

**Chemistry 118 C**  
**Spring 2011**  
**Second Midterm**  
**Fri. May 20<sup>th</sup>, 2011**  
**Instructor: Lievens**

This exam contains seven (7) pages and eight (8) problems. Please make sure that your copy contains all seven pages. If there is a problem, please tell the exam administrator prior to beginning. Please answer all questions. Remember that UC Davis Code of Academic Conduct applies to this exam and all other graded work in this class.

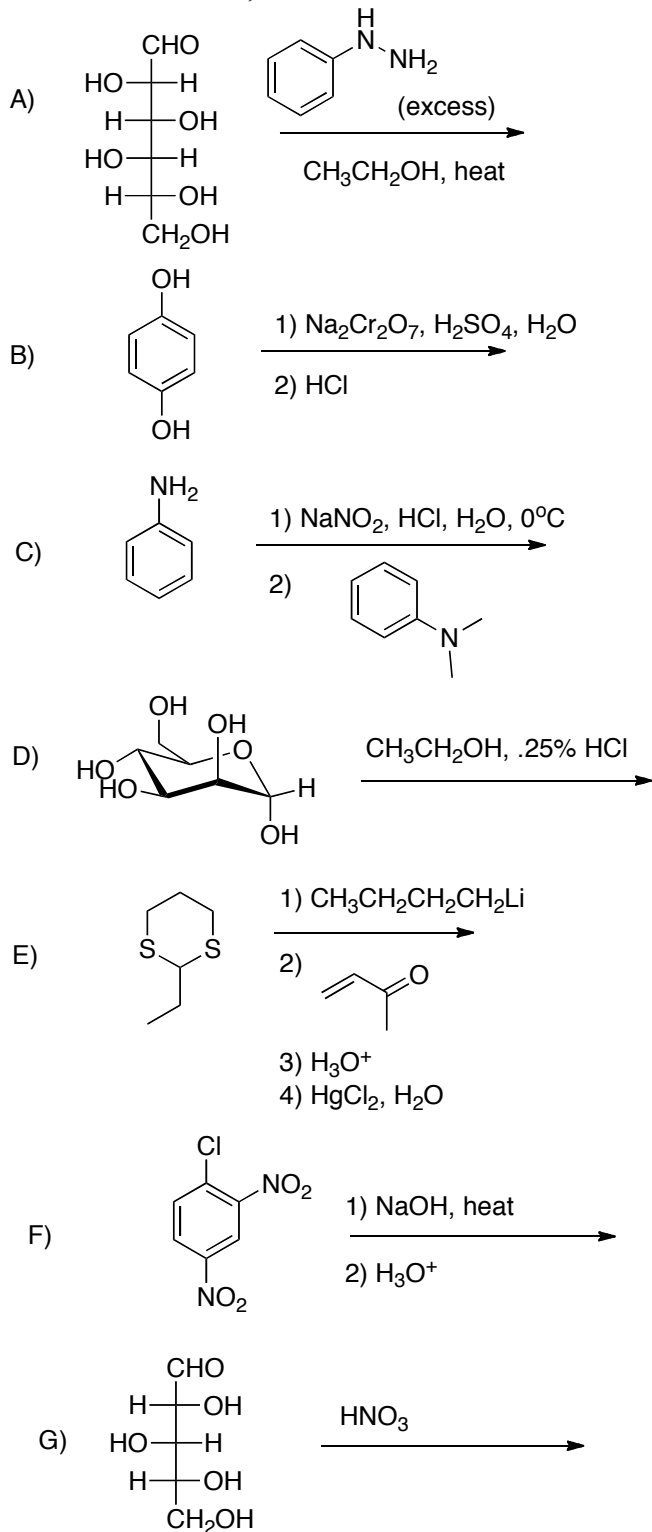
**Name:** \_\_\_\_\_  
Last First MI

**Student ID. #** \_\_\_\_\_

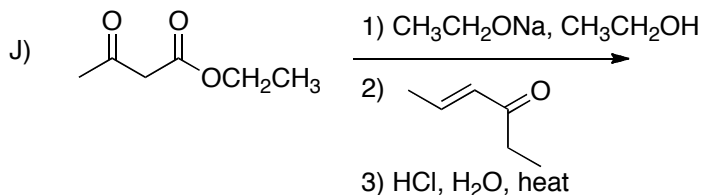
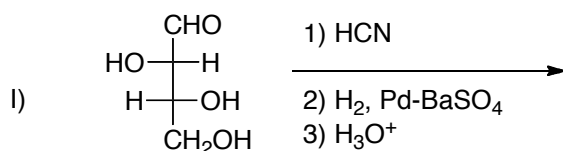
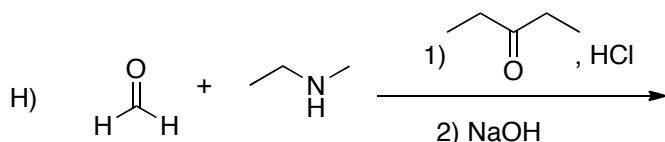
**T.A./ Lab Section:** \_\_\_\_\_

Page #	Points
2	
3	
4	
5	
6	
7	
Total (121)	

1. **Reactions:** (28 pts). Draw the structure of the expected organic product(s) formed in the following reactions *including correct relative stereochemistry*, if the reaction is racemic indicate this by either drawing both enantiomers or drawing one and writing racemic. Assume all reagents listed are present in *excess* unless otherwise noted. If no reaction occurs, state 'No Reaction'.

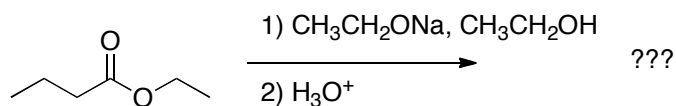


2. **Reactions:** (12 pts). Draw the structure of the expected organic product(s) formed in the following reactions *including correct relative stereochemistry*, if the reaction is racemic indicate this by either drawing both enantiomers or drawing one and writing racemic. Assume all reagents listed are present in *excess* unless otherwise noted. If no reaction occurs, state 'No Reaction'.



