Note: All quizzes will be photocopied prior to being returned. In the event of a grading error, please submit the original quiz along with a note explaining the grading error. Do not mark on or alter the quiz in any way. Any marks or alteration may be taken as evidence of academic dishonesty and may result in a failing grade in the class and a letter in the student's file.

1. Make a sketch that shows the geometry of allene \((H_2C=\overset{\text{\large C}}{\text{\large C}}=\text{CH}_2)\). Use the axes and incomplete drawing shown below as a template (i.e., complete the drawing). Make sure that your sketch clearly shows the relative orientations of the \(\text{CH}_2\) groups and the carbon p-orbitals that are combined to make the \(\pi\) molecular orbitals in allene \((H_2C=\overset{\text{\large C}}{\text{\large C}}=\text{CH}_2)\). (5 points)

What is the hybridization of the carbon atoms in the \(\text{CH}_2\) groups? ______

What is the hybridization of the central carbon atom \( (=\overset{\text{\large C}}{\text{\large C}}=)\)? ______

Do the \(\text{CH}_2\) groups both lie in the same plane? ______

2. (Bruice, Problem 1.63a, 2 points)
   a. Give the products of the following acid-base reaction:

   \[
   \begin{array}{c}
   \text{CH}_3\text{COH} + \text{CH}_3\text{O}^- \rightleftharpoons \\
   \text{O} \\
   \text{CH}_3\text{COH} + \text{CH}_3\text{O}^- \\
   \end{array}
   \]

   b. Indicate whether reactants or products are favored at equilibrium.

3. Draw a Lewis structure for each of the following species. Make sure to show formal charges, as appropriate (Bruice, Problem 1.50df; 3 points):

   \(\text{N}_2\text{H}_4\) \hspace{1cm} \(\text{CH}_3\text{N}_2^+\)