Chem 12B
Exam #1
March 10, 2021

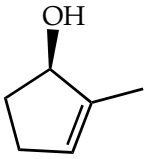
Name _____
please print
90 min, 100 points

Instructions- Read through all questions carefully. The points for each problem are in square brackets (e.g. [/8]). The exam is split between two sections. All of the problems in section one must be completed, the points of these problems are weighted according to difficulty. Only three of the problems in section two need to be completed, these problems are of equal point value. This is an open book, open note test.

Section One – All questions mandatory

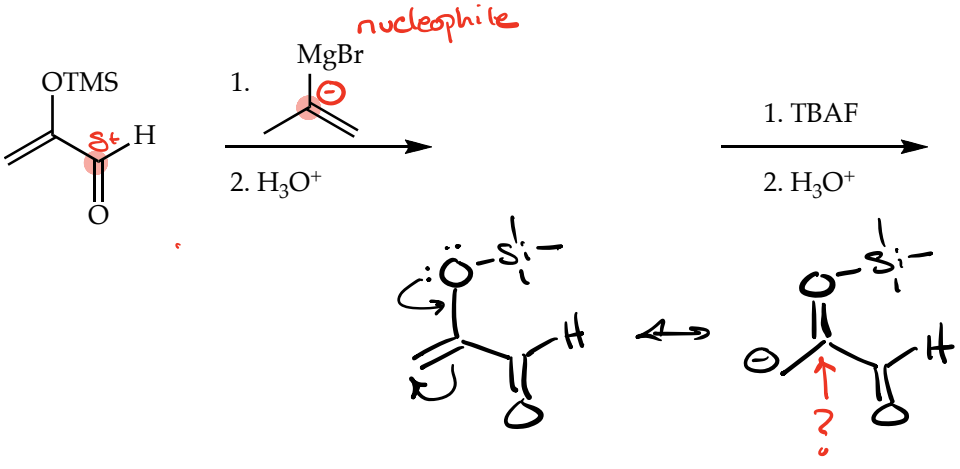
1. [/12] For the following problems: given the name, draw the structure, or given the structure, provide the name.

a)

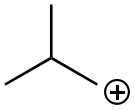
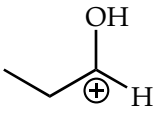
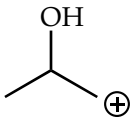
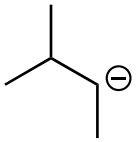


b) 3-methoxy-4-methylpent-4-en-2-ol

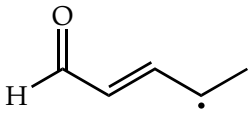
2. [/8] Give the products for each of the two steps in the sequence. Don't speed through too fast, slow down and pay attention.



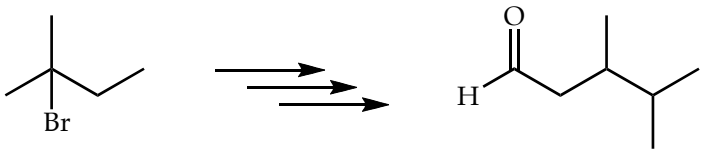
3. [/12] Pictured below are some typical synthons that can result from bond disconnections in retro synthesis. Provide an actual molecule (synthetic equivalent), that you would use in the forward synthesis, that has the desired property of the given synthon.

Synthon	Synthetic equivalent
	
	
	
	

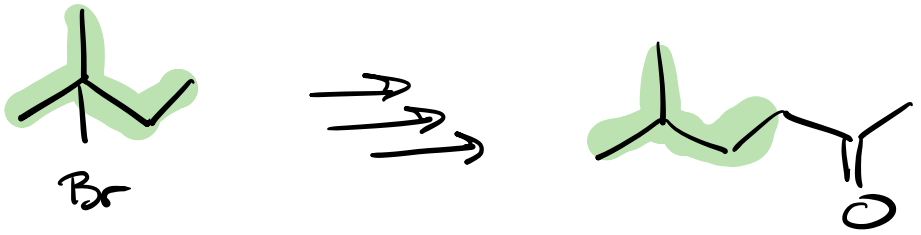
4. [/8] Draw all of the resonance contributors for the radical species given below.



5. [/12] Provide a retrosynthetic analysis and the forward synthesis to achieve the following transformation. This synthesis can be done in as little as five steps. Do not worry about stereochemistry.

