

California State Polytechnic University, Pomona

Chem 315
Midterm Exam
Summer, 2001
Beauchamp

Name: _____

Topic	Total Points Exam Points	Credit
1. Nomenclature (1)	25	
2. Mechanisms, arrow pushing, proton transfers, resonance	20	
3. Reactions page using reactions learned thus far (20) (you supply either reactants, reagents or products)	20	
4. Multistep syntheses using the reactions learned thus far in the course (possible in three steps for each part)	20	
5. Evaluation of acidity and/or basicity	15	
6. Complete details of SN1/E1 and SN2/E2 reactions. Stereochemistry, nomenclature, arrow pushing, carbocations, rearrangements are part of the problem	44	
7. Complete arrow pushing mechanisms, epoxides and carbonyls in acid and base conditions	30	
Total	174	

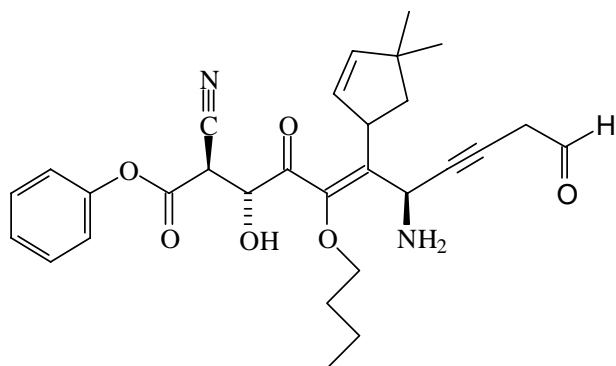
This is a long exam. It has been designed so that no one question will make or break you. The best strategy is to work steadily, starting with those problems you understand best. Make sure you show all of your work. Draw in any lone pairs of electrons, formal charge and curved arrows to show electron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

Enthusiasm and persistence can make an average person superior,
indifference and lethargy can make a superior person average

William Ward

California State Polytechnic University, Pomona

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

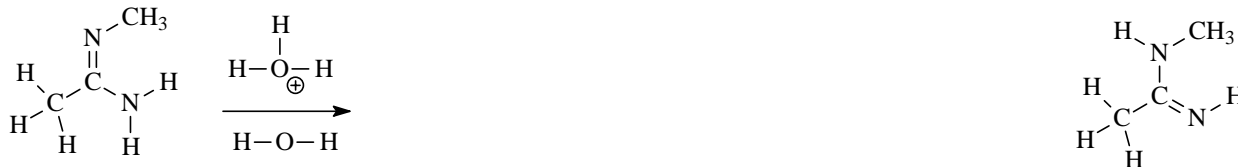


2. Provide a complete arrow-pushing mechanism (curved arrows, lone pairs and formal charge) to explain the following transformations. The required steps for both transformations are: 1. Proton transfer; 2. Resonance delocalization of the intermediate (show this); 3. Another proton transfer. (20 pts)

a.



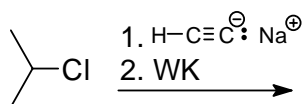
b.



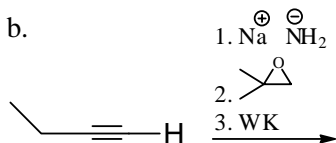
California State Polytechnic University, Pomona

3. Fill in the missing product, reagent or reactant, as needed, for each reaction below. (20 pts)

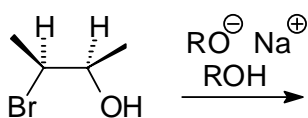
a.



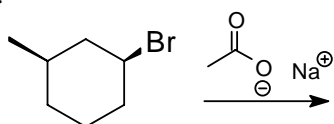
b.



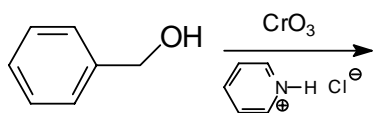
c.



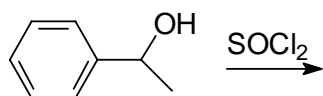
d.



