

California State Polytechnic University, Pomona

Chem 315
Midterm Exam
Winter, 2004
Beauchamp

Name: _____

Topic	Total Points	Credit
1. Nomenclature (1)	25	
2. Tautomeric mechanisms, arrow pushing, proton transfers, resonance, one in acid and one in base	28	
3. Reactions page using reactions learned thus far (20) (you supply either reagents or products)	35	
4. Multistep syntheses using the reactions learned thus far in the course (possible in 4-5 steps)	25	
5. Complete details of $S_N1/E1$ and $S_N2/E2$ reactions. Stereochemistry, arrow pushing, carbocations, rearrangements might be part of the problem	35	
6. Complete arrow pushing mechanisms, one in acid (rearrangements are possible) and one in base (understanding tautomerization will help)	30	
Total	178	

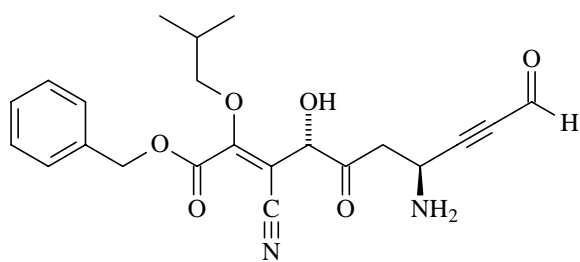
This is a long exam. It has been designed so that no one question will make or break you. The best strategy is to work steadily, starting with those problems you understand best. Make sure you show all of your work. Draw in any lone pairs of electrons, formal charge and curved arrows to show electron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

You cannot teach people anything. You can only help them discover it within themselves.

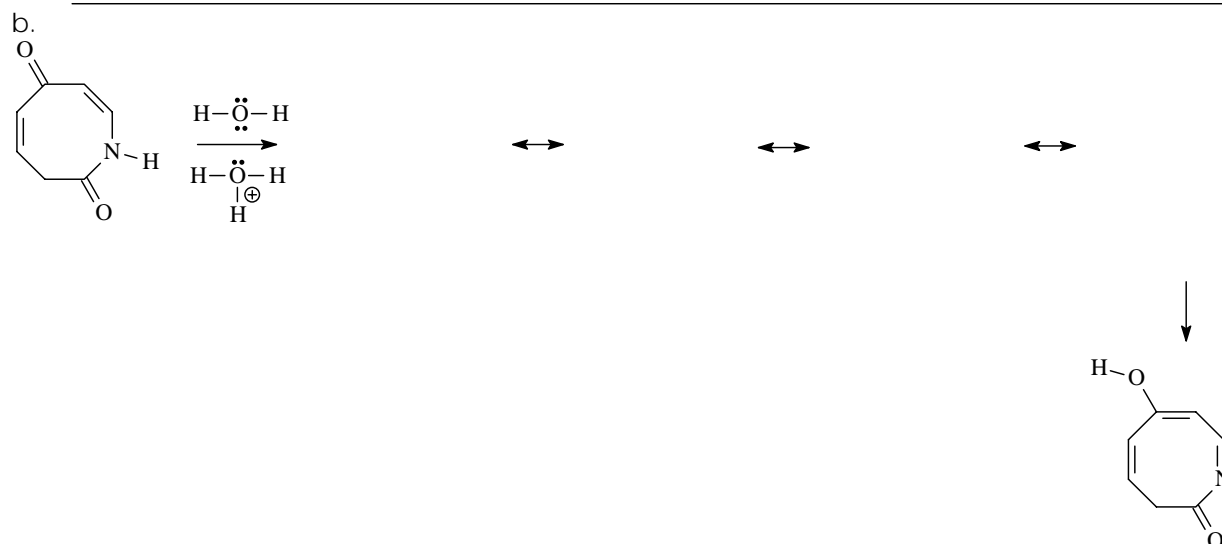
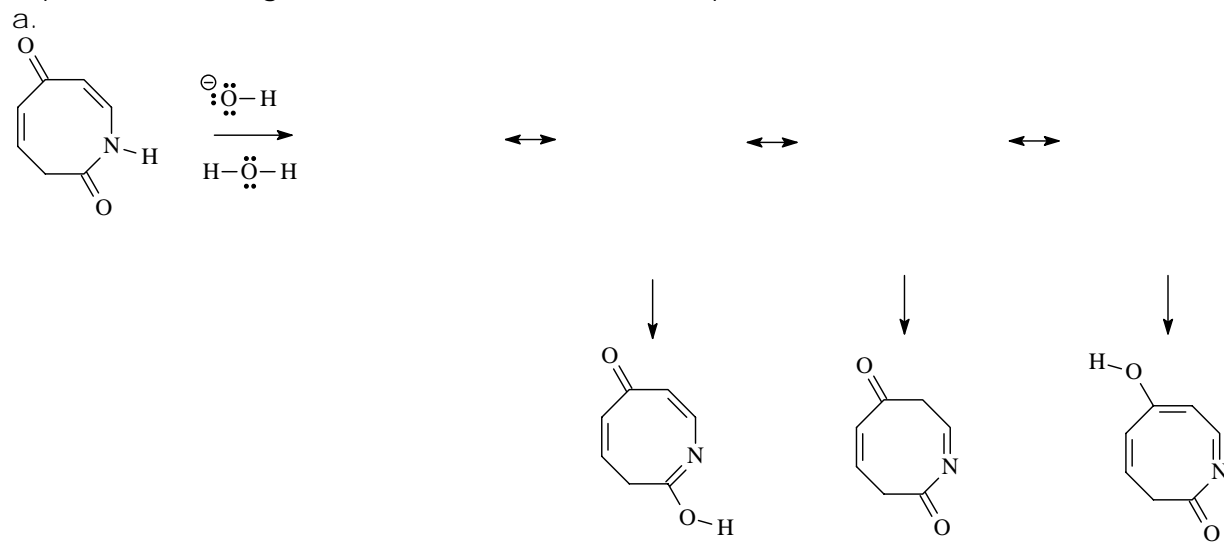
Galileo

