

CHEMISTRY 3331, Spring 2004  
Professor Walba  
Second Hour Exam, March 11

scores:

- 1)
- 2)
- 3)
- 4)

\_\_\_\_\_

CU Honor Code Pledge: On my honor, as a University of Colorado at Boulder Student, I have neither given nor received unauthorized assistance.

Name (printed): \_\_\_\_\_

Signature: \_\_\_\_\_

Recitation TA Name: \_\_\_\_\_

Recitation day and time: \_\_\_\_\_

This is a closed-book exam. The use of notes, models, calculators, and other paraphernalia will not be allowed during the exam. Please put all your answers on the test. Use the backs of the pages for scratch.

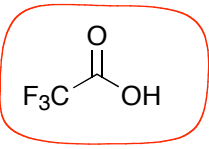
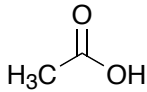
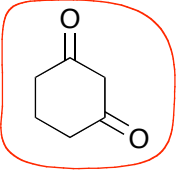
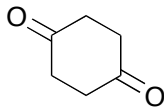

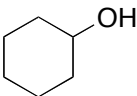
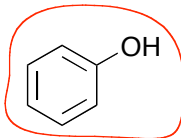
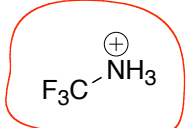
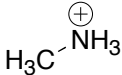
**PLEASE read the questions carefully!**

## Partial Periodic Table

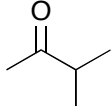
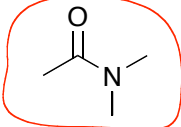
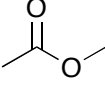
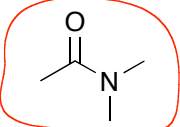
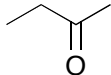
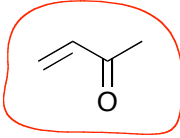
1A								8A	
1 H	2A					7A	2 He		
3 Li	4 Be	3A	4A	5A	6A	9 F	10 Ne		
5 B	6 C	7 N	8 O	13 Al	14 Si	15 P	16 S	17 Cl	18 Ar
11 Na	12 Mg						35 Br		
							53 I		

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

1 (25 pts) a) Circle the stronger Bronsted acid in each of the following pairs of structures.

			
	$\text{H}_2\text{O}$		
		Intentionally left blank	

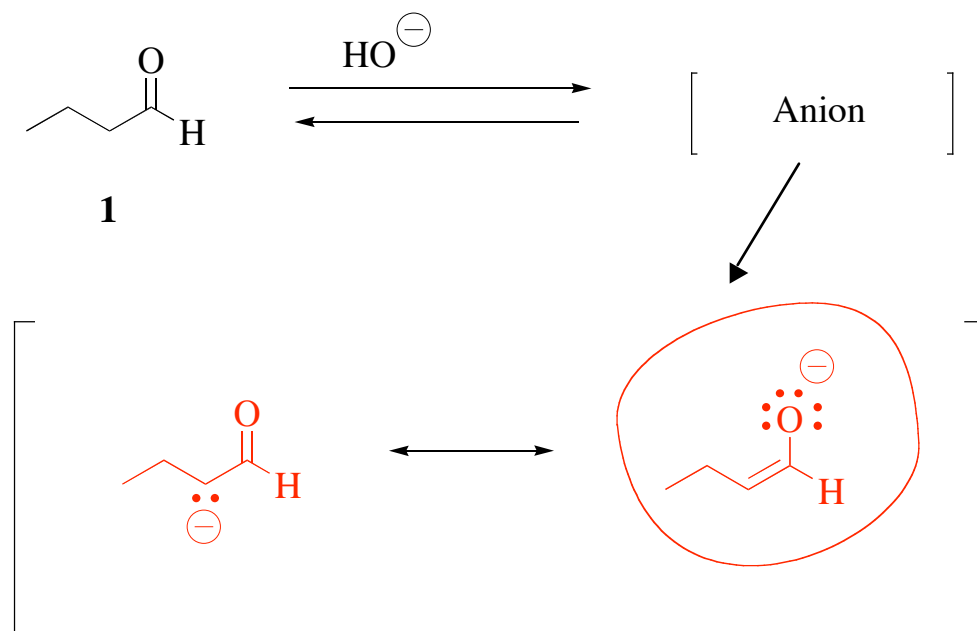
b) Circle the compound with the more stable carbonyl group in each of the following pairs of compounds.

