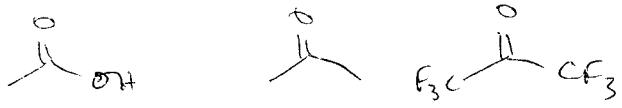
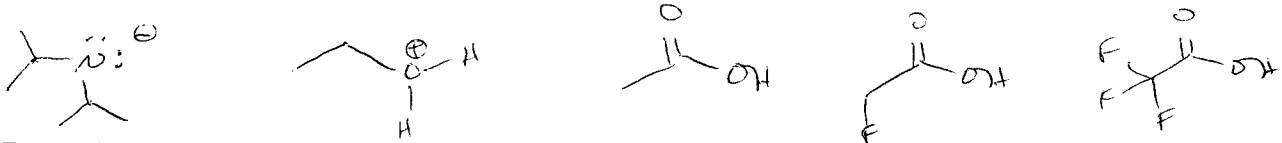
Practice Exam 3 - CHEM 322 - Spring 2003 - Dr. Neal Zondlo

1. **The following acids and bases are mixed together in equal amounts (1 mole each). Which species are observed at equilibrium? (12 pts)**

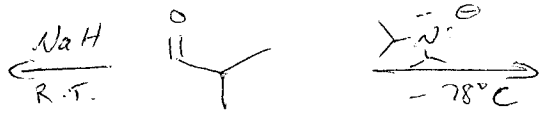
(a) 

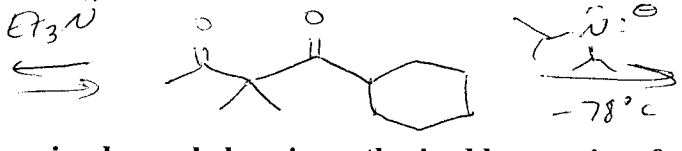
(b) 

(c) 

2. **Draw the dominant enolates former under the given conditions. Label each enolate as kinetic or thermodynamic. For (a), explain why the indicated enolate is formed under each condition. (12 pts)**

(a) 

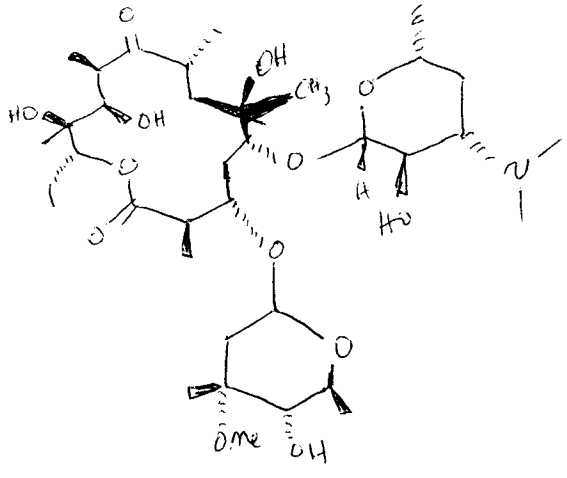
(b) 

(c) 

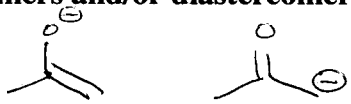
3. **The antibiotic erythromycin, drawn below, is synthesized by a series of aldol-like reactions. (8 pts)**

(a) Identify bonds likely formed by an aldol reaction by placing an X across these bonds. Hint to find all bonds: enolate addition to an aldol product generates a product with alcohols beta and delta to the carbonyl.

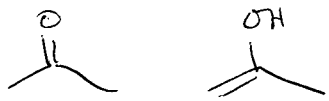
(b) Identify any acetals by circling the carbon centers.

