</th>
<th>Step 1 Product</th>
<th>Step 2 Product</th>
<th>Step 3 Product</th>
<th>Final Product (3-bromo-3-methyl-2-butanol)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PBr₃</td>
<td>Br₂</td>
<td>NaH</td>
<td>HBr/NaBr</td>
<td>Br₂</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Question 23 of 25

Sapling Learning

In each reaction box, place the best reagent and conditions from the list below.