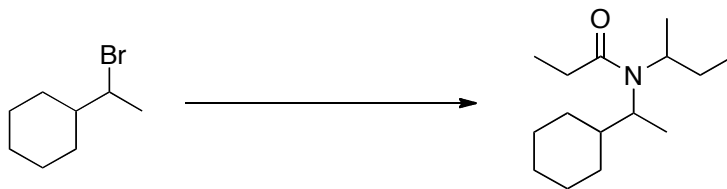
3. **Vocabulary:** (14 pts) Fill in the blanks with the appropriate vocabulary word. If multiple boldfaced words are given circle the correct word.
- A) An alpha anomer has an **R / S** stereocenter at the \_\_\_\_\_ carbon.
- B) D-Sugars have an **R / S** stereocenter at the \_\_\_\_\_ stereocenter and are **always / sometimes / never** dextrorotatory.
- C) Heterocyclic \_\_\_\_\_ ions can be used to catalytically form  $\alpha$ -hydroxyketones from aldehydes.
- D) Formation of phenol from chlorobenzene with NaOH, heat, and high pressure occurs via a \_\_\_\_\_ intermediate
- E) A  $-N_2^+$  group is a \_\_\_\_\_ ion, it is a **good / bad** leaving group.
- F) The reaction in question 2H is a \_\_\_\_\_ reaction, the reaction series in question 2I is a \_\_\_\_\_ synthesis and the reaction series in question 2J is an \_\_\_\_\_ synthesis.
- G) Reducing the carbonyl in a monosaccharide produces an \_\_\_\_\_.  
Oxidizing the aldehyde in an aldose produces an \_\_\_\_\_.

4. **Mechanism:** (20 pts.). Show a detailed reaction mechanism for the following reaction. Include the structure of the expected products, any relevant resonance structures, and appropriate stereochemistry for all steps. Assume all reagents are in excess.

