

California State Polytechnic University, Pomona

Chem 315  
Midterm Exam  
Spring, 2015  
Beauchamp

Name: \_\_\_\_\_

Topic	Total Points	Credit
1. Nomenclature (1)	30	
2. Mechanisms involving reactivity of C=O functional groups	20	
3. Reactions Page (40 reaction arrows, possibly multi-step)	40	
4. Tautomeric mechanisms, arrow pushing, proton transfers, resonance, one in acid and one in base	30	
5. Multistep syntheses using the reactions learned thus far in the course	30	
6. Complete details of S <sub>N</sub> 1/E1 and S <sub>N</sub> 2/E2 reactions. Stereochemistry, arrow pushing, carbocations,	30	
7. Two Arrow-Pushing Mechanisms, one in acid and one in base, requires explanation	30	
<b>Total</b>	210	

This is a long exam. It has been designed so that no one question will make or break you. The best strategy is to work steadily, starting with those problems you understand best. Make sure you show all of your work. Draw in any lone pairs of electrons, formal charge and curved arrows to show electron movement. Only write answers on the front of each page. Do your best to show me what you know in the time available.

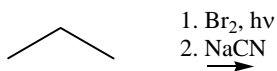
“Education is the most powerful weapon which you can use to change the world.” Nelson Mandela



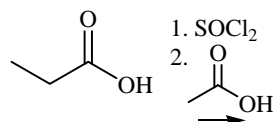
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3. Fill in the missing product or reagent, as needed, for each reaction below. Do not waste time by writing mechanisms or thinking too much on any one part. (40 pts)

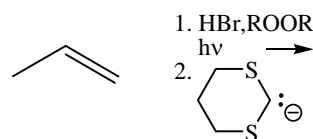
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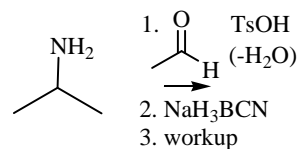
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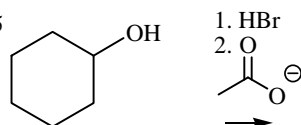
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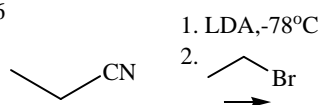
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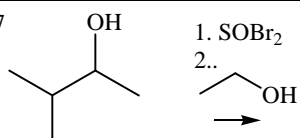
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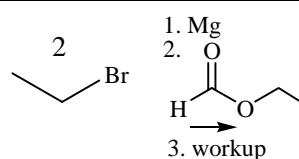
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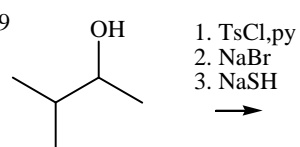
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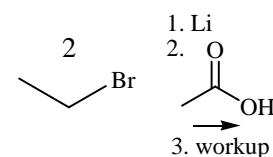
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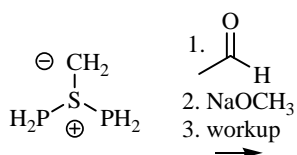
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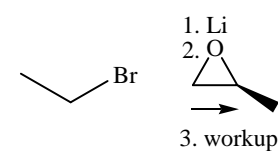
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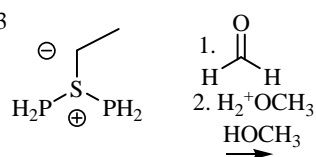
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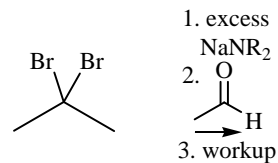
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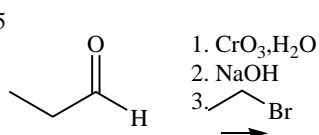
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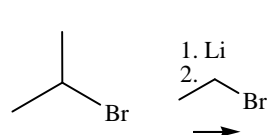
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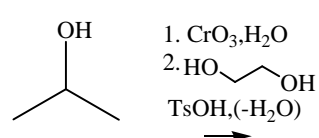
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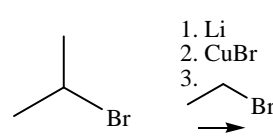
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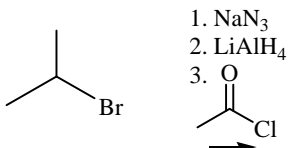
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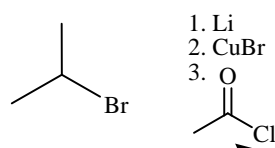
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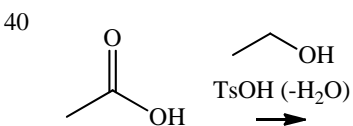
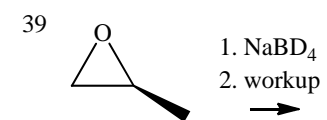
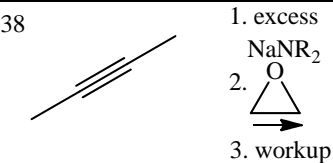
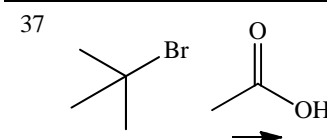
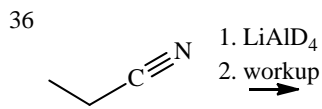
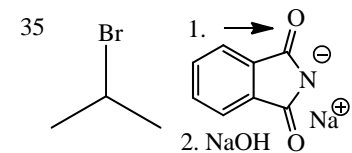
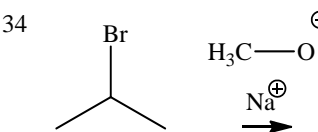
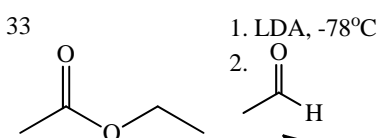
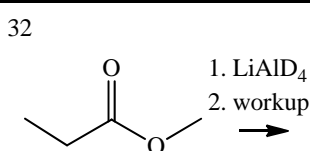
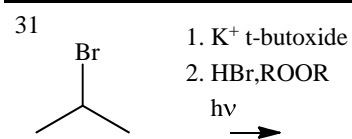
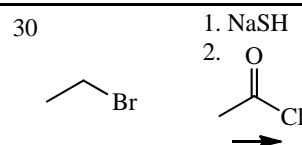
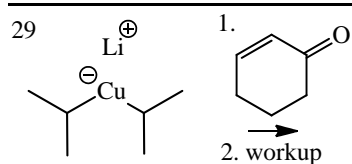
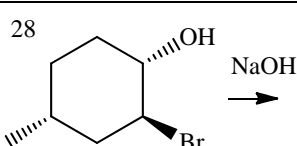
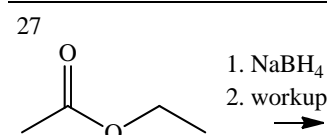
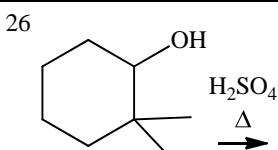
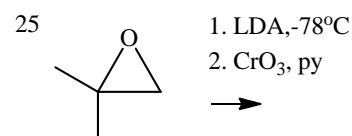
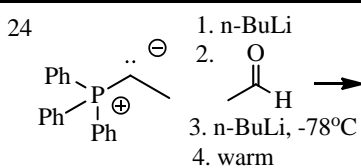
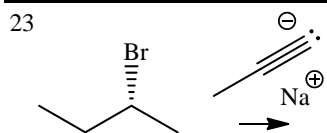
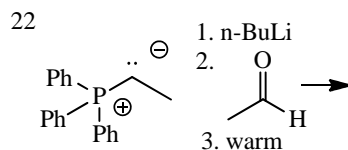
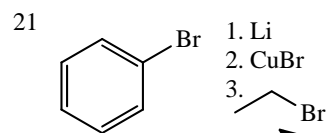
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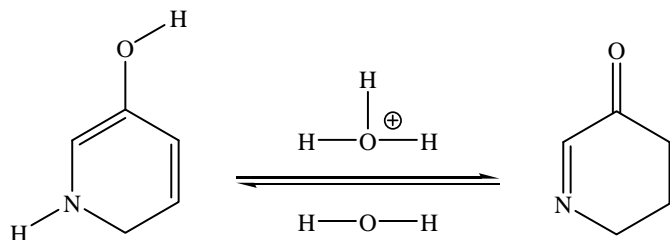
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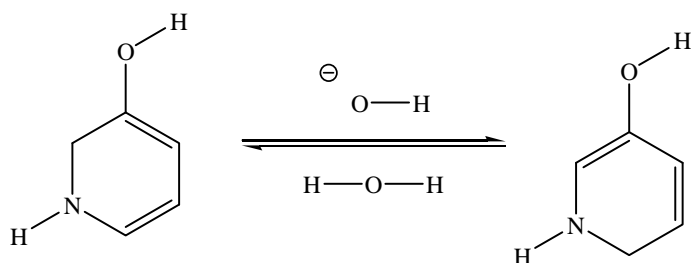
4. Provide a complete arrow-pushing mechanism for the following transformations (curved arrows, lone pairs, formal charge and at least 2 resonance structures, including the "best" one). Restrict your tautomeric changes to keto or enol portions of the molecules, not isolated carbon-carbon double bonds. (30 pts)

a.