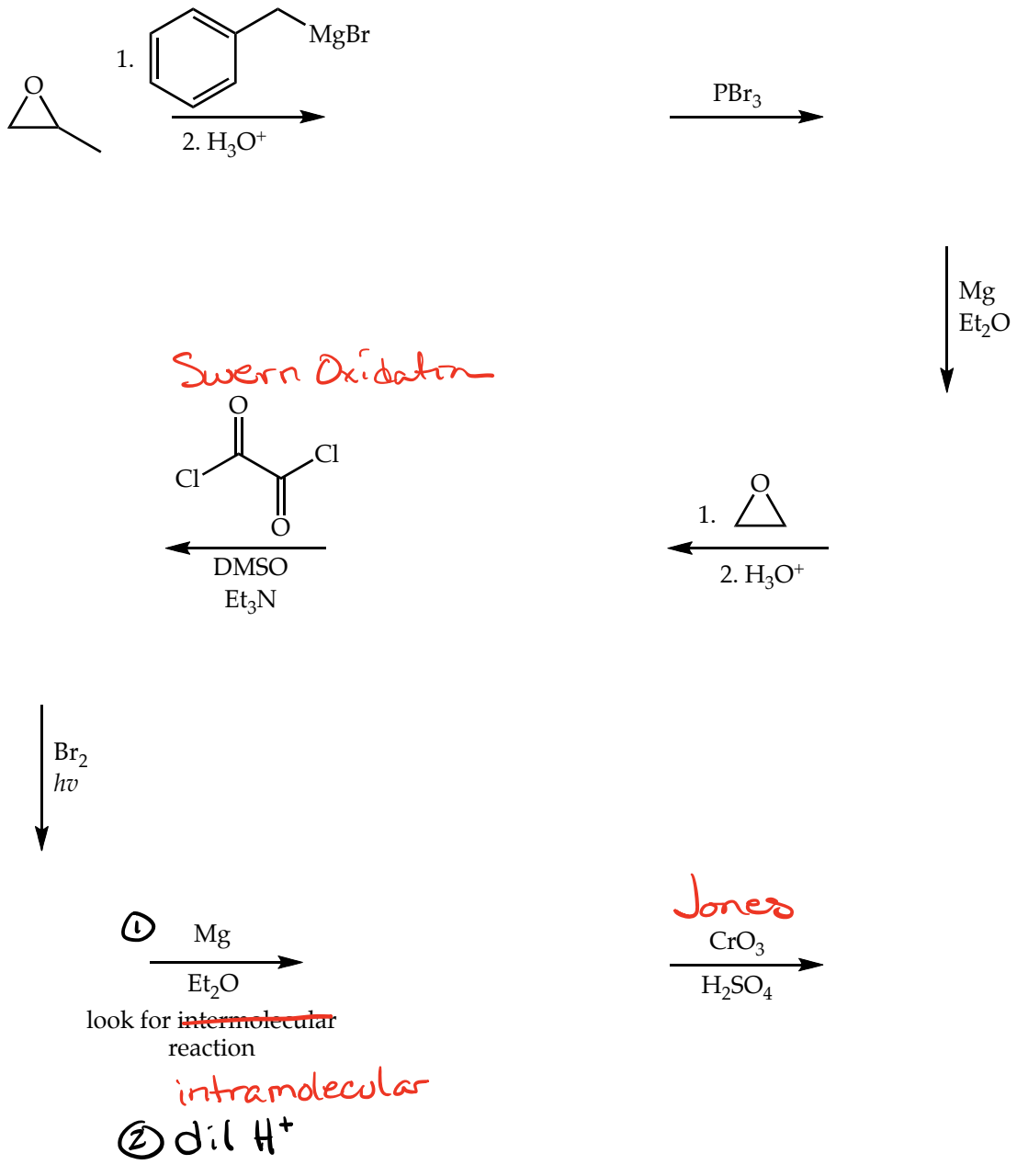


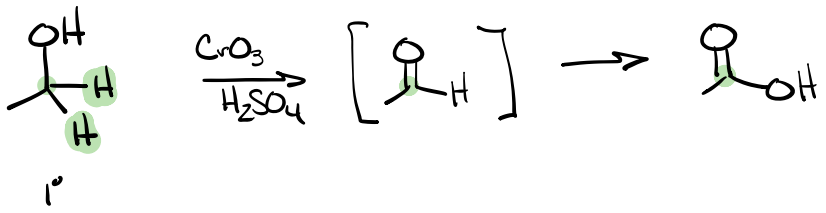
≡ equivalent



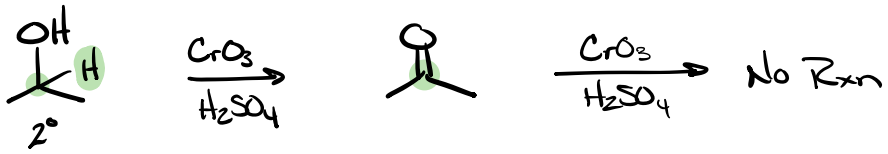
Section Two – Choose three of the following questions to answer. Clearly indicate your choice by striking the problems you do not want me to grade with a large diagonal line.

6. [/16] Fill in the product and reagents represented by A through J in the following scheme. Indicate stereochemistry where known.