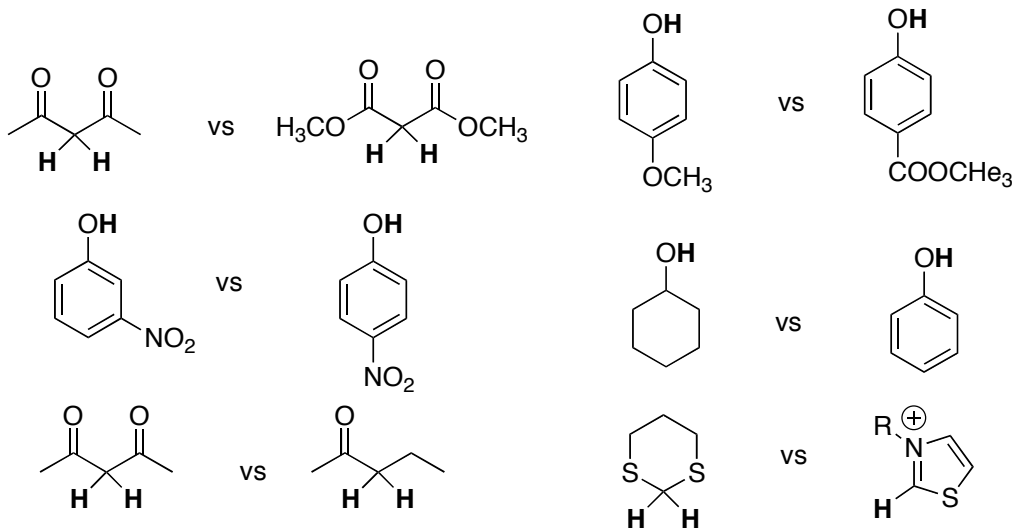


- A) This is a \_\_\_\_\_ reaction.
- B) The pKa of the product alpha hydrogen is about \_\_\_\_\_.
- C) The pKa of the starting material alpha hydrogen is about \_\_\_\_\_.

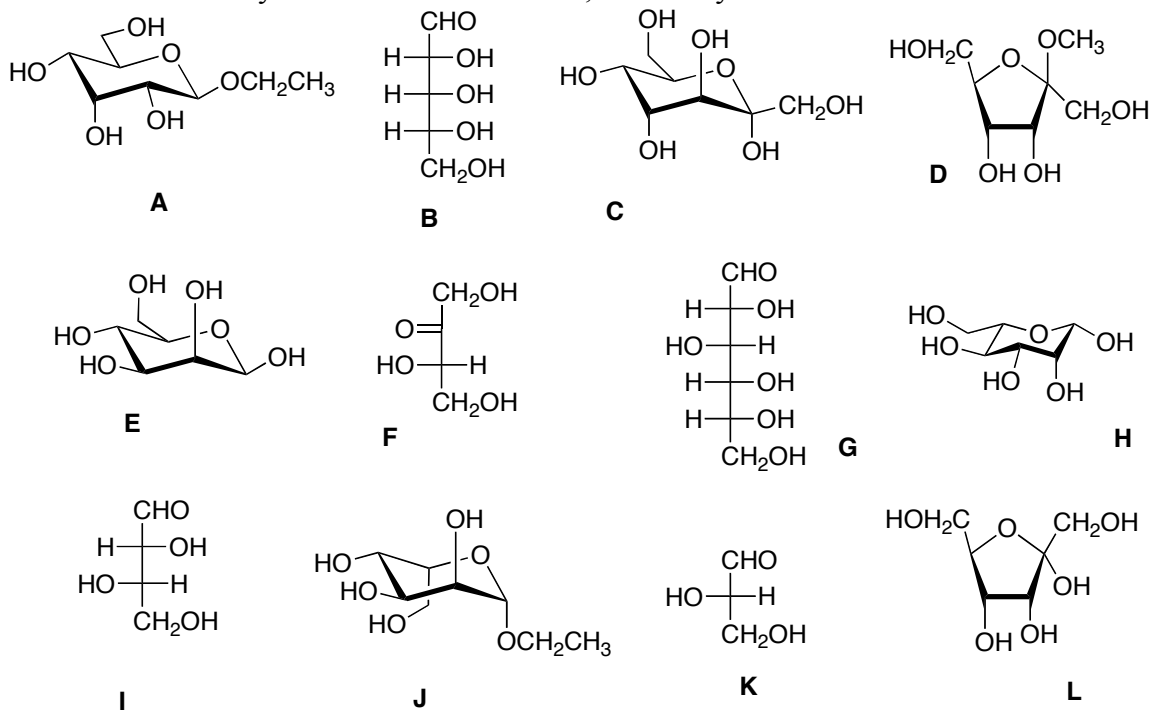
5. **Synthesis:** (15 pts) Show how you would carry out the following synthesis. Include the reagents you would need for each step and the structure of the intermediate products formed in each step. You may use any inorganic reagents you need and organic reagents of five or less carbons.



