Reactions involving Alcohols

1. 2-Methyl-3-pentanol is classified as: (3 points)
   a. a primary alcohol  
   b. a secondary alcohol  
   c. a tertiary alcohol  
   d. none of the above

2. Provide acceptable names for the following: (10 points total)

3. Circle the molecule with the highest boiling point. Put a square around the molecule with the highest water solubility. (4 points)

4. Rank the acidity of the following molecules, from 1 (strongest) to 4 (weakest). Explain very briefly why A and B have very different acidities.
5. Draw the major products for the following reactions. (Assume excess quantities of reagents.)
(3 points each, 21 points total)

\[
\begin{align*}
\text{CH}_3\text{COCH}_3 + \text{NaBH}_4 &\rightarrow \text{CH}_3\text{OH} \\
\text{C}_5\text{H}_8\text{Br} + \text{Mg} &\rightarrow \text{C}_5\text{H}_8\text{MgBr} \\
\text{C}_5\text{H}_8\text{OCH}_3 + \text{H}_3\text{CO}_3 &\rightarrow \text{C}_5\text{H}_8\text{O} \\
\text{C}_5\text{H}_8\text{OCH}_3 + \text{CH}_3\text{CH}_2\text{MgBr} &\rightarrow \text{C}_5\text{H}_8\text{O} \\
\text{C}_5\text{H}_11\text{OH} + \text{H}_2\text{CrO}_4 &\rightarrow \\
\text{C}_5\text{H}_11\text{OH} + \text{TsCl, pyridine} &\rightarrow \text{C}_5\text{H}_11\text{OH} \\
\end{align*}
\]
\[
\text{CH}_3\text{C}_4\text{H}_4\text{OH} \xrightarrow{\text{PBr}_3} 
\]
6. Which of the following would be suitable to use when forming a Grignard reagent? (3 points)

7. Provide the reagents necessary to accomplish the following transformations (5 each, 20 total)
8. Draw a possible structure for an achiral molecule A with formula C₅H₁₂O, given that when H₂CrO₄ is added to A the solution turns green, and that the Lucas test with A takes about 3-4 minutes. (5 points)

9. Draw the mechanisms for the following transformations. Identify the slow step in each mechanism. (6 points each)

\[
\begin{align*}
\text{OCH}_3 & \quad 1. \text{ 2 PhMgBr} & \quad \text{OH} \\
\text{2. H}_3\text{O}^+ & & \text{Ph} \\
\end{align*}
\]

\[
\begin{align*}
\text{Ph OH} & \quad \text{H-Br} & \quad \text{Ph Br} \\
\end{align*}
\]
10. Design syntheses of the following, starting from alcohols of ≤4 carbons. (7 points each)