1. Give the products of the following reactions showing stereochemistry in 3-D when necessary and all the stereoisomers that are formed.

   a) 
   \[
   \begin{align*}
   \text{product} & \quad \text{LiAlH}_4 \\
   & \quad 2. \text{H}_3\text{O}^+ \\
   & \quad 3. \text{NaOH}
   \end{align*}
   \]

   b) 
   \[
   \begin{align*}
   \text{product} & \quad \text{NH}_3 \text{ xs}
   \end{align*}
   \]

   c) 
   \[
   \begin{align*}
   \text{product} & \quad \text{H}_3\text{O}^+ \text{ xs} \\
   & \quad \text{heat}
   \end{align*}
   \]

   d) 
   \[
   \begin{align*}
   \text{product} & \quad \text{H}_2 \\
   & \quad \text{Pd/C}
   \end{align*}
   \]

2. Show how you would accomplish the following synthesis. Show all reagents over the arrows and isolable compounds along the way.

   \[
   \begin{align*}
   \text{product} & \quad \text{H}_2 \\
   & \quad \text{Pd/C}
   \end{align*}
   \]

3. Give the mechanism of the following reaction showing all intermediates and electron-pushing arrows.

   \[
   \begin{align*}
   \text{product} & \quad \text{CH}_3\text{NH}_2 \\
   & \quad \text{excess}
   \end{align*}
   \]

4. Write the Lewis structure of the following carboxylic acid derivatives.

   a) tert-butyl benzoate

   c) 2-chloropentanenitrile