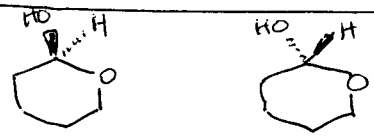


4. Identify whether the following pairs of molecules are resonance structures, in equilibrium, enantiomers and/or diastereomers of one another (or none of the above). (8 pts)

(a) 

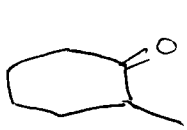
(b) 

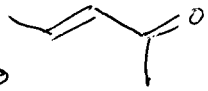
(c) 

(d) 

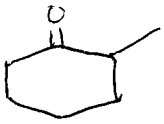
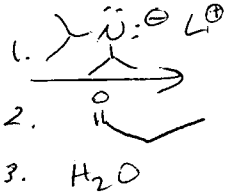
(in presence of NaOH)

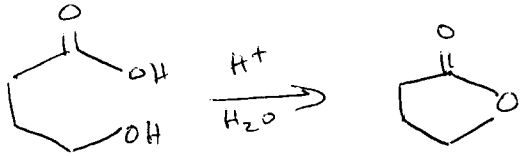
5. Provide mechanisms and products for the following transformations. (24 pts)

(a) 

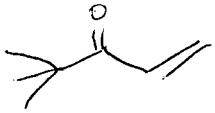
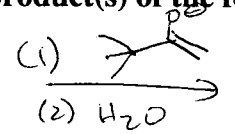


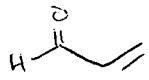
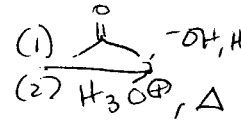

(# of stereoisomers?)

(b) 


(c) 

6. Provide the major product(s) of the following reactions. (21 pts)

(a) 


(b) 


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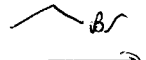
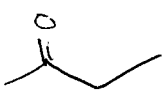
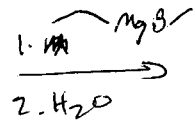


(d) 


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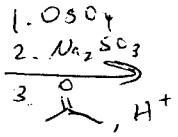

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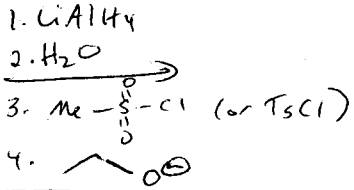
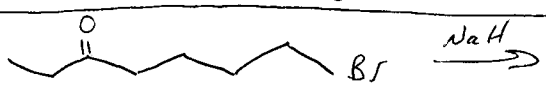
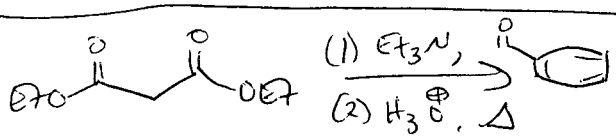
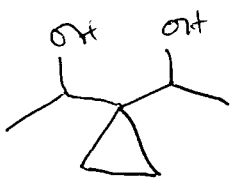


(g) 

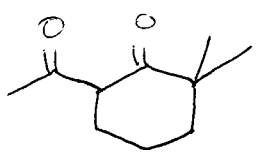
(h) 

7. Propose syntheses of the following compounds using the requested reagents. (15 pts)

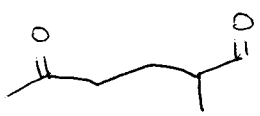
Via an aldol rxn.



Via an aldol rxn.

