This assignment is intended to help you prepare for Exam 2. The Problem Set will not be collected or graded.

1. Arrange the compounds in each set in order of increasing acidity.

(a) 

\[ \begin{align*} 
\text{A} & \quad \text{B} & \quad \text{C} \\
\text{\(\text{O}_2\text{N}\)} & \quad \text{\(\text{OH}\)} & \quad \text{\(\text{NO}_2\)} \\
\end{align*} \]

\(\text{A} < \text{C} < \text{B}\)

weakest acid \hspace{1cm} \text{strongest acid}

(NO\textsubscript{2} is electron withdrawing in meta position, NO\textsubscript{2} exerts only inductive effect; in para position, NO\textsubscript{2} exerts both inductive and resonance effects)

(b) 

\[ \begin{align*} 
\text{A} & \quad \text{B} & \quad \text{C} \\
\text{CH}_3\text{CO}_2\text{H} & \quad \text{CF}_3\text{CH}_2\text{OH} & \quad \text{CH}_3\text{CH}_2\text{OH} \\
\end{align*} \]

\(\text{C} < \text{B} < \text{A}\)

weakest acid \hspace{1cm} \text{strongest acid}
2. Provide the reagents that you would use to perform the following reactions.

(a) \[ \text{CrO}_3/\text{H}_2\text{SO}_4 \quad \text{or} \quad \text{PCC}/\text{CH}_2\text{Cl}_2 \]

(b) \[ \text{PBr}_3 \quad \text{or} \quad \text{HBr} \]

(c) \[ \text{H}_2\text{SO}_4 \quad \text{dehydration} \]

(d) \[ \text{bulky base} \quad \text{favors E2} \]

(e) \[ \text{CN}^- \]

*Other correct answers are possible.*
3. Draw structures for the major organic products of the following reactions. (It is **not necessary** to write a balanced reaction with respect to reagents and inorganic products.)

(a) \[
\begin{align*}
\text{(CH}_3\text{)}_3\text{CO}^- & \quad \text{(CH}_3\text{)}_3\text{COH} \\
\text{E2} & \\
\text{strong base (less hindered)} & \text{(more hindered)}
\end{align*}
\]

(b) \[
\begin{align*}
\text{(CH}_3\text{)}_3\text{COH} & \\
\text{S_N1/E1} & \text{weak base}
\end{align*}
\]

(c) \[
\begin{align*}
PCC & \\
\text{CH}_2\text{Cl}_2
\end{align*}
\]

(d) \[
\begin{align*}
\text{CrO}_3 & \quad \text{aq. H}_2\text{SO}_4 \\
\text{acetone}
\end{align*}
\]

(e) \[
\begin{align*}
\text{SOCl}_2 & \\
\text{pyridine}
\end{align*}
\]

does **NOT** produce carboxylic acid
4. Show how you would synthesize each of the following compounds from the indicated starting material. You may use any other reagents, organic or inorganic. Draw the structures of any intermediate compounds that would be isolated, and specify all reagents and reaction conditions. (Do not write out every intermediate in a reaction mechanism.)

(a)  
\[ \text{from} \quad \text{from} \quad \text{from} \quad \text{from} \]
\[ \text{CrO}_3, \quad \text{aq. H}_2\text{SO}_4 \quad \text{aq. H}_2\text{SO}_4 \quad \text{aq. H}_2\text{SO}_4 \]

(b)  
\[ \text{from} \quad \text{from} \quad \text{from} \quad \text{from} \]
\[ \text{CrO}_3, \quad \text{aq. H}_2\text{SO}_4 \quad \text{aq. H}_2\text{SO}_4 \quad \text{aq. H}_2\text{SO}_4 \]

Another possibility

Other correct answers are possible