

# California State Polytechnic University, Pomona

Chem 316

Midterm Exam (Retake)

Fall, 2009

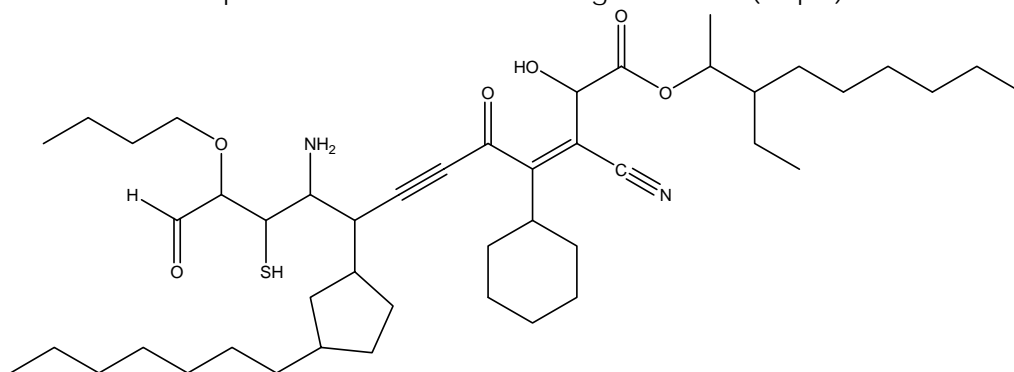
Beauchamp

You may use the cheat sheet you made for the midterm exam. You may take as much time as you want to do the exam. Please sign the following pledge.

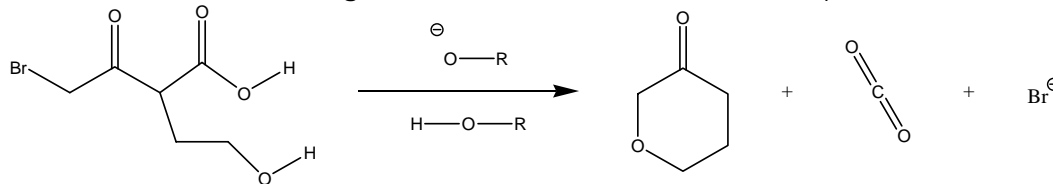
I give my word that I did this exam completely on my own without help or consultation from any other person or using any other person's work. If I find that you received any help your score will be zero.

Signature (and print name) \_\_\_\_\_

1. Provide an acceptable name for the following structure. (30 pts)



2. Provide complete arrow-pushing mechanisms for the reaction below (curved arrows, lone pairs of electrons and formal charge). Show resonance structures. (20 pts)



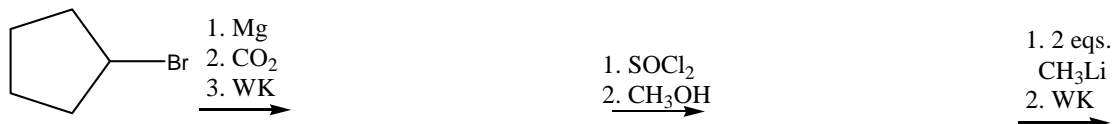
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3. Provide the expected product for each of the following transformations. Show regiochemistry and stereochemistry clearly, if relevant. Do NOT show mechanisms. (30 pts)

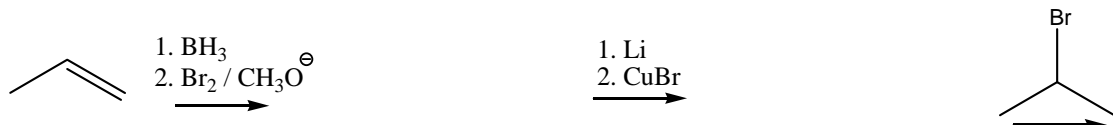
a.



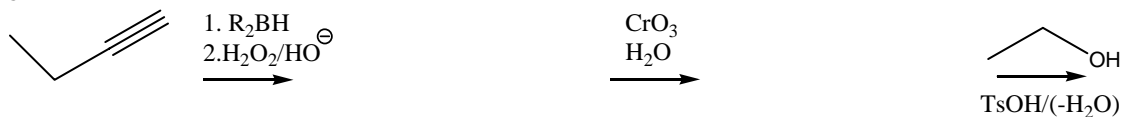
b.