6. **Acids and Bases:** (6 pts). Circle the compound in each of the given pairs of molecules that is more acidic at the boldface H.



7. **Carbohydrates:** (16 pts.) Using the letter codes identify the given carbohydrates. Some letters may be used more than once; some may not be used at all.



Which of the above carbohydrates is a ketose? \_\_\_\_\_

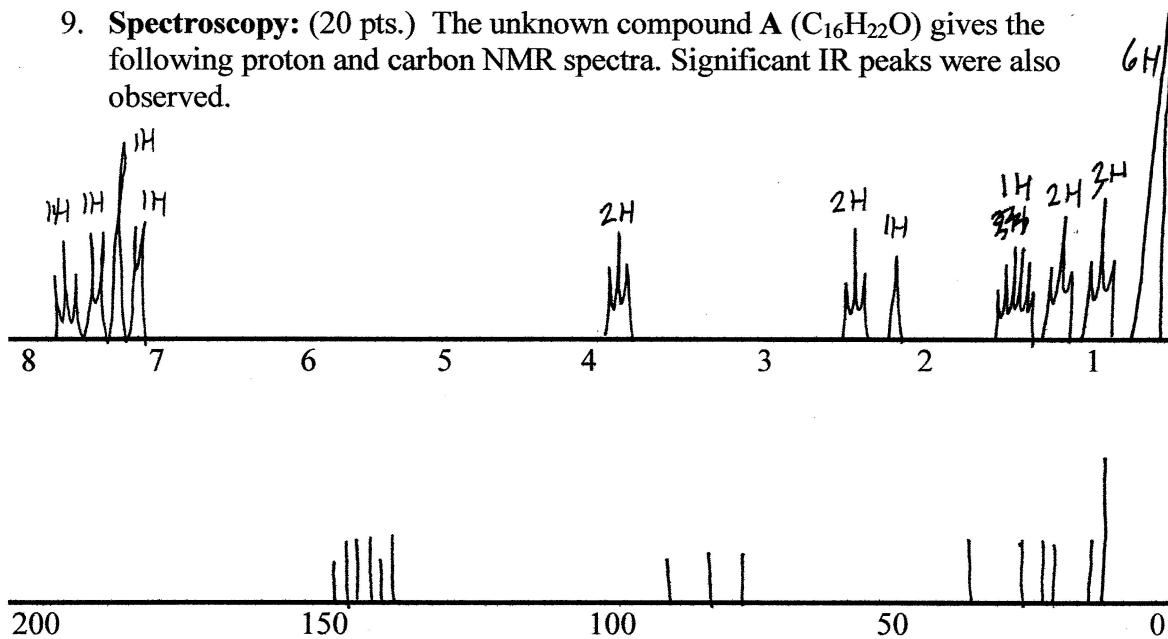
Which of the above carbohydrates is an L-sugar? \_\_\_\_\_

Which of the above carbohydrates is a furanose? \_\_\_\_\_

Which of the above carbohydrates is a nonreducing sugar? \_\_\_\_\_

Which of the above carbohydrates is glucose \_\_\_\_\_, ribose \_\_\_\_\_, fructose \_\_\_\_\_.

9. **Spectroscopy:** (20 pts.) The unknown compound A ( $C_{16}H_{22}O$ ) gives the following proton and carbon NMR spectra. Significant IR peaks were also observed.



IR: 3324 (sharp), 3034, 2957, 2253, 1592, 1210, 792, 702, and fingerprint  $cm^{-1}$ .