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



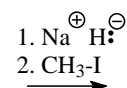
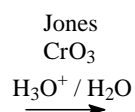
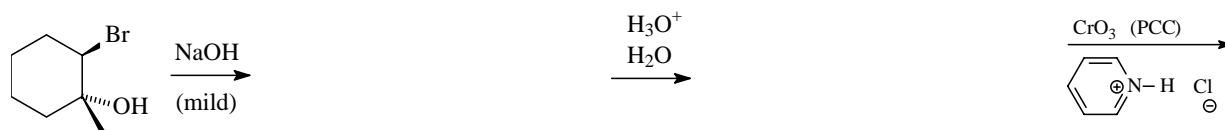
2. Provide a complete arrow-pushing mechanism (curved arrows, lone pairs and formal charge) to explain the following tautomeric transformations. (28 pts/)



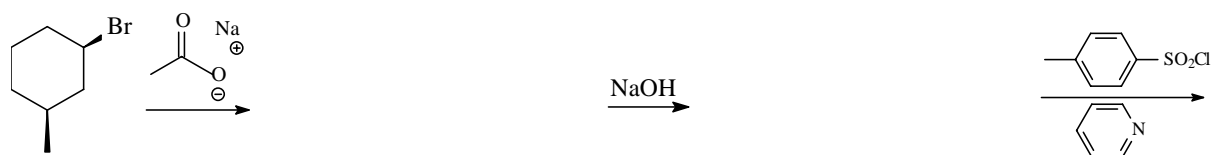
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3. Fill in the missing product or reagent, as needed, for each reaction below. Do not waste time by writing mechanisms. (35 pts)

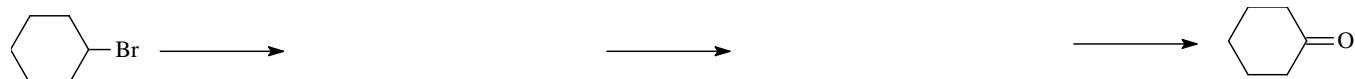
a.



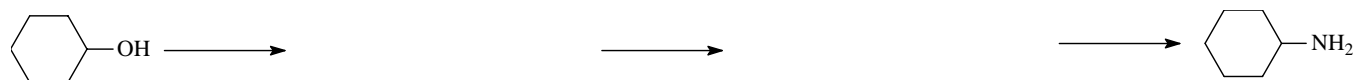
b.



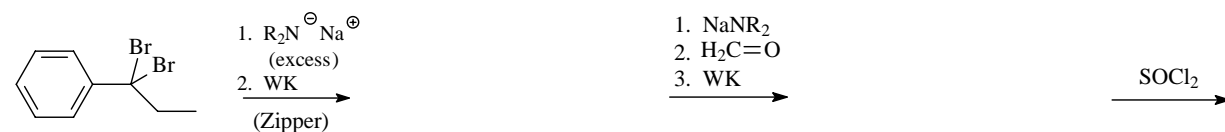
c.



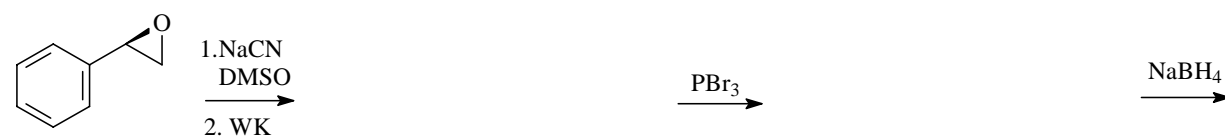
d.



e.



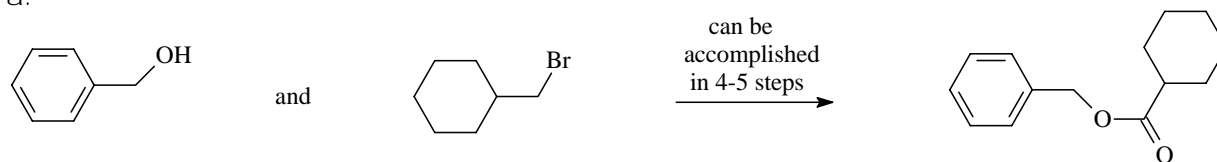
f.



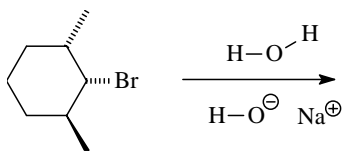
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4. Propose a reasonable synthetic method to accomplish the following transformations using any additional materials available from our course. Show a reaction arrow with appropriate reagents and the product for each step of your synthesis. Do not show mechanisms. (25 pts)

a.

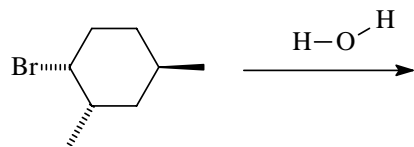


5. a. Show the expected kinds of reaction(s) when 2-bromo-1S,3S-dimethylcyclohexane is reacted with sodium hydroxide in water. If more than one variation of a reaction type is possible, redraw the reactant in the appropriate conformation to clearly demonstrate an arrow-pushing mechanism. Indicate the relative amounts of each product expected. State what mechanism is operating in each case. (16 pts)



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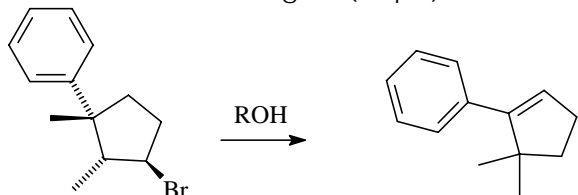
5b. Show the expected kinds of reaction(s) when the given structure is reacted with water, alone. Assume that if a more stable intermediate can form, it will and use that intermediate to illustrate any expected reactions. A single intermediate structure can be used to demonstrate all product(s) of a certain mechanistic type. Indicate the relative amounts expected of each product. Show all mechanistic steps. State what mechanism is operating in each case. (24 pts)



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6. 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.

a. Hint: Number your carbons in the reactant and the product in a systematic way. What is the driving force for such a change? (15 pts)



b. Provide a complete arrow pushing mechanism to show how the product is formed. How many hydrogens are remaining of the original 3H's on the methyl in the starting material? (15 pts)