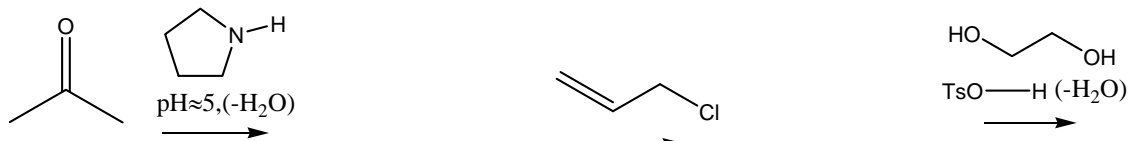
c.



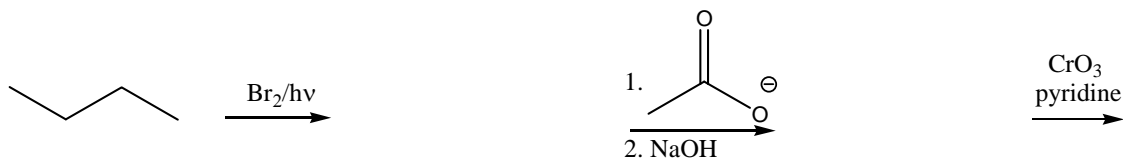
d.



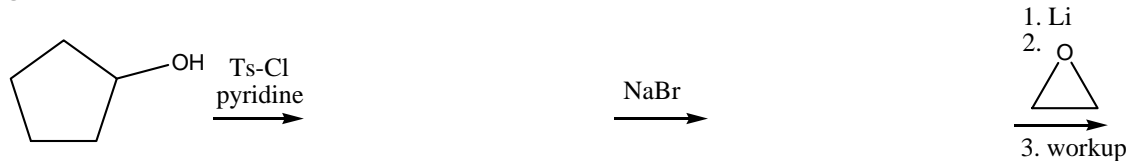
e.



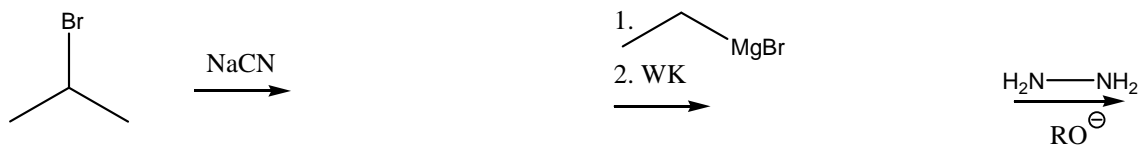
f.



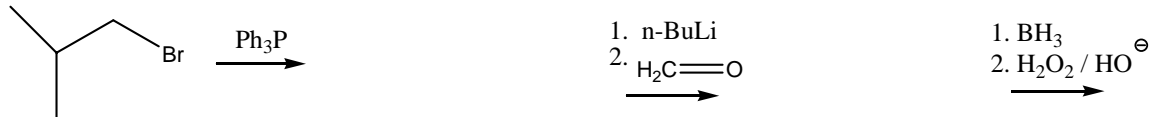
g.



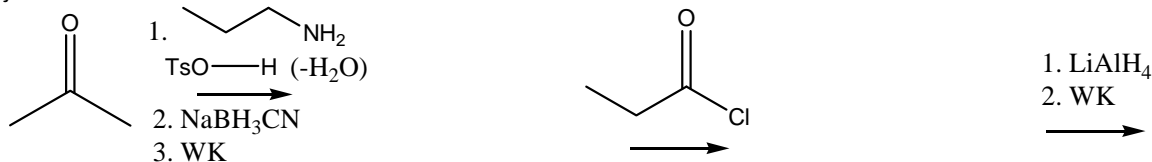
h.



i.