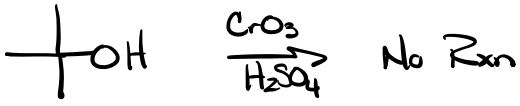




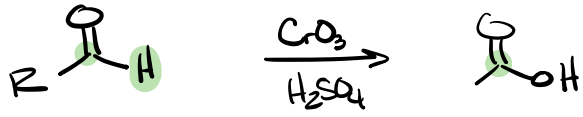
1°

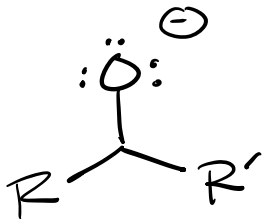


2°



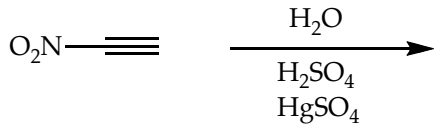
3°



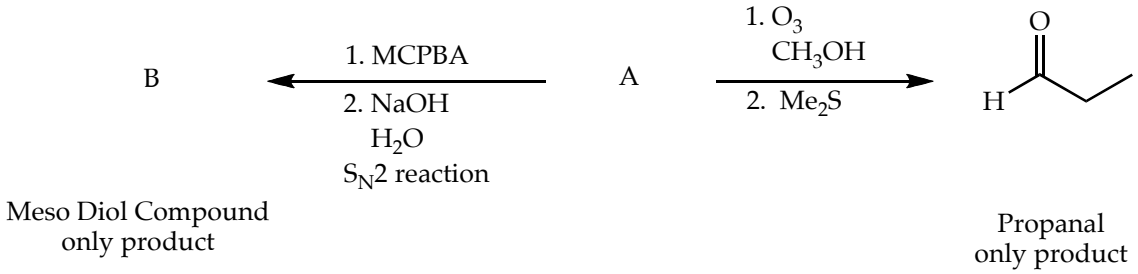


Alkoxide ion

7. [/16] Determine the product of the hydration of nitroacetylene. In determining the product, **draw the full mechanism of the reaction (All arrow pushing starting from the protonation)**. Remember to consider your options. Also remember to explain your reasoning for whatever product you arrive at.



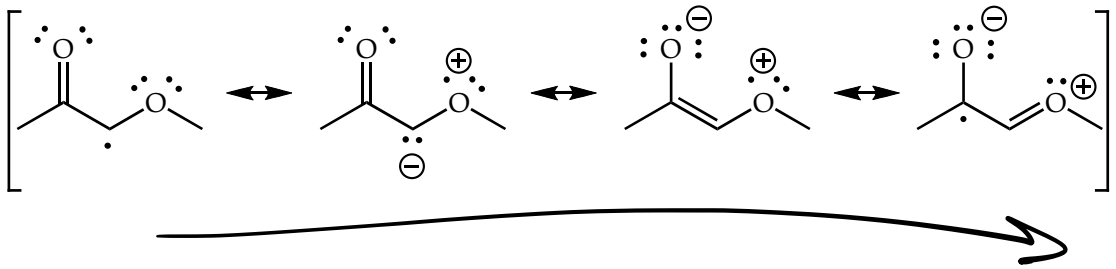
8. [/16] When compound **A** is treated with ozonolysis, followed with dimethyl sulfide, propanal is obtained as the only product. Treatment of compound **A** with MCPBA followed by S_N2 reaction with hydroxide nucleophile results in the diol compound **B** as the only product (compound **B** is meso). What are the structures of compounds **A** and **B**? No guessing, you need a rational for your answers.



Meso Diol Compound
only product

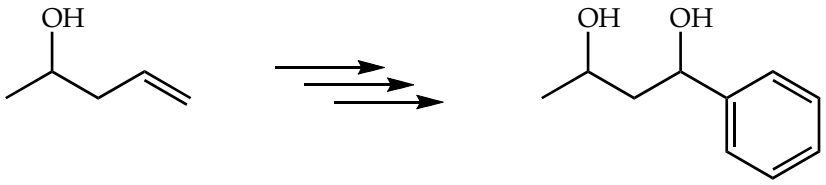
Propanal
only product

9. [/16] We talked in class about the stability of radicals and how they can be stabilized by either resonance EWG or resonance EDG. We also mentioned that radicals are most stabilized when situated between both types of groups, though we didn't exactly say why. **A)** Complete the diagram below providing the proper arrows to show the electron flow. Be carful of the types of arrows you use! **B)** Indicate the two most stable resonance contributors. **C)** Explain why your two chosen structures are more stable than the remaining two.

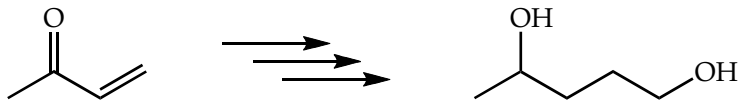


10. [/16] Design a synthesis of (*E*)-4,6-dimethyl-hept-2-ene from (*E*)-4-methyl-pent-2-ene using any organic or inorganic reagents. This synthesis requires approximately six steps.

11. [/16] Design a synthesis to achieve the following transformation. A retrosynthetic analysis is not required, but would be helpful. This synthesis can be done in as little as four steps.



12. [/16] Design a synthesis of pentane-1,4-diol starting from but-3-en-2-one. You may use any organic and inorganic reagents you desire. This reaction requires approximately 6 steps.



but-3-en-2-one pentane-1,4-diol