1-10 are True/False. (10pts)

1) All alkynes have a Carbon-Carbon triple bond.

2) Internal alkynes have a triple bond flanked by alkyl substituents on both sides.

3) But-1-yne has two sp hybridized Carbon atoms.

4) Cyclobutanol is a cyclic, secondary alcohol.

5) Cyclobutanol is chiral.

6) The Carbon-Carbon triple bond is shorter than a Carbon-Carbon single bond.

7) But-1-yne is more acidic than But-2-yne.

8) Primary alcohols can be oxidized to aldehydes and carboxylic acids.

9) Enols are unstable, and will tautomerize into their more stable keto form.

10) Unsymmetrical alkynes can exist in isomeric Z and E forms.
11) Grignards are *Organometallic* reagents where Magnesium is covalently bound to Carbon (such as shown below):

```
  H   H   H
H-C-C-C-Mg-Br
  H   H   H
```

i) Indicate the two electrons that move when this powerful nucleophile reacts. (2pts)

ii) How would you make the above Grignard reagent using an *insertion* reaction? (2pts)

12) Identify the following functional groups. (5pts)

- R-O-H
- R-O-O-R
- R-H

- R-OH
- R-R
- R-OOH
- R-OR

- R-C=O
- R-O-R
- R-
13) Provide reagents to achieve the following transformations. (10 pts)

14) Draw curly arrows to show the mechanism of the following reaction. (4pts)
15) Draw 2-methylcyclohex-3-en-1-ol. (4pts)

16) Provide the products in the following reactions. (10pts)
17) Provide the reagents you could use to achieve this (multi step) transformation. (3pts)

BONUS QUESTION

How many of the five transformations in Q.13 are proceeding with regiochemistry that is ANTI-MARKOVNIKOV? (2pts)
1-10 are True/False. (10pts)

1) All alkynes have a Carbon-Carbon triple bond. \( T \)

2) Internal alkynes have a triple bond flanked by alkyl substituents on both sides. \( T \)

3) But-1-yne has two sp hybridized Carbon atoms. \( T \)

4) Cyclobutanol is a cyclic, secondary alcohol. \( T \)

5) Cyclobutanol is chiral. \( F \)

6) The Carbon-Carbon triple bond is shorter than a Carbon-Carbon single bond. \( T \)

7) But-1-yne is more acidic than But-2-yne. \( T \)

8) Primary alcohols can be oxidized to aldehydes and carboxylic acids. \( T \)

9) \textit{Enols} are unstable, and will tautomerize into their more stable \textit{keto} form. \( T \)

10) Unsymmetrical alkynes can exist in isomeric \textit{Z} and \textit{E} forms. \( F \)
11) Grignards are *Organometallic* reagents where Magnesium is covalently bound to Carbon (such as shown below):

\[
\begin{array}{c}
\text{H} \quad \text{H} \quad \text{H} \\
\text{H-} \quad \text{C-} \quad \text{C-} \quad \text{Mg-} \quad \text{Br} \\
\text{H} \quad \text{H} \quad \text{H}
\end{array}
\]

i) Indicate the two electrons that move when this powerful nucleophile reacts. (2pts)

- these two

ii) How would you make the above Grignard reagent using an *insertion* reaction? (2pts)

\[
\text{CH}_3\text{CH}_2\text{CH}_2\text{-Br} + \text{Mg} \rightarrow \text{CH}_3\text{CH}_2\text{CH}_2\text{-Mg-Br}
\]

12) Identify the following functional groups. (5pts)

- \(\text{R-O-H}\) **alcohol**
- \(\text{R-O-O-R}\) **Peroxide**
- \(\text{R-H}\) **Aldehyde**
- \(\text{R-\text{OH}}\) **Carboxylic acid**
- \(\text{R-\text{R}}\) **Ketone**
- \(\text{R-OOH}\) **Peroxy acid**
- \(\text{R-\text{OR}}\) **Ester**
- \(\text{R-\text{CO-R}}\) **Diketone**
- \(\text{R-O-R}\) **Ether**
- \(\text{R-\text{O}}\) **Epoxide**
13) Provide reagents to achieve the following transformations. (10 pts)

14) Draw curly arrows to show the mechanism of the following reaction. (4pts)
15) Draw 2-methylcyclohex-3-en-1-ol. (4pts)

16) Provide the products in the following reactions. (10pts)
17) Provide the reagents you could use to achieve this (multi step) transformation. (3pts)

```
Cyclohexene → H₃O⁺ → H₂CrO₄ → ketone
```

**BONUS QUESTION**
How many of the five transformations in Q.13 are proceeding with regiochemistry that is ANTI-MARKOVNIKOV? (2pts)

```
Two

( → CH₃CH₂Br & → CH₃CH₂COH )
```