Final Review Packet

1. Draw all resonance structures for the compound and explain why the particular substituent has an electron donating or electron withdrawing resonance effect.

\[
\begin{align*}
\text{NO}_2
\end{align*}
\]

2. Devise a synthesis of each compound from phenol and any other organic or inorganic reagents.

a. 

\[
\begin{align*}
\text{H}_2\text{CO} & \quad \text{CH}_2=\text{CH} \\
\end{align*}
\]

b. 

\[
\begin{align*}
\text{H}_2\text{N} & \quad \text{CH}_3 \\
\text{H}_2\text{CO} & \quad \text{NH}_2
\end{align*}
\]
3. Identify the lettered compounds in the following reaction scheme.

4. Draw a stepwise mechanism for the following reaction. Account for the formation of all products.
5. Draw a stepwise mechanism for the following reaction.

\[
\text{OCH}_2\text{CH}_3 \xrightarrow{\text{H}_2\text{O}^+} \text{OH} + \text{CH}_3\text{CH}_2\text{OH}
\]

6. What carboxylic acid is needed to prepare each ester by Fischer Esterification?

a. 

\[
\text{O} \quad \text{O}
\]

b. 

\[
\text{O} \quad \text{O}
\]
7. Devise a synthesis of melatonin, from the neurotransmitter serotonin, alcohols, and any needed organic or inorganic reagents.

8. Draw the product and mechanism (first 2 steps only) for each step in the following reaction.

\[
\text{CH}_3\text{CH}_2\text{Br} \quad [1] \text{NaCN} \\
[2] \text{LiAlH}_4 \\
[3] \text{H}_2\text{O}
\]
9. Predict the product(s) and draw a stepwise mechanism for the following reaction.

10. Devise a synthesis of 2-methylcyclopentanone from cyclohexene. You may use any required reagents.
11. Propose a synthesis of the following compound from the provided starting material.

12. Devise a synthesis of octinoxate (shown below) from phenol and alcohols with fewer than five carbons. You may use any other needed reagents.
13. Devise a synthesis of the following compound from benzene, any organic alcohols having four carbons or fewer, and any other required agent.