

California State Polytechnic University, Pomona

Chem 315
Midterm Exam
Fall, 2006
Beauchamp

Name: _____

Topic	Total Points	Credit
1. Nomenclature (1)	25	
2. Arrow pushing mechanism (in acid or base)	20	
3. Comparisons of epoxides with carbonyl compounds	20	
4. Reactions page using reactions learned thus far (21)	31	
5. Tautomeric mechanisms, arrow pushing, proton transfers, resonance (one in acid and one in base)	30	
6. Complete details of S _N 1/E1 and S _N 2/E2 reactions. Stereochemistry, arrow pushing, carbocations, and their reactions	40	
7. Multistep synthesis using reactions learned thus far in the course (use retrosynthetic analysis)	30	
Total	196	

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.

Keep your thoughts positive, because your thoughts become your words.

Keep your words positive, because your words become your behavior.

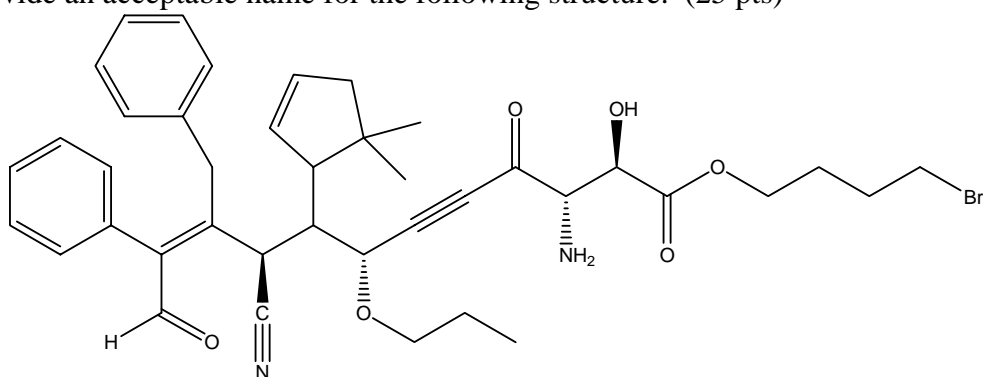
Keep your behavior positive, because your behavior becomes your habits.

Keep your habits positive because your habits become your values.

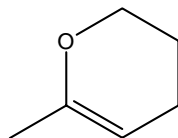
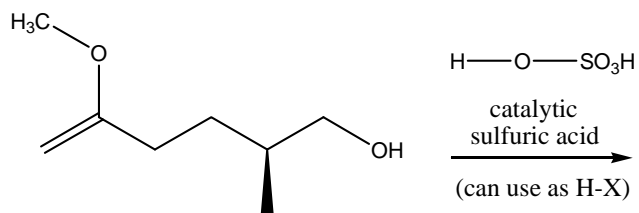
Keep your values positive, because your values become your destiny. Mahatma Gandhi

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



2. Provide a detailed, arrow-pushing mechanism to explain the following transformation. Include any important resonance structures. Add in the missing methyl side branch in the product with the proper stereochemistry (specify all chiral centers as R or S. Write in the missing “other product”. (20 pts)

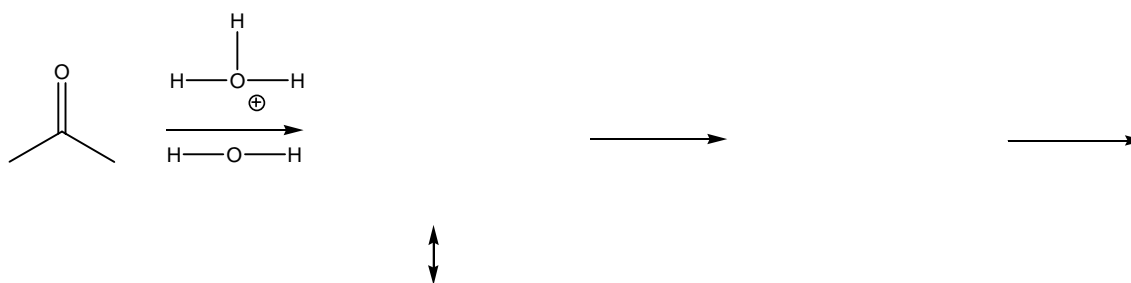
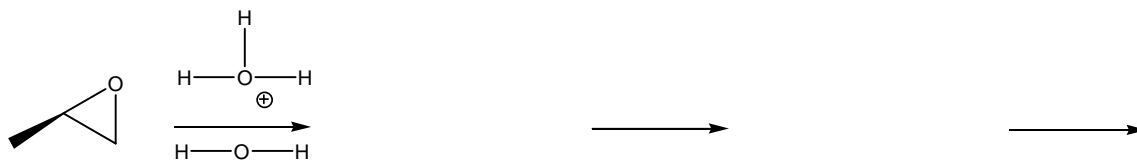


Add in missing methyl branch.
What is the other product?