			
		Intentionally left blank	

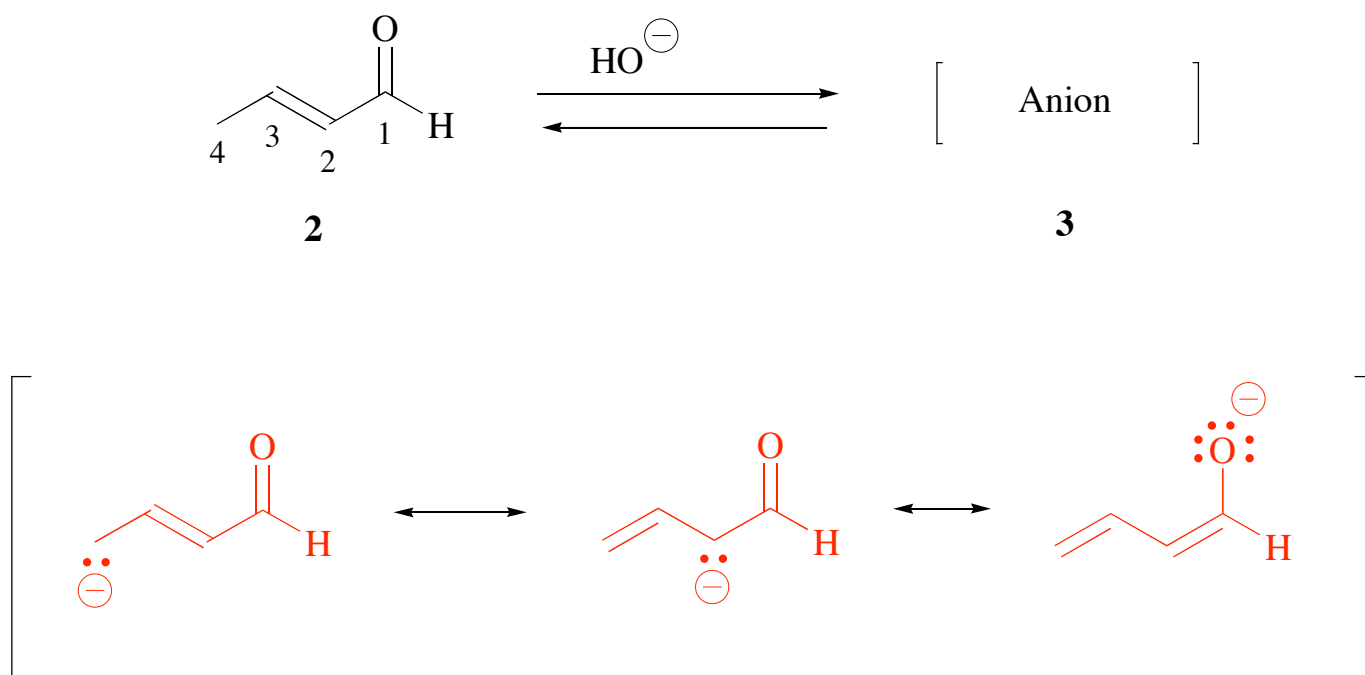
Name: \_\_\_\_\_

1) - continued

a) Treatment of butanal (**1**) with hydroxide gives an anionic intermediate with molecular formula  $C_4H_7O^-$ . Give the two major resonance contributors to the structure of this anion, and **circle the major contributor**.