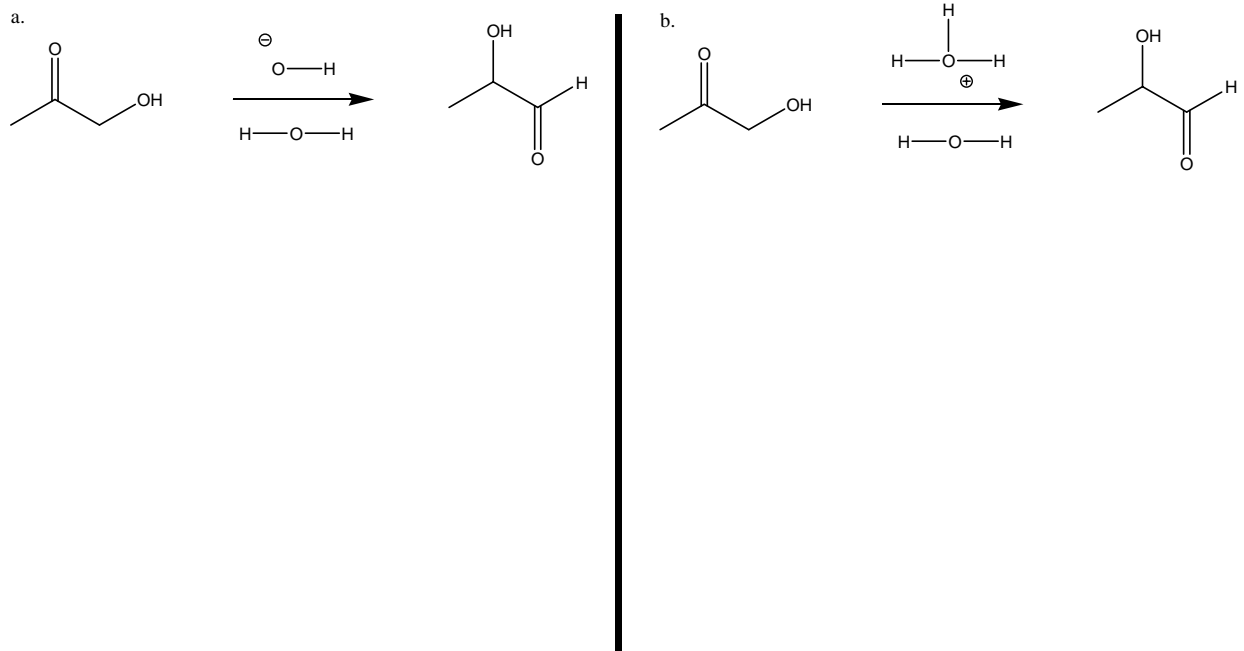


j.



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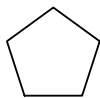
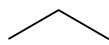
4. Propose a mechanism for the following tautomeric transformations. (30 pts)



5. Propose a synthesis for the following compound using the given structures. You may also use any typical organic reagents. Show the reagents and reactant for each backwards step until you reach allowable starting molecules. Do not show mechanisms. (30 pts)

available starting materials

CH<sub>4</sub>



NaCN

CO<sub>2</sub>

\*CH<sub>4</sub>

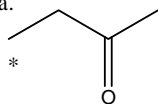
\*NaCN

\*CO<sub>2</sub>

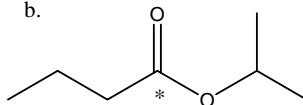
\* = <sup>14</sup>C label

target structures

a.



b.

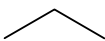


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6. Make the following ketone using each of the following approaches. Work backwards (retrosynthetic thinking) and show each intermediate structure and each reagent until you reach an acceptable starting point. Acceptable starting points are the following structures and any routine reagents we have discussed in the course. Once a structure is made you can use it in other syntheses. Just refer back to the part where it was made. Do not show mechanisms. (36 pts)

