2. Show the complete mechanism;

   cyclohexyl bromide reacts with methyl magnesium chloride

   methylpropanoate reacts with cyanide ion

   the enolate of acetone reacts with propenal via conjugate (1,4) addition, followed by acid workup

   -

3. Show how you could prepare the following compounds from butanal. Only a list of reagents is required.

   2-ethyl-3-hydroxyhexanal (in 2 steps)

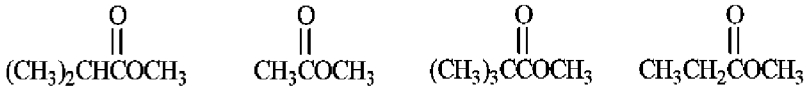
   2-hexene

   ethylbutanoate

   4-heptanol

   -

4. Rank the following compounds in order of *increasing* reactivity with a nucleophile.

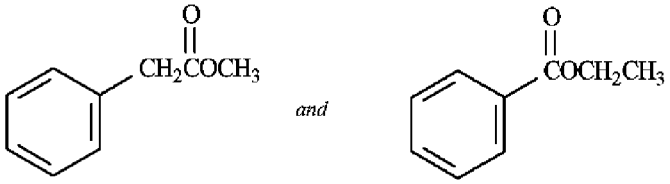


Instructions: How would you distinguish between the two members of the pair. Tell what differences you would expect to see in both the IR and the NMR. Be specific and detailed, with numbers.

5. Identify specific signals in the;

   IR

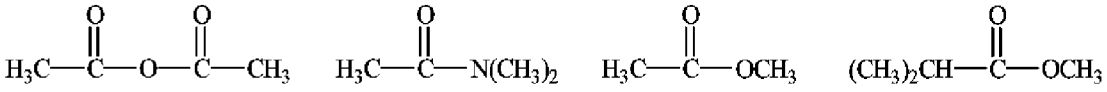
   NMR



Multiple Choice
Identify the choice that best completes the statement or answers the question.

____ 6. Which of the following best describes the key mechanistic steps in the reaction of an acid chloride and an alcohol to form an ester?
   a. addition followed by elimination
   b. elimination followed by addition
   c. addition followed by decarboxylation
   d. substitution followed by addition

____ 7. What is the order of *decreasing* reactivity towards nucleophilic acyl substitution for the carboxylic acid derivatives? (most reactive first)



I **II** **III** **IV**

   a. II, I, III, IV
   b. I, III, IV, II
   c. I, II, III, IV
   d. II, IV, III, I