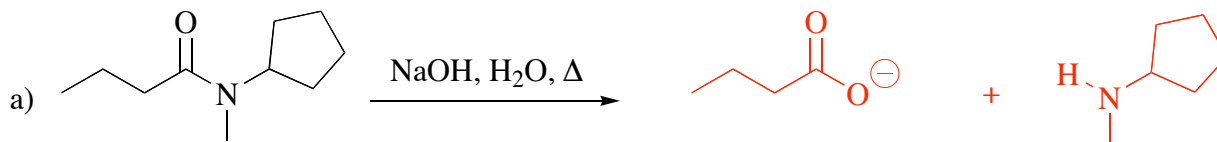


b) Treatment of 2,3-butenal (**2**) with hydroxide gives an anion (**3**) with molecular formula  $C_4H_5O^-$ , with molecular formula . In anion **3**, both carbons 2 and 4, as numbered in structure **2**, are nucleophilic! Give the THREE major contributors to the structure of anion **3**.

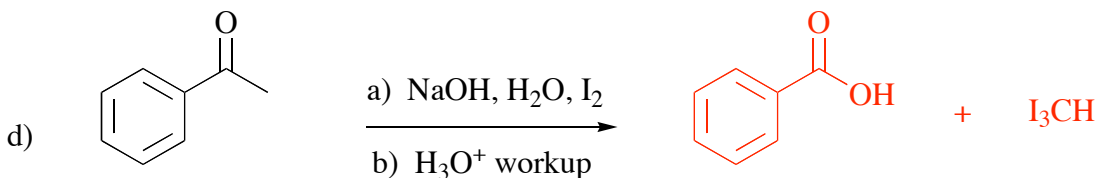
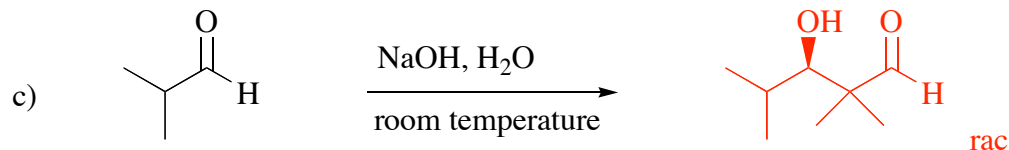
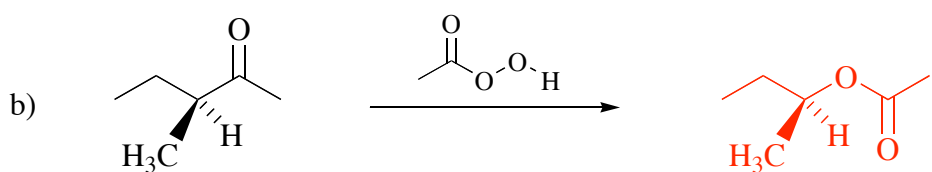


Name: \_\_\_\_\_

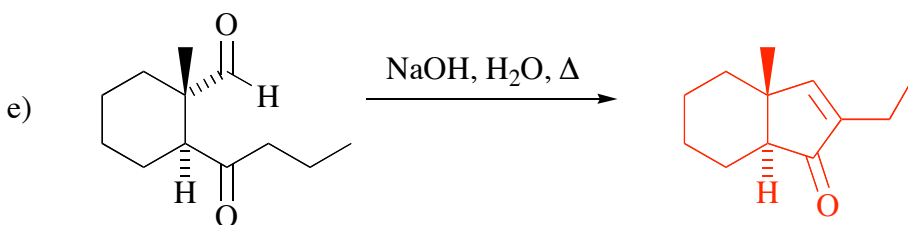
2) (20 pts) Give the single major organic product of each of the following reactions, unless more products are specifically requested. Carefully indicate the stereochemistry of the product(s) if appropriate. If a racemate is formed, show only one enantiomer and label it "rac."



