Midterm 1 Review

**Chapter 16: Reactions of Aromatic Compounds**

1. Predict the major product(s) of each reaction.

   a. 
      \[
      \text{Cyclohexene} \xrightarrow{\text{SO}_3, \text{H}_2\text{SO}_4} \text{Product}
      \]

   b. 
      \[
      \text{1-Chloro-2-pentene} \xrightarrow{\text{AlCl}_3} \text{Product}
      \]

   c. 
      \[
      \begin{align*}
      \text{2-Fluoro-4-methoxy-3-methylnitrobenzene} & \xrightarrow{\text{NaNH}_2} \text{Product} \\
      \text{Product} & \xrightarrow{\text{NaNH}_2} \text{Product}
      \end{align*}
      \]

   d. 
      \[
      \begin{align*}
      \text{4-Chloro-3-nitrobenzene} & \xrightarrow{130^\circ \text{C}} \text{Product} \\
      \text{Product} & \xrightarrow{130^\circ \text{C}} \text{Product}
      \end{align*}
      \]
2. Suggest a starting material that would efficiently generate the product shown.

a. 

\[
\begin{array}{c}
\text{AlCl}_3 \\
\rightarrow
\end{array}
\]

b. 

\[
\begin{array}{c}
\text{Br}_2 \\
\text{hv} \\
\rightarrow
\end{array}
\]

c. 

\[
\begin{array}{c}
\text{AlCl}_3 \\
\rightarrow
\end{array}
\]

d. 

\[
\begin{array}{c}
\text{H}_2\text{NNH}_2 \\
\text{NaOH} \\
\Delta \\
\rightarrow
\end{array}
\]

e. 

\[
\begin{array}{c}
1. \text{Sn, HCl} \\
2. \text{NaOH workup}
\end{array}
\]
3. Suggest a plausible arrow-pushing mechanism for the following transformation.

4. Show any steps, reagents, and conditions necessary to efficiently carry out the following multi-step transformations from the starting material on the left to the product on the right.

a.
5. Select ALL the products that could be generated in one step from any starting material using ELECTROPHILIC AROMATIC SUBSTITUTION.
Chapter 17: Introduction to Carbonyl Chemistry

1. Predict the products for the following reactions.

   a. 

   b. 
2. Circle the compound in each following pair that is the most reactive towards nucleophilic attack at the carbonyl.
   a. 
   ![Diagram](image1)
   ![Diagram](image2)
   b. 
   ![Diagram](image3)
   ![Diagram](image4)
   c. 
   ![Diagram](image5)
   ![Diagram](image6)
3. Provide the reagents and product for the following reactions.
   a.
   \[
   \begin{aligned}
   \text{Ph}_2\text{CuLi} & \rightarrow \text{?} \\
   \text{1. } \text{Cl}\text{C} & \rightarrow \text{?} \\
   \text{2. } \text{H}_2\text{O} & \rightarrow \text{?}
   \end{aligned}
   \]

   b.
   \[
   \begin{aligned}
   \text{OH} & \rightarrow \text{?} \\
   \text{1. } \text{CuLi} & \rightarrow \text{?} \\
   \text{2. } \text{H}_2\text{O} & \rightarrow \text{?}
   \end{aligned}
   \]

4. Predict the product for the following reactions and draw the mechanism.
   a.
   \[
   \begin{aligned}
   \text{Cl}\text{C} & \rightarrow \text{?} \\
   \text{1. } \text{LiAlD}_4 & \rightarrow \text{?} \\
   \text{2. } \text{H}_2\text{O} & \rightarrow \text{?}
   \end{aligned}
   \]
5. Provide the reagents needed for each synthesis reaction.

a.

b. Provide two synthesis options for this reaction


c.


Chapter 18: Aldehydes and Ketones

1. Draw the mechanism for Enamine Hydrolysis

\[
\text{NH}_{2} \quad \overset{\text{H}_{2}\text{O}}{\longrightarrow} \quad \text{NH} = \text{C} = \text{O}
\]
2. Determine the product or starting material for the following reactions
A. 
\[
\text{Me}_2\text{NH} \xrightarrow{\text{AcOH}} \quad \text{N} \quad \text{Me}
\]
B. 
\[
\text{1. DIBAL-H} \\
\text{2. H}_2\text{O} \\
\text{3. Ph}_3\text{P=CH}_2
\]
C. 
\[
\text{HCl} \xrightarrow{\text{H}_2\text{O}}
\]

3. Determine the required reagents for the following synthesis reaction
\[
\text{O} \equiv \text{C} \equiv \text{O} \xrightarrow{} \text{N} \quad \text{H}
\]
4. Determine the required reagents for the following synthesis reaction

5. Determine the required reagents for the following synthesis reaction

6. Suggest a plausible arrow-pushing mechanism for the following transformation