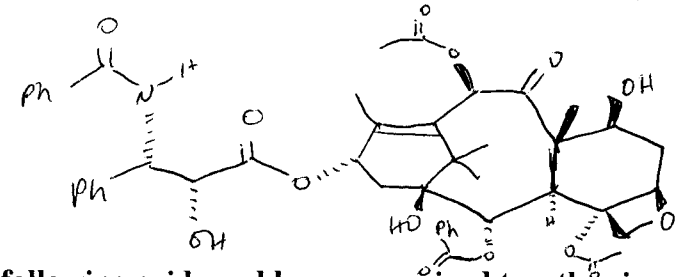


Using any compounds w/ ≤ 4 carbons

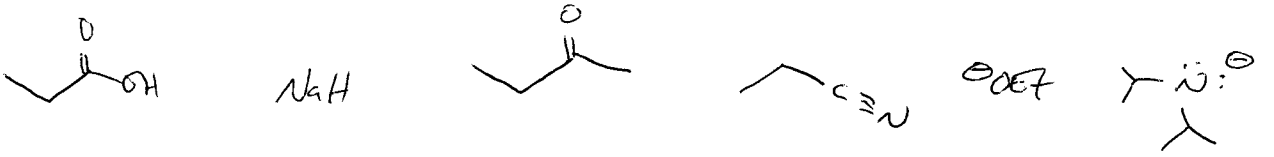


Practice Exam 4 - CHEM 322 - Spring 2003 - Dr. Neal Zondlo

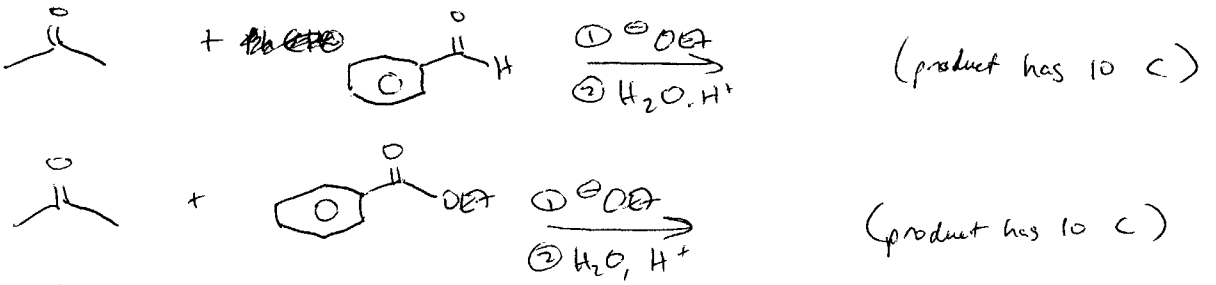
1. Identify the functional groups (ethers, alcohols, esters, etc.) in taxol, a very potent compound used in the treatment of various cancers. Circle and label the functional groups. (5 pts)



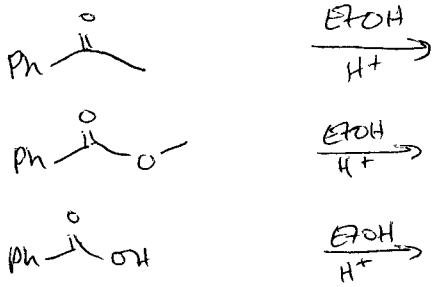
2. The following acids and bases are mixed together in equal amounts (1 mole each). Which species are observed at equilibrium? (5 pts)



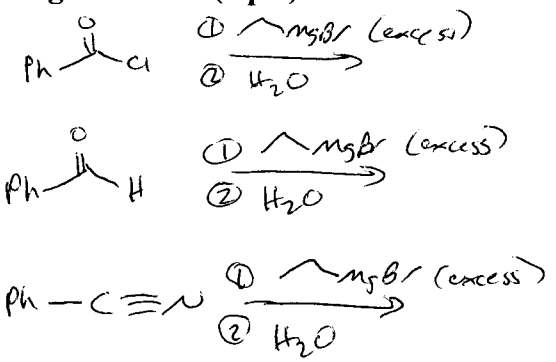
3. Compare the aldol reaction and Claisen condensation by providing the mechanisms and products of the following reactions. (12 pts)



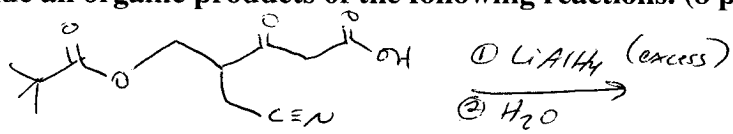
4. Compare the reactivity of ketones, esters and carboxylic acids by providing the products of the following reactions. (8 pts)

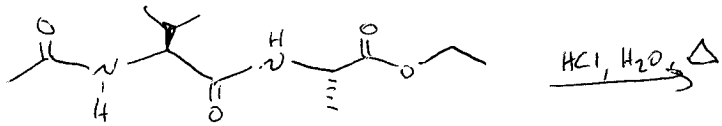


5. Compare the reactivity of aldehydes, acid chlorides, and nitriles by providing the products of the following reactions. (8 pts)



6. Provide all organic products of the following reactions. (8 pts)





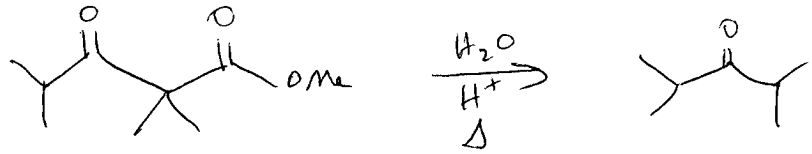
7. Answer one of the following questions. (Structures of compounds indicated were given in class and would be given on exam.)

