1. Give the names and draw the structures of major product(s) of the following reaction:

\[
\text{3-methyl-3-hexene } \xrightarrow{\text{BH}_3, \text{THF}} \xrightarrow{\text{H}_2\text{O}_2, \text{OH}}
\]

2. Draw the structures of major product(s) of the following reaction:

\[
\text{7-methyl-3-octyne } \xrightarrow{\text{H}_2, \text{Lindlar Catalyst}} \xrightarrow{\text{O}_3, \text{Zn, H}_2\text{O}}
\]

3. Give the names and draw the structures of major product(s) of the following reaction:

\[
\text{2-bromo-5-ethyl octane } \xrightarrow{\text{CH}_3\text{C}≡\text{C- Na}^+, \text{THF}}
\]
4. Two of the following compounds are analyzed by mass spectrometry, and the following spectra are obtained. Determine the compound used for each spectrum, and determine the ions responsible for each peak with greater than 20% Relative Abundance.
5. Which of the following compounds is most consistent with the infrared spectrum given? Explain your reasoning.
6. Below, a mass spectrum and IR spectrum of an unknown compound are given. Using the spectra, determine the likely identity of the compound. Give the compound’s name and draw its chemical structure.