Before you begin this exam: First: You are allowed to have a calculator and a simple model set at your seat. Please put away all other materials. Second: Place your student identification on your desk. A proctor will come around to check every one’s ID. Third: Read through the entire exam. Your goal, as always, is to score as many points as possible. Do not waste time on problems that you can’t do if there are others that look easy. Fourth: It is critically important that your answers be written in a clear, unambiguous manner. Answers in which your intentions are unclear will not receive credit. Fifth: READ EACH QUESTION CAREFULLY.

Problem Number  | Points possible | Score  
--- | --- | ---
1. | 6 | ________
2. | 4 | ________
3. | 10 | ________
4. | 10 | ________
5. | 10 | ________
6. | 25 | ________
7. | 25 | ________
8. | 10 | ________

Total  |  | ________

You are expected to pick up your graded exam at my office during the week following the exam. Be sure to check to see that the score from each problem was recorded correctly on this cover page and that the scores were added up correctly.

My records show that your score on the first exam was ________
If this is incorrect, see me immediately.
1. (6 points) Provide structures that correspond to the following names.

   a) 2-Methyl-3-hexanone

   b) Phenyl butyl ether

   c) 4-Methyl cyclooctanol

2. (4 points) Which of the following carboxylic acids would you expect to be the most acidic (having the lowest pKa) and which would be the least acidic (having the highest pKa)? Label your choices clearly.
3. (10 points) Draw a viable mechanism for the formation of the acetal shown below. Your mechanism must show the movement of all electrons, show any critical intermediates, and pay particular attention to the conventions governing the use of arrows.
4. (10 points) Treatment of bromoacetal 1 with magnesium metal does not lead to a stable Grignard reagent. After mild acid workup, vinyl ether 3 is obtained. Propose a viable mechanism for this reaction, starting from the unstable Grignard reagent 2.
5. (10 points) Aldehydes are notably more reactive toward nucleophiles than are ketones. Provide a brief explanation for this phenomenon. Use words and drawings as you see fit, but do not exceed the space provided.

6. (25 points) Provide the product expected from each of the reactions below. If you believe that two products will be formed, show both (do not show more than two). If you believe that no reaction will occur, write NO REACTION.

   a) 
   ![Diagram of reaction a) with chemical structures and reagents labeled]

   b) 
   ![Diagram of reaction b) with chemical structures and reagents labeled]

   c) 
   ![Diagram of reaction c) with chemical structures and reagents labeled]
7. (25 points) Provide the reagents needed to convert the starting materials shown into the products shown.

a) 

\[
\text{OH} \xrightarrow{\text{H.O.}} \text{O}
\]

b) 

\[
\text{CO}_2\text{CH}_3 \xrightarrow{\text{NaOCH}_3, \text{H}_2\text{O}^+} \text{HOCH}_3\text{CH}_3
\]

c) 

\[
\text{O} \xrightarrow{\text{H}_2\text{O}^+} \text{O}
\]

d) 

\[
\text{Br} \xrightarrow{\text{Ph}_3\text{P}, \text{BuLi}} \text{OH}
\]
8. (10 points) Show how the following compound can be made from the starting material given. A protecting group may be required. Show the reagents needed for each step, and show each compound formed along the way. No more than three or four steps are required.