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3. 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. (20 pts)

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



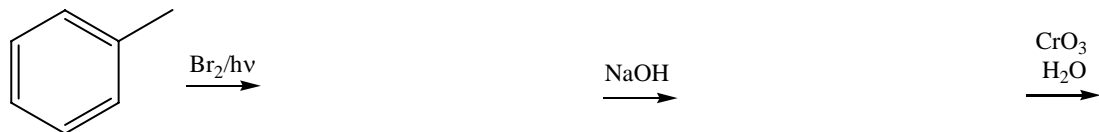
c. Epoxides and carbonyl compounds with 1. LDA 2. electrophile



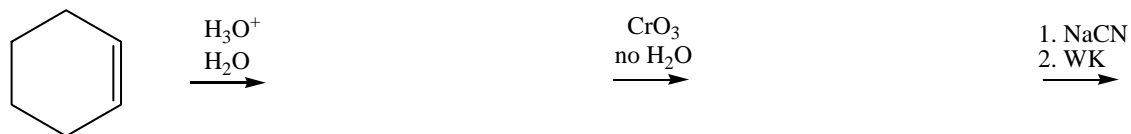
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4. Fill in the missing reagent for each reaction below (only the major product). Do not waste time by writing mechanisms. Remember, all sodium salts are ionic. (31 pts)

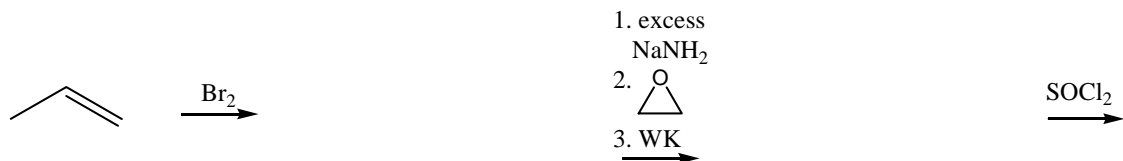
a.



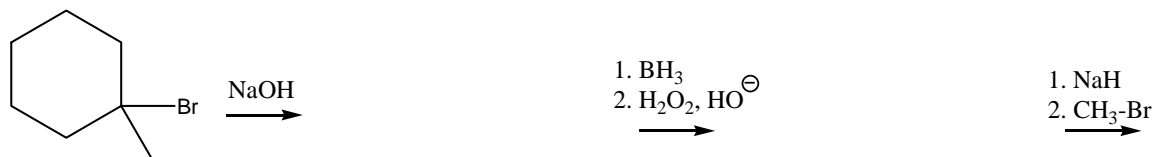
b.



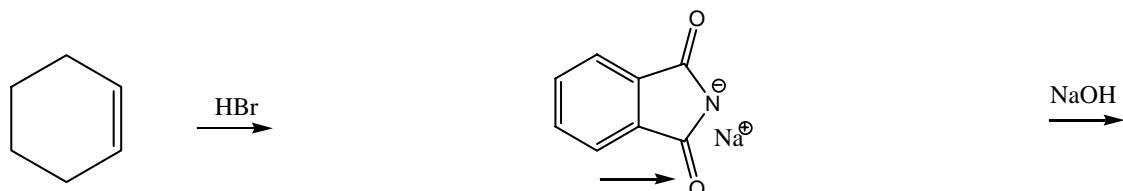
c.



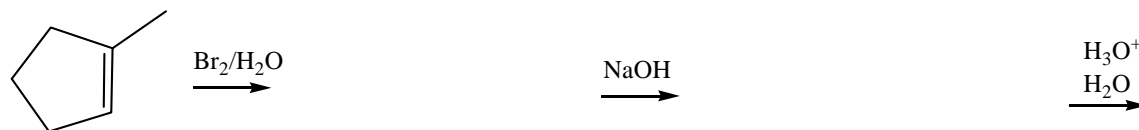
d.



e.



f.



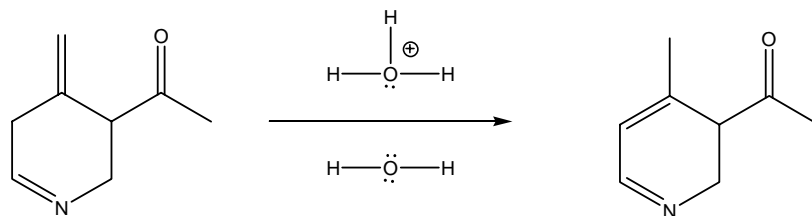
g.