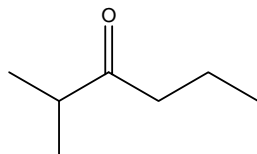
Allowed sources of carbon

CH<sub>4</sub>



CO<sub>2</sub>

NaCN



←  
synthesis last step  
= your first step

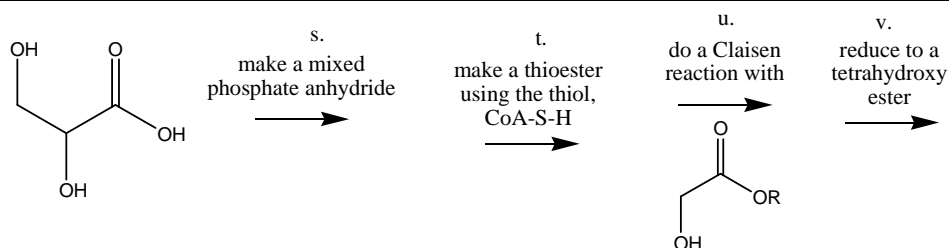
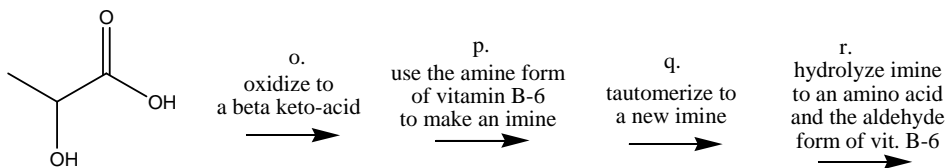
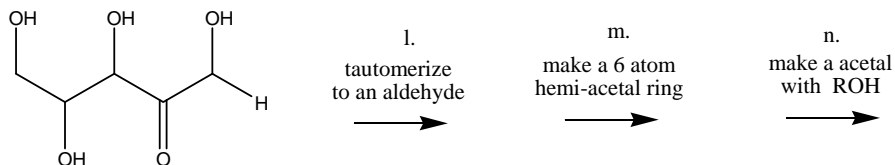
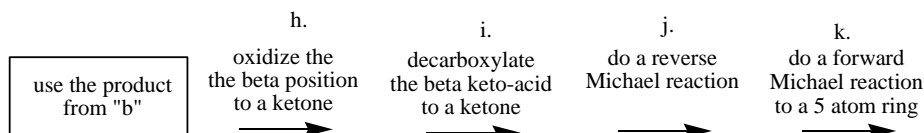
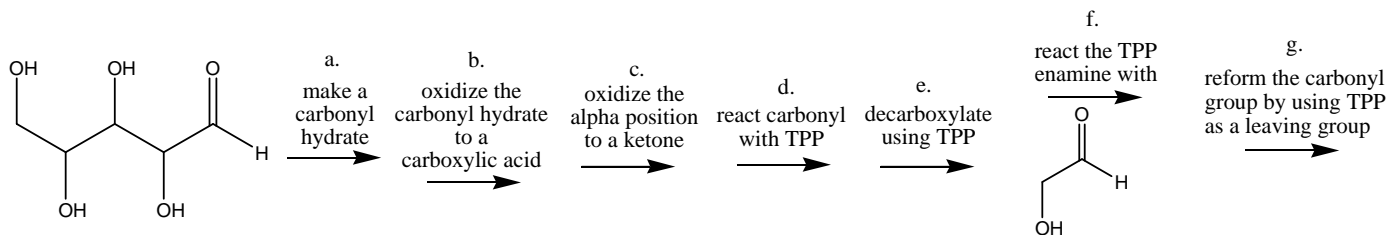
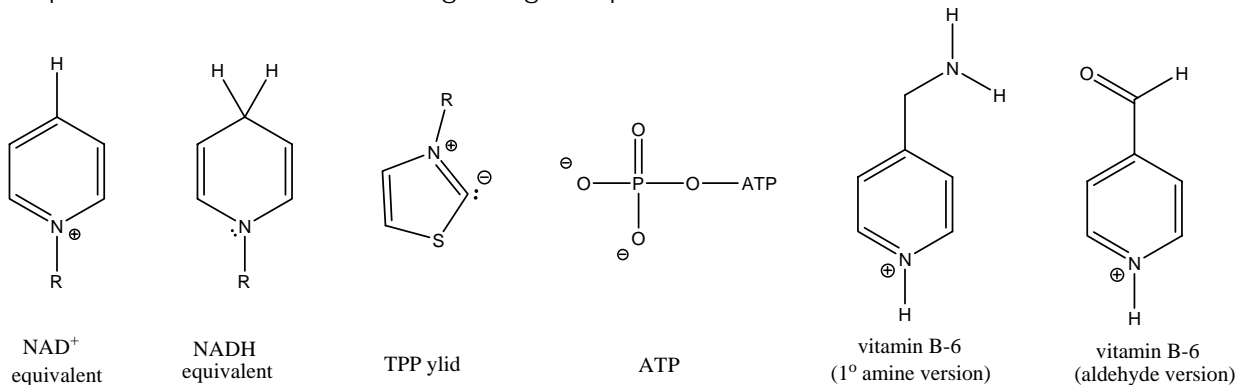
Make the given ketone using:

- a nitrile
- a ketone
- a cuprate
- dithiane
- an alcohol
- ethyl acetoacetate (given)

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7. From the given bio-organic structure, use our simplistic mechanisms to show how each transformation could occur. Use the descriptive term to fill in the necessary structures and details. Draw in any additional atoms or structures needed to demonstrate the transformations (e.g. a hydrogen atom or a water molecule, any co-factors, etc.). Use **B:** if you need a base and **B-H<sup>⊕</sup>** if you need an acid. Acceptable representations of possible co-factors are provided below. (44 pts)

Simplified co-factors for the bio-organic game problems, if needed.



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