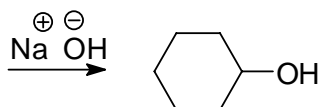
e.



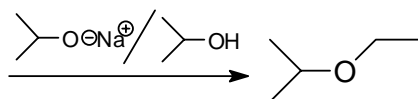
f.



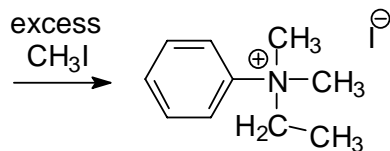
g.



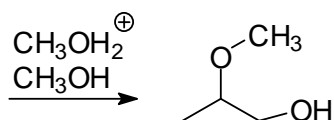
h.



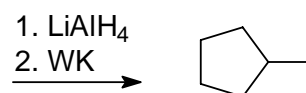
i.



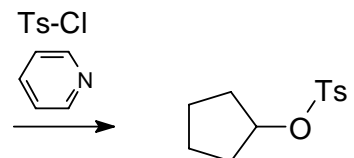
j.



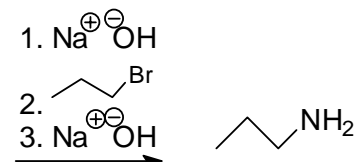
k.



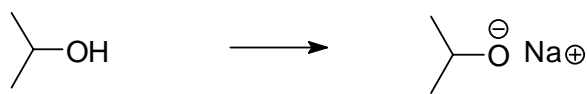
l.



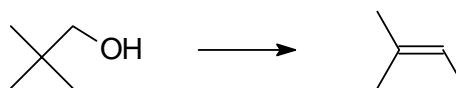
m.



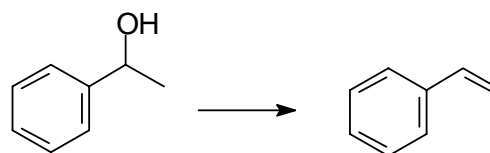
n.



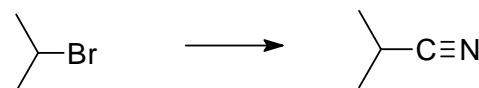
o.



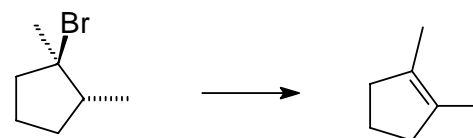
p.



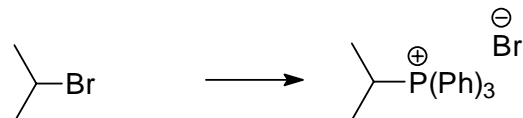
q.



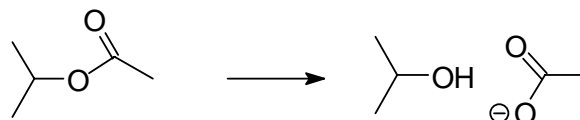
r.



s.



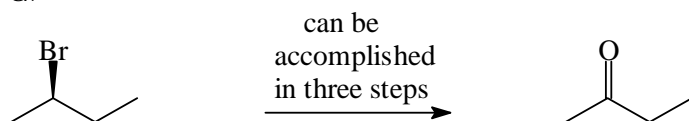
t.



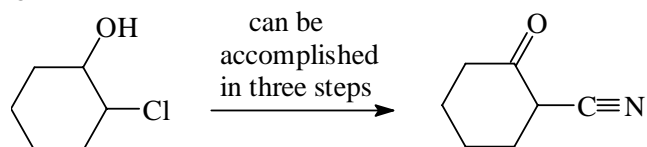
California State Polytechnic University, Pomona

4. Propose a reasonable synthetic method to accomplish the following transformations using any 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. (20 pts)

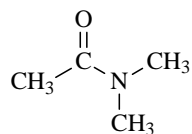
a.



b.