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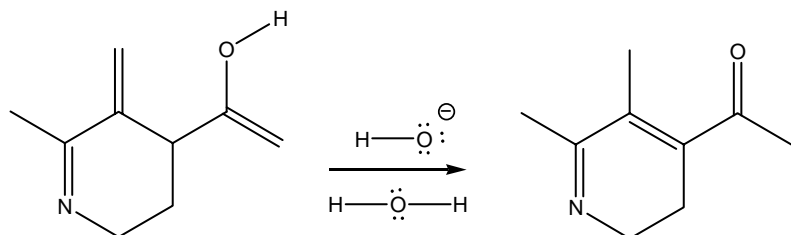
5. Provide a complete arrow-pushing mechanism (curved arrows, lone pairs, formal charge and appropriate resonance structures) to explain the following transformations. Be careful to use only keto, enol or enamine functionality in your transformations. The required steps for each tautomeric transformation are: 1. Proton transfer; 2. Resonance delocalization of the intermediate (show this); 3. Another proton transfer. (30 pts)

a.



Be careful! There is a deceptively easy-looking answer, and it is wrong.

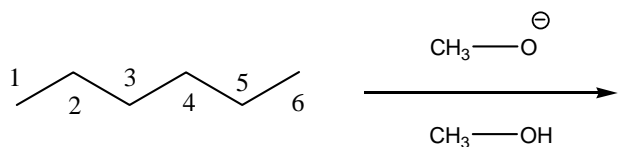
b.



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5.

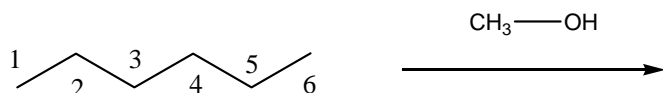
a. Show the expected products from reaction of 3S-bromo-4S-methylhexane with sodium methoxide in methanol (you have to draw the substituents in). For each different type of mechanism, clearly demonstrate **one** arrow-pushing mechanism to form the major expected product from that mechanism. Clearly show any stereocenters important to your mechanisms. Draw structures for any other products expected (do not show mechanisms for these, but **DO** show proper stereochemistry, and label as R/S or E/Z). State what mechanism formed each product. What is the major overall product? (15 pts)



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5b.

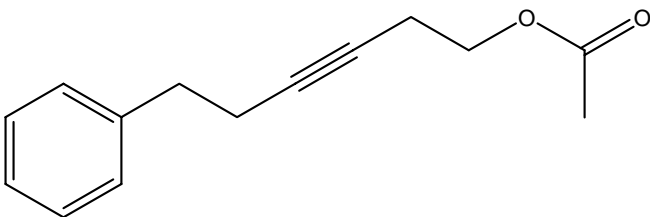
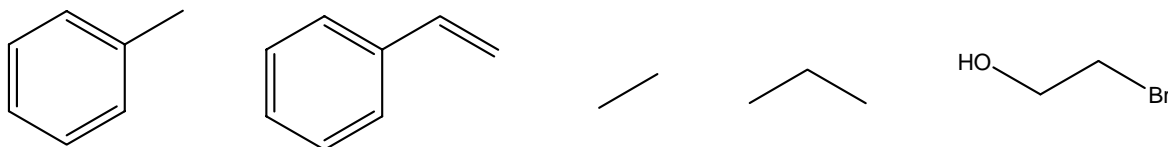
Show the expected products from reaction of 3S-bromo-4S-methylhexane in methanol (you have to draw the substituents in). For each different type of mechanism, clearly demonstrate **one** arrow-pushing mechanism to form the major expected product from that mechanism. Assume that if a more stable intermediate can form, it will form as the major expected pathway (show its formation using curved arrow formalism). Also use the more stable intermediate to predict any additional expected products (do not show additional mechanisms, but **DO** show proper stereochemistry and label R/S or E/Z). Draw 3D structures for any other products expected (do not show mechanisms for these). State what mechanism formed each product. What is the major overall product? (25 pts)



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6. Propose a reasonable synthetic method to accomplish the following transformations using the given hydrocarbons and any other typical 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. (30 pts)

Allowed starting materials, plus any usual organic reagents learned in our course:



Target molecule - look for logical break points and work your way back to allowed starting materials.

Someone is always doing what someone else said couldn't be done.

Extra

From problem 3

b. Epoxides and carbonyl compounds in base:

