

California State Polytechnic University, Pomona

Chem 315
Midterm Exam
Fall, 2007
Beauchamp

Name: _____

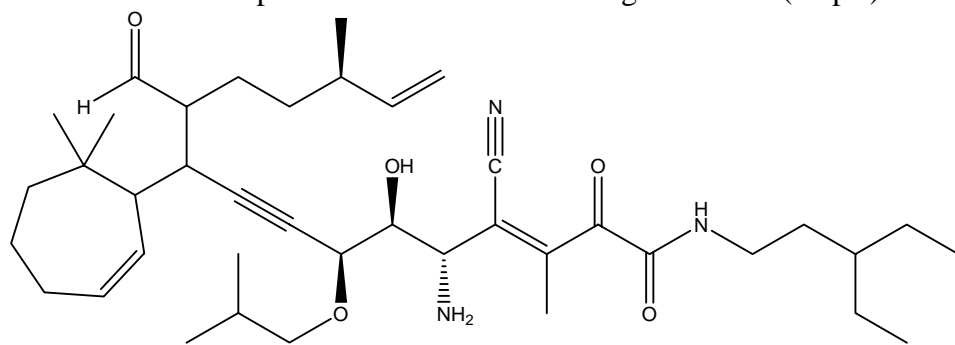
Topic	Total Points	Credit
1. Nomenclature (1)	30	
2. Tautomeric mechanisms, arrow pushing, proton transfers, resonance, one in acid and one in base	30	
3. Reactions page using reactions learned thus far (30) (you supply either reagents or products)	30	
4. Carbonyl (C=O) and epoxide chemistry	20	
5. Multistep syntheses using the reactions learned thus far in the course (possible in 4-5 steps)	26	
6. Complete details of S _N 1/E1 and S _N 2/E2 reactions. Stereochemistry, arrow pushing, carbocations, rearrangements might be part of the problem	32	
7. Complete arrow pushing mechanisms, one in acid (rearrangements are possible) and one in base (understanding tautomerization will help)	30	
Total	198	

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.

In the middle of every difficulty lies opportunity. Albert Einstein

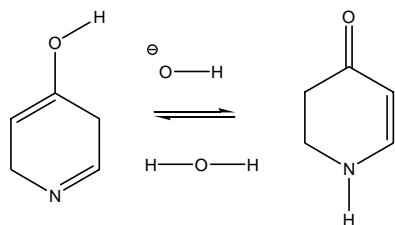
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1. Provide an acceptable name for the following structure. (25 pts)

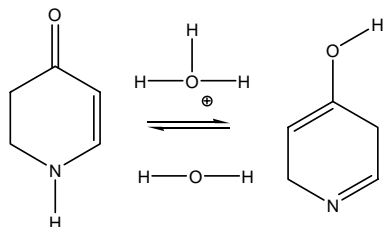


2. Provide a complete arrow-pushing mechanism (curved arrows, lone pairs and formal charge) to explain the following tautomeric transformations. (30 pts)

a.

