Week 4 Worksheet

Objectives

Chapter 22
- Wittig reaction
  - Preparation of a phosphonium ylide
  - Reaction with aldehydes and ketones
  - Synthesis with the wittig reaction
  - Understand the mechanisms to be able to determine products
- Addition of weak nucleophiles to alpha, beta unsaturated aldehydes and ketones
  - Know the mechanism
  - 1,2 vs 1,4
- Structure and properties of carboxylic acids
  - Boiling point
  - Acidity trends
    - Inductive effect trend
    - Understand the stability of the conjugate base
    - Bases that deprotonate carboxylic acids
- Reaction of nitriles
  - Acid catalyzed mechanism only
  - Understand reactivity of nitriles

Problem Set

1. Of the carbonyls, box the appropriate compound that is reactive towards nucleophilic attacks with cyanide ions.
2. Draw the mechanism of the addition of water to the ketone in the presence of acid and a base in the forward and reverse directions.

**Acid-Catalyzed**

![Acid-Catalyzed Mechanism]

**Base-Catalyzed**

![Base-Catalyzed Mechanism]

3. Draw the mechanism of the addition of a primary amine to the following compound below in the forward and reverse directions. What condition does the reaction run best under?

![Primary Amines Mechanism]
4. Draw a stepwise mechanism for the following reaction.

\[
\begin{align*}
\text{[Compound]} & \xrightarrow{\text{H}_2\text{O}^+} \text{[Product]} \\
\text{[Reactant]} & \text{[Reactant]} \quad \text{[Reactant]}
\end{align*}
\]

5. Devise a synthesis of each compound from cyclohexene and organic alcohols. You may use any other required organic and inorganic reagents.

![Target Compound]

6. Draw the product of the following reaction and indicate the stereochemistry at any stereogenic centers.

\[
\begin{align*}
\text{[Compound]} & \xrightarrow{\text{[Reagent]}} \text{[Product]} \\
\text{[Reactant]} & \text{[Reactant]} \quad \text{[Reactant]}
\end{align*}
\]