Give two organic products - be sure to show the correct charges (if any) on your products

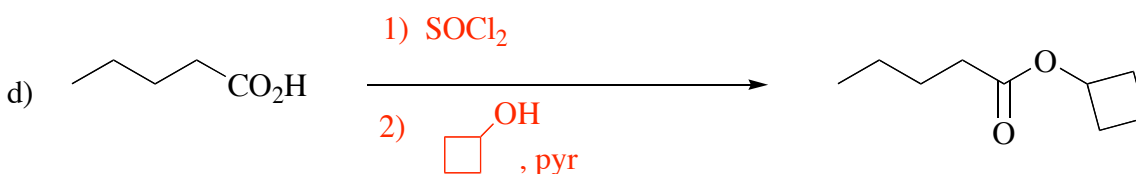
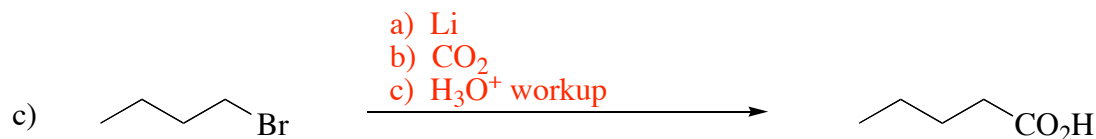
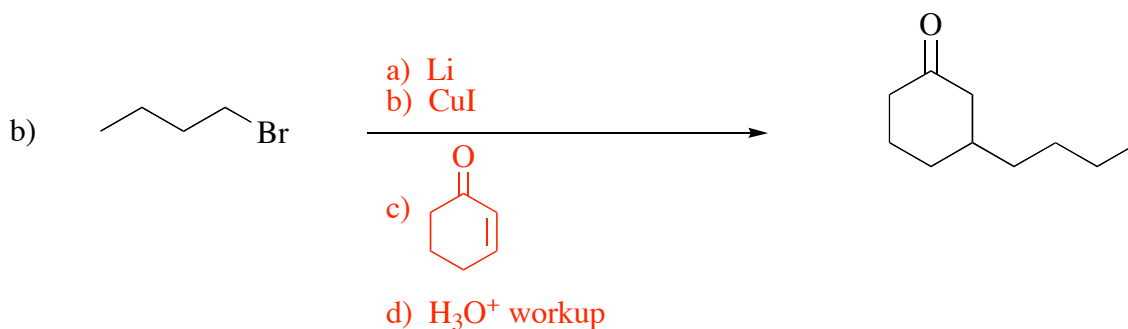
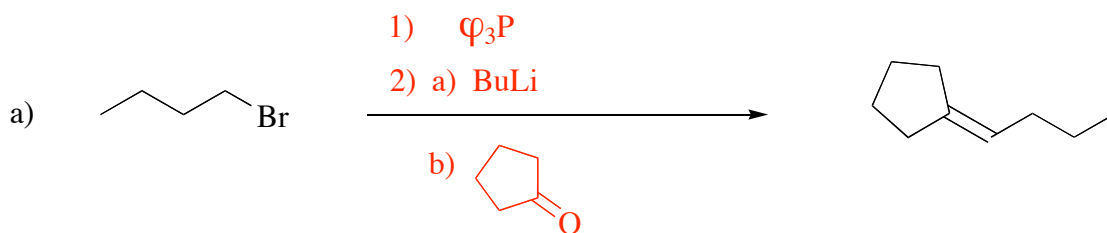


Give two organic products - be sure to show the correct charges (if any) on your products



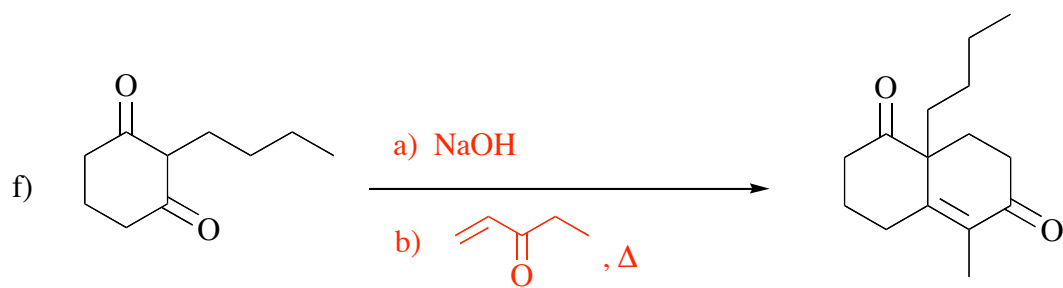