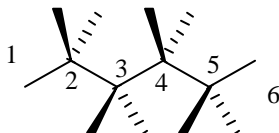


5. What is the most basic site in the following molecule. Provide a complete explanation, supplying all structures necessary to rationalize your answer. Use H-X to represent sulfuric acid. (15 pts)



California State Polytechnic University, Pomona

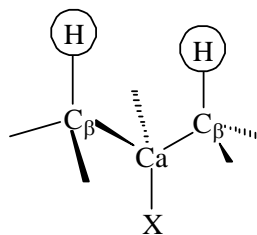
6. a. Draw a 3D structure (lines, dashes and wedges) of 3S-bromo-4R-methylhexane. This structure is necessary to the following parts of the problem and will be supplied for the point value of this part of the problem. If rearrangements are possible in any part, only include rearrangements to **more stable carbocations** and assume that all appropriate reactions occur from that intermediate. (4 pts)



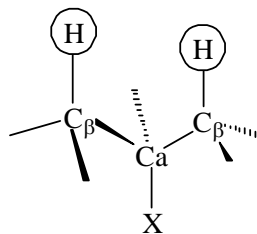
3D structure of 3S-bromo-4R-methylhexane

In parts b-e show the expected kinds of reaction(s) when reacted with **sodium methoxide in methanol**. If more than one variation of a reaction type is possible, redraw the reactant in the appropriate conformation to clearly demonstrate an arrow-pushing mechanism. (20 pts)

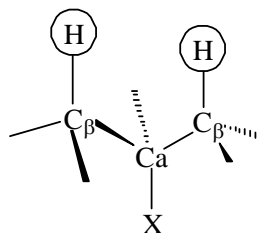
b. mechanism(s) _____



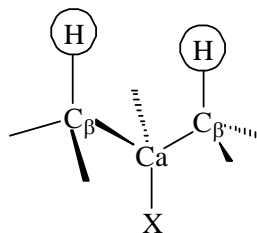
c. mechanism(s) _____



d. mechanism(s) _____

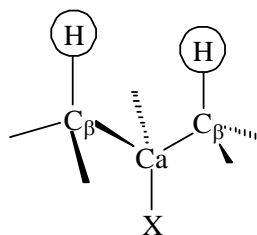


e. mechanism(s) _____



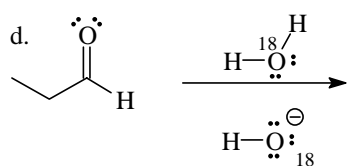
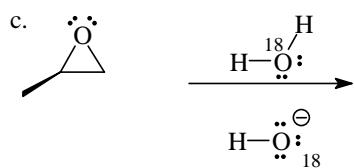
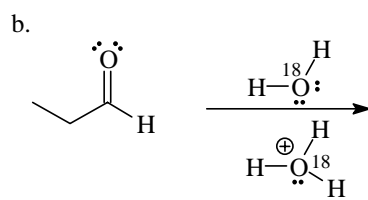
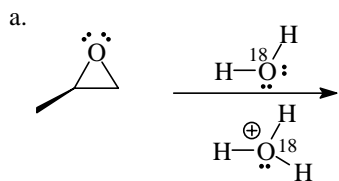
In parts d and e show the expected kinds of reaction(s) when reacted with **methanol**. A single structure can be used to demonstrate any product(s) of a certain reaction type. Indicate the relative amounts expected of each product. Remember, if rearrangements are possible in any part, only include rearrangements to **more stable** carbocations and assume that all appropriate reactions occur from that intermediate. (20 pts)

f. mechanism(s) _____



California State Polytechnic University, Pomona

7. Epoxides and carbonyls show many parallel reactions in acid or base conditions. Assume that the products below are addition reactions of isotopically (O^{18}) labeled water, H_2O^{18} . You can show the labeled oxygen from the water with a star, H_2O^* . Provide complete arrow-pushing mechanisms for each of the reactions. Include curved arrows, lone pairs of electrons and formal charge for each step of the reaction. All of these **addition mechanisms to neutral molecules** can be written in two to three steps. Specify the absolute configuration of any chiral centers in the reactants and products. (30 pts)



The beautiful thing about learning is nobody can take it away from you.