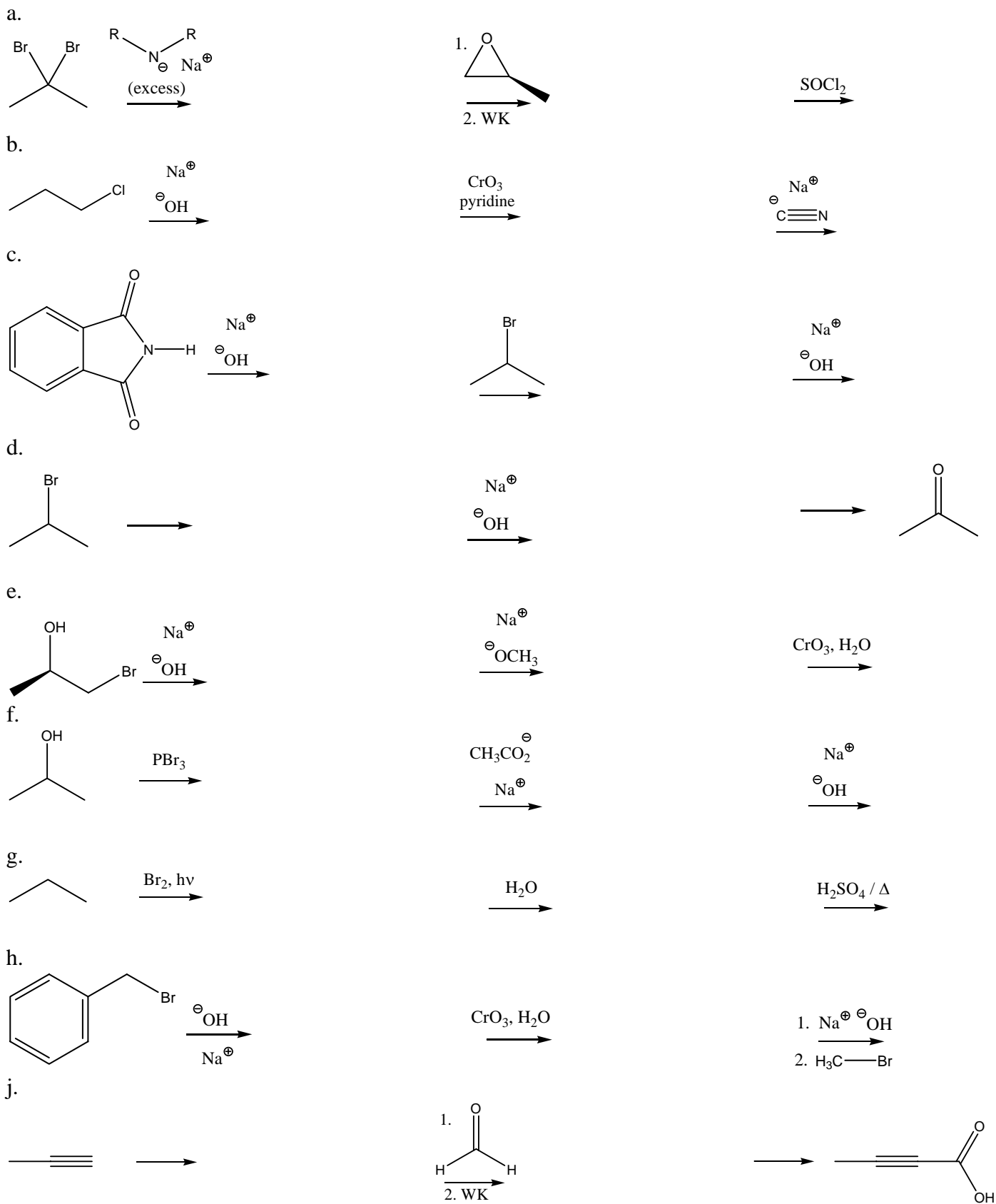


b.



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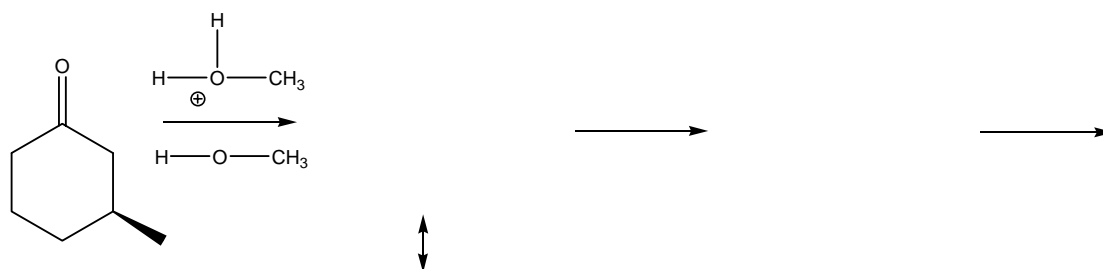
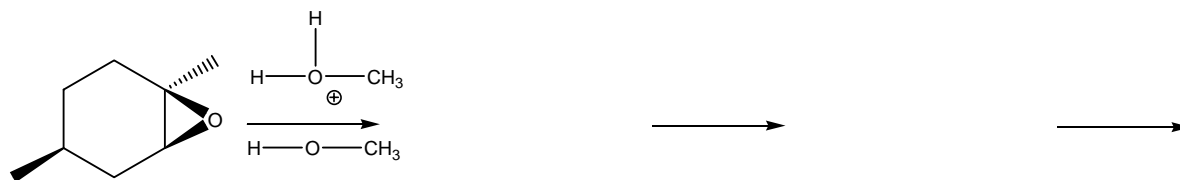
3. Fill in the missing product or reagent, as needed, for each reaction below. Do not waste time by writing mechanisms. (30 pts)



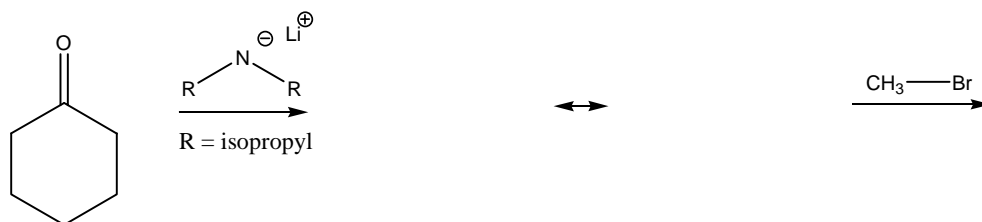
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4. Provide complete arrow-pushing mechanisms for the carbonyl and epoxide reactions below. Include curved arrows, lone pairs of electrons, formal charge and correct 3D structures for each step. Draw important pi resonance structures. If stereoisomers are possible, draw them without any extra mechanisms. (20 pts)

a. Epoxides and carbonyl compounds in aqueous acid (hydration):



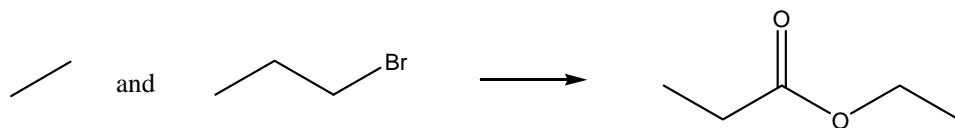
c. Epoxides and carbonyl compounds with 1. LDA 2. electrophile



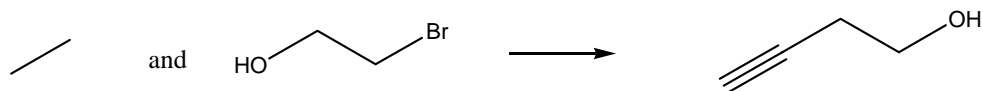
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5. Propose a reasonable synthetic method to accomplish the following transformations using any additional materials available from our course. Show a reaction arrow with appropriate reagents and the product for each step of your synthesis. Do not show mechanisms. (26 pts)

a.

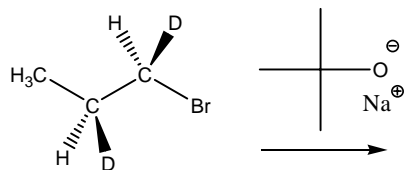


b.

