Quiz 1 (10 pts)

1. (6 pts) Draw the products from each of the following acid-base reactions.

a. \( \text{KNH}_2 + \text{HOCCCH}_3 \rightarrow \)

b. \( \text{CH}_{3}\text{OH} + \text{CH}_3\text{Li} \rightarrow \)

c. \( \text{CH}_3\text{NaN} + \text{HCl} \rightarrow \)

2. (4 pts) Label any polar covalent bonds, using the \( \delta^+/-\) convention, within the following molecules.

\[
\begin{align*}
\text{H} & \quad \text{H} \\
\text{H} & \quad \text{H} \\
\text{H} & \quad \text{H} \\
\text{H} & \quad \text{H}
\end{align*}
\]

\[
\begin{align*}
\text{H} & \quad \text{H} \\
\text{H} & \quad \text{H}
\end{align*}
\]

\[
\begin{align*}
\text{H} & \quad \text{H} \\
\text{H} & \quad \text{H}
\end{align*}
\]

\[
\begin{align*}
\text{H} & \quad \text{H}
\end{align*}
\]
Quiz 2 (10 pts)

1. (6 pts) Give each of the following molecules acceptable names. You may use either the IUPAC system or “common” names for substituents.

   a) 

   b) 

   c) 

2. (4 pts) Give the products from each of the following acid-base reactions, approximate pK\(_a\) values for the acids on each side of the equations, and indicate which side is favored.

   a) 

   b)
Chemistry 3719R                                          Name:

Quiz 3 (10 pts)

1. (4 pts) Draw Newman projections that correspond to the following situations:

   a) The *lowest energy* conformation of *n*-pentane looking along the C-2 – C-3 bond axis.

   b) The *least stable* conformation of *n*-hexane looking along the C-3 – C-4 bond axis.

2. (6 pts) Which molecule is more stable, *cis*-1,3-diethylcyclohexane or *trans*-1,3-diethylcyclohexane? Draw chair conformations for each isomer and use them to explain your answer.
1. (6 pts) Draw the transition states associated with each of the following reaction steps:

\[ \text{HO} \quad \xrightarrow{\text{HCl}} \quad \text{H}_2\text{O} \quad \xrightarrow{\text{Cl}^-} \quad \text{ClH} \]

2. (4 pts) Draw a reaction profile (on the axes given below) that describes energy changes during the reaction.

\[ \text{HO} \quad \xrightarrow{\text{HCl}} \quad \text{ClH} \]

Label places on the profile that correspond to transition states or reactive intermediates (you don’t need to draw them just label where they are found).
1. (6 pts) **Draw a reaction profile** (on the axes given below) that describes energy changes during the reaction.

   ![Reaction Profile](image)

   Label places on the profile that correspond to transition states or reactive intermediates (you don’t need to draw them just label where they are found), then indicate which step is rate-determining.

2. (4 pts) Provide the **major** products expected from each of the following bromination reactions.

   a) ![Bromination Reaction a](image)

   b) ![Bromination Reaction b](image)
1. (6 pts) Give a complete mechanism for the formation of the major product in the following reaction:

\[
\text{H}_2\text{SO}_4, \Delta \quad \text{OH} \quad \rightarrow \quad \text{+}
\]

2. (4 pts) Provide the major organic products only from the following reactions.

a)

\[
\text{Br} \quad \text{NaOCH}_3, \Delta \quad \rightarrow
\]

b)

\[
\text{OH} \quad \text{H}_3\text{PO}_4, \Delta \quad \rightarrow
\]
1. (6 pts) Give the major and minor products formed under the following conditions, then a complete mechanism for the formation of those products:

![Chemical structure](image)

2. (4 pts) Provide the major and minor products from the following reactions.

a) ![Reaction scheme](image)

b) ![Reaction scheme](image)
Quiz 8 (10 pts)

1. (10 pts) Answer the following questions related to the hydroboration-oxidation shown below:

\[
\text{Cyclohexene} \xrightarrow{1. \text{H-B(cyclohexyl)}_2} \text{Cyclohexanol} + \text{Cyclohexanol}
\]

\[1. \text{NaOH, } \text{H}_2\text{O}_2\]

a) Explain the regiochemical outcome of the reaction.

b) Is the hydroboration step concerted or stepwise?

c) Draw a mechanism for the oxidation process that gives the major product (step 2).
2. (10 pts) Identify any asymmetric carbon atoms in the following molecules and label them as having either the (R) or (S) configuration.
1. (6 pts) Within each of the following pairs of molecules, identify any chiral centres, label those centers as being the (R) or (S) configuration, and then indicate the relationship between the two molecules (i.e. are they enantiomers, diastereomers, or identical?).

   a) (2 pts)
   
   relationship?

   ![Molecule 1](image1)
   and
   ![Molecule 2](image2)

   b) (4 pts)

   ![Molecule 3](image3)
   and
   ![Molecule 4](image4)

2. (4 pts) Give the expected organic product from the following reaction and then label each of the stereocenters in the starting material and the product as being either the (R) or (S) configuration.

   ![Reaction](image5)
   \[ 	ext{NaN₃, DMF} \] 
   100 °C
1. (10 pts, 2 pts each) Give the expected organic products from each of the following reactions.

a. \[
\begin{align*}
\text{Br} & \quad \text{NaCN} \\
\text{DMF, 80 °C}
\end{align*}
\]

b. \[
\begin{align*}
\text{Cl} & \quad \text{KSCH}_3 \\
\text{DMSO, 75 °C}
\end{align*}
\]

c. \[
\begin{align*}
\text{OH} & \quad 1. \text{TsCl, pyridine} \\
& \quad 2. \text{NaN}_3, \text{DMSO}
\end{align*}
\]

d. \[
\begin{align*}
\text{OH} & \quad \text{HBr}
\end{align*}
\]

e. \[
\begin{align*}
\text{C≡C−H} & \quad 1. \text{NaNH}_2, \text{THF} \\
& \quad 2. \text{CH}_3\text{CH}_2\text{Br}
\end{align*}
\]
1. (10 pts) Give a complete mechanism for the formation of the products in the following reaction. Explain the formation of racemic mixtures.