(a) Explain how soapy water removes greases and oils from clothing/hair/skin/carpet/etc. (6)

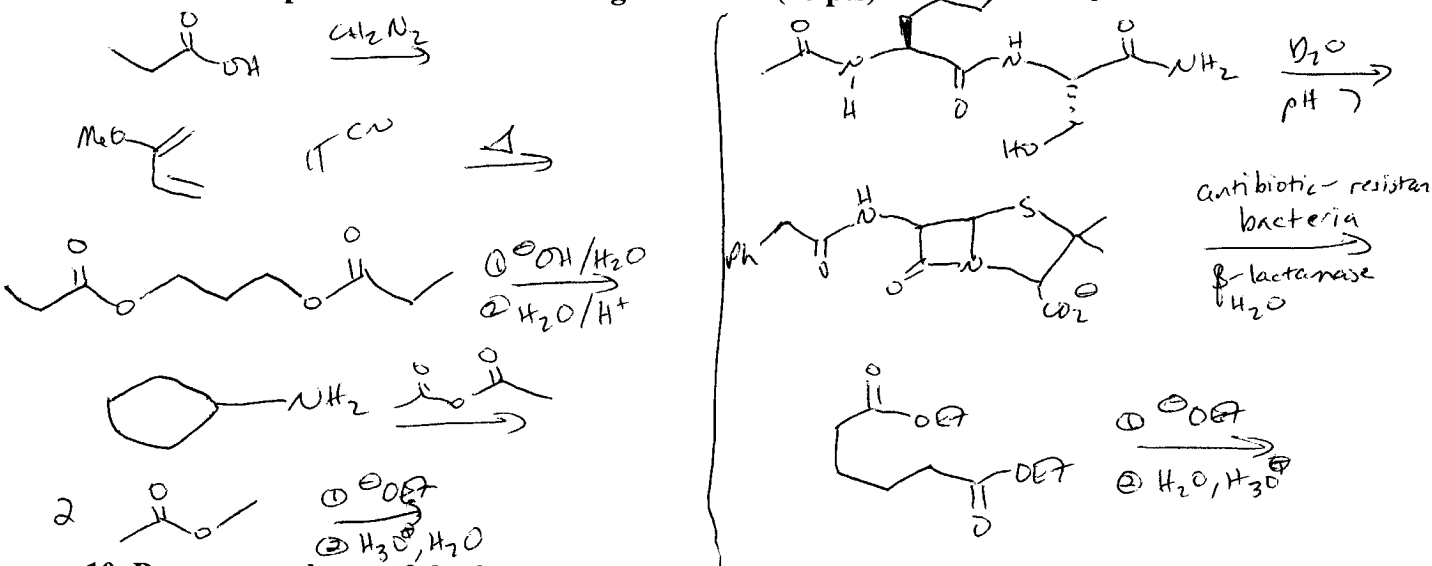
(b) Use acid/base chemistry and hydrophobicity to indicate (a) whether and why morphine or heroin (=conversion of two alcohols on morphine to acetate esters by reaction with acetyl chloride) is more able to cross the blood-brain barrier and (b) why an ammonium (=protonated amine) is able to cross a membrane. (8)

(c) Aspirin and organophosphate nerve agents (such as sarin) both function by covalently modifying enzymes (prostaglandin synthase and acetylcholinesterase, respectively). Describe the enzyme modification, using organic chemistry, and explain the biological effects. (10)

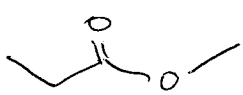
8. Provide the mechanism of beta-keto ester hydrolysis and decarboxylation. (12 pts)



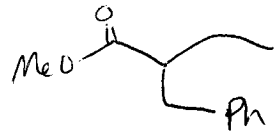
9. Provide the products of the following reactions. (20 pts)



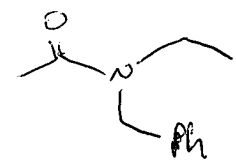
10. Propose syntheses of the following compounds using the indicated reagents. (15 pts)



Using alcohols, alkyl halides + CO_2 as sole carbon sources



using



Using carboxylic acids, alkyl halides as the only C sources