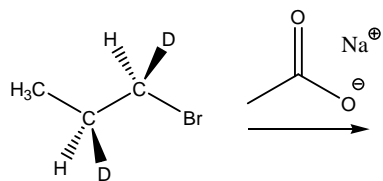


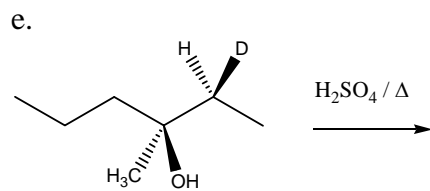
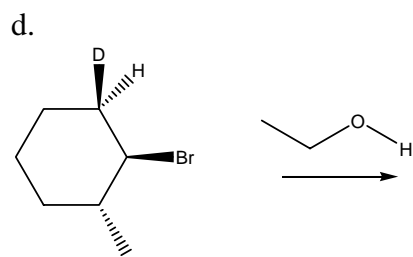
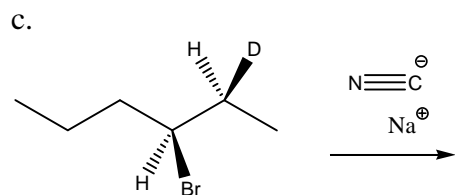
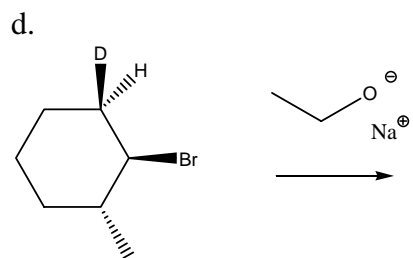
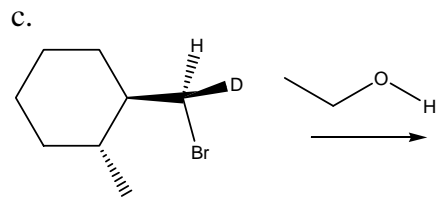
6. Indicate only the major product(s) expected in each reaction below. State what mechanism is operating in each case, and clearly show how it (they) is (are) formed using 3D structures. Assume that if a more stable intermediate can form, it will generate the major product(s). If multiple products form by one type of mechanism, just show one mechanistic sequence and draw the other possible products. (32 pts)

a.



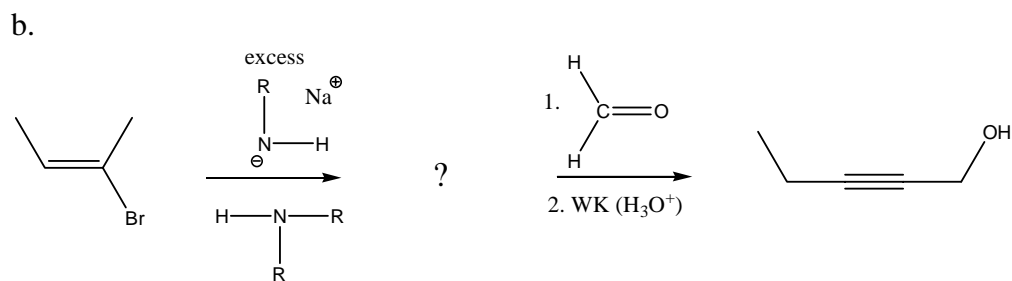
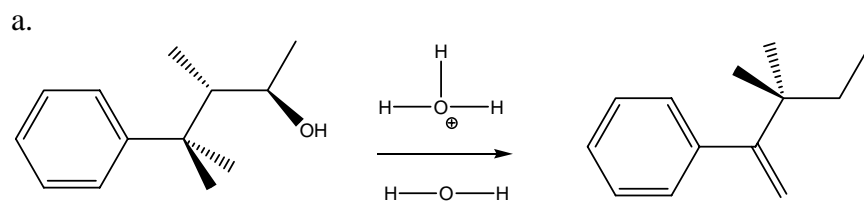
b.





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8. Provide complete arrow-pushing mechanisms for the reactions below. Include curved arrows, lone pairs of electrons and formal charge for each step. If resonance is present, draw at least one additional resonance structure to show you recognize this feature. (30 pts)



There are always two choices, two paths to take. One is easy - and its only reward is that it's easy.

Unknown

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