

# California State Polytechnic University, Pomona

Chem 316  
Midterm Exam  
Winter, 2005  
Beauchamp

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

Topic	Total Points Exam Points	Credit
1. Nomenclature (1)	25	
2. Arrow-pushing Mechanisms, (in acid and in base)	20	
3. Reactions page 10 x 3 lines of reactions studied so far in organic chemistry	35	
4. Tautomers (one in acid and one in base)	30	
5. Carbohydrate Game (reaction recognition/simplistic mechanisms, four sequences)	24	
6. <sup>14</sup> C synthesis (methanol, ethene, cyclohexene, propene, bromobenzene, NaCN, CO <sub>2</sub> , <sup>14</sup> C compounds)	25	
<b>Total</b>	159	

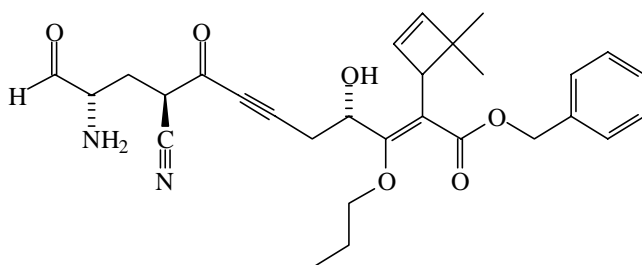
This is a long exam. It has been designed so that no one question will make or break you. The best strategy is to work steadily throughout the period, starting with those problems you understand best. Make sure you **show all of your work**. In mechanism problems, draw in any lone pairs of electrons, formal charge and curved arrows to show electron movement. If resonance is present in a mechanism problem, draw at least one additional resonance structure to show you recognize this feature (make sure the "best" resonance structure is included in your two resonance structures). Only write answers on the front of each page. Do your best to show me what you know in the time available.

Nothing in life is to be feared. It is only to be understood.

Marie Curie

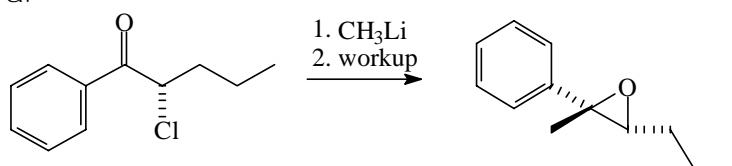
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Provide an acceptable name for the following structure. (25 pts)

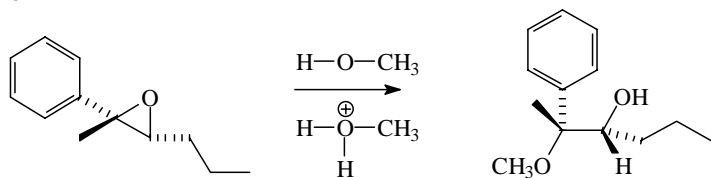


1. Provide complete arrow-pushing mechanisms for the following reactions. Include curved arrows, lone pairs of electrons and formal charge. If resonance is present, draw at least one additional resonance structure to show you recognize this feature (make sure the "best" resonance structure is included in your two resonance structures). (20 pts)

a.



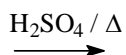
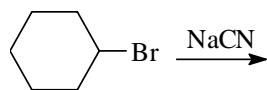
b.



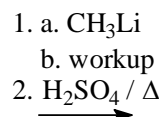
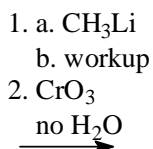
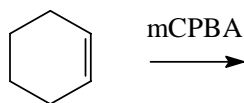
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2. Provide the expected product for each of the following transformations. Show regiochemistry and stereochemistry clearly, if relevant. Do NOT show mechanisms. (a, h, j = 4 pts, b = 5pts. (35 pts)

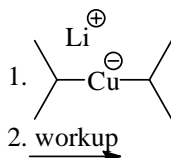
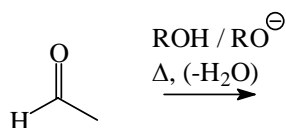
a.



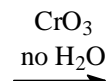
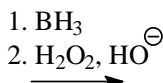
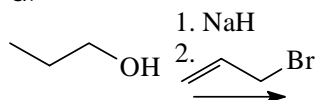
b.



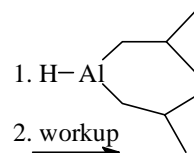
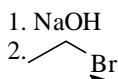
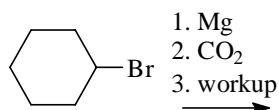
c.



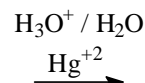
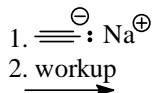
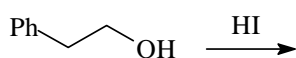
d.



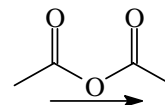
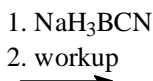
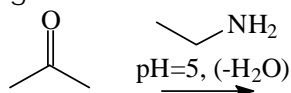
e.



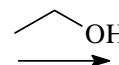
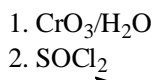
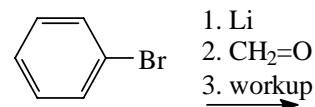
f.



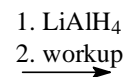
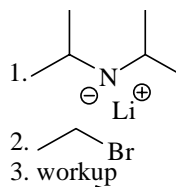
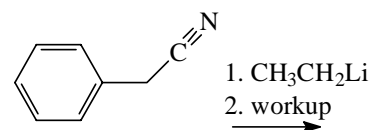
g.



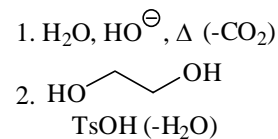
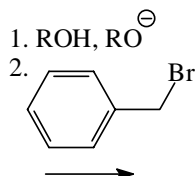
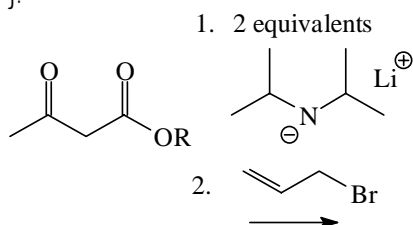
h.



i.



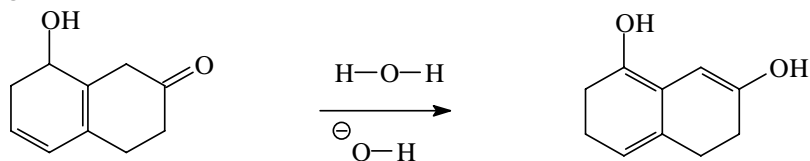
j.



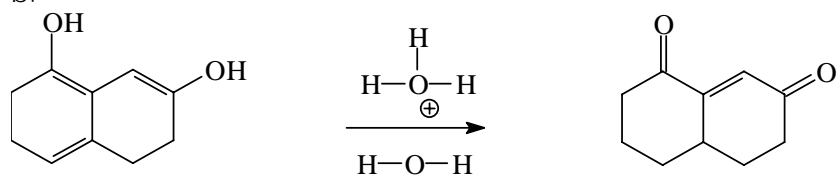
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3. Provide complete arrow-pushing mechanisms for the reaction below. Include curved arrows, lone pairs of electrons and formal charge. If resonance is present, draw at least one additional resonance structure to show you recognize this feature (make sure the "best" resonance structure is one of your two resonance structures). (30 pts)

a.



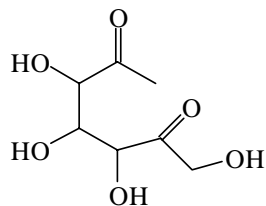
b.



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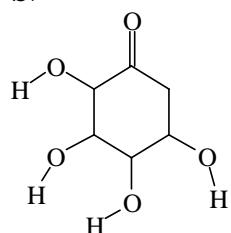
4. From the given carbohydrate, use a simplistic nondetailed mechanism to show how each transformation could occur. Add in any additional atoms to demonstrate your transformations. Use B: if you need a base and B-H<sup>⊕</sup> if you need an acid. (24 pts)

a.



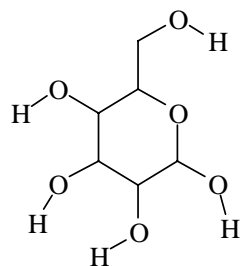
intramolecular  
aldol reaction  
→

b.



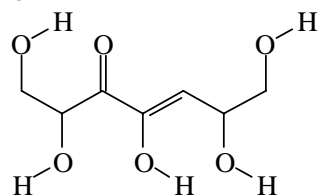
tautomerization  
to form "en-diol"  
→

c.



reverse  
hemi-acetal  
open chain  
→

d.

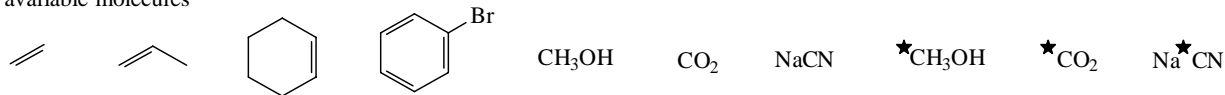


Michael  
(hydration)  
→

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5. Propose a synthesis for the following compound using methanol, ethene, propene, cyclohexene, bromobenzene, sodium cyanide or carbon dioxide. Your only source of radioactive  $^{14}\text{C}$  carbon is  $^{14}\text{C}$  methanol,  $^*\text{CH}_3\text{OH}$ , carbon dioxide,  $^*\text{CO}_2$  and sodium cyanide,  $\text{Na}^*\text{CN}$ . You may also use any typical organic reagents. Often the best strategy is to work backwards from the target molecule. The last step of the synthesis should be your first step. Show the reagents and reactant for each backwards step until you reach allowable starting molecules. Do not show mechanisms. (25 pts)

available molecules



target structure