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b.

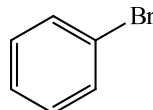
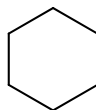
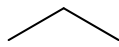


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5. Propose a reasonable synthetic method to accomplish the following transformations using the given structures and any additional materials available from our course. Show a reaction arrow with appropriate reagents and the product for each step of your synthesis. Do not show mechanisms.  
(a = 14 pts, b = 16 pts)

Sources of carbon:

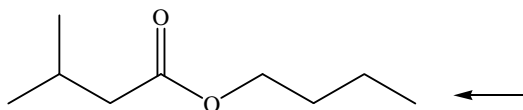
CH<sub>4</sub>



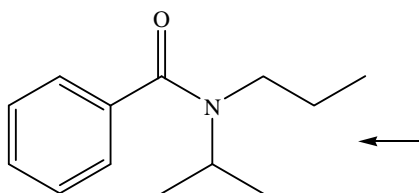
CO<sub>2</sub>

NacN

a.



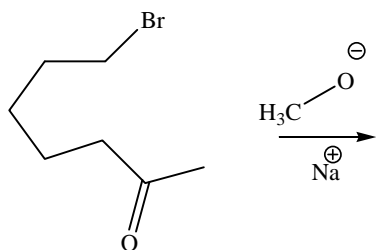
b.



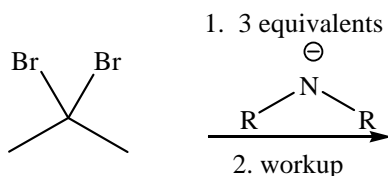
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6. Indicate the major reaction mechanism in each reaction below and write an arrow-pushing mechanism. Assume that if a more stable intermediate can form, it will generate the major product(s). If multiple products form by one type of mechanism, just show the mechanistic sequence for the major expected product. (30 pts)

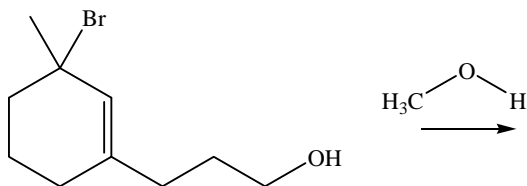
a. (7 pts) Forms 5 atom ring. Mechanism = \_\_\_\_\_



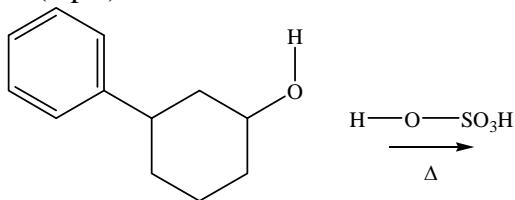
b. (7 pts) Mechanism = \_\_\_\_\_



c. (8 pts) Forms compound with 2 rings (6 and 5). Mechanism = \_\_\_\_\_

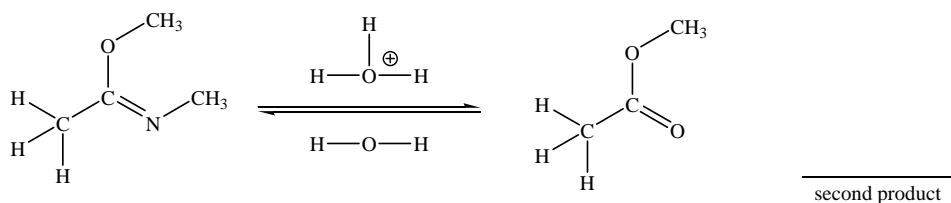


d. (8 pts) Make most stable intermediate, then most stable product. Mechanism = \_\_\_\_\_

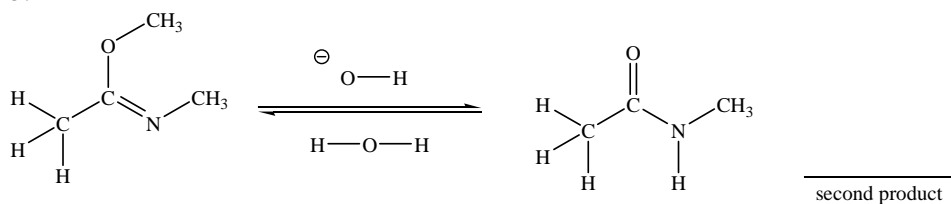


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7. a. Write a complete mechanism for each of the following reactions and provide an explanation for the different products obtained. (15 pts each)



b.



“Students should be taught how to think, not what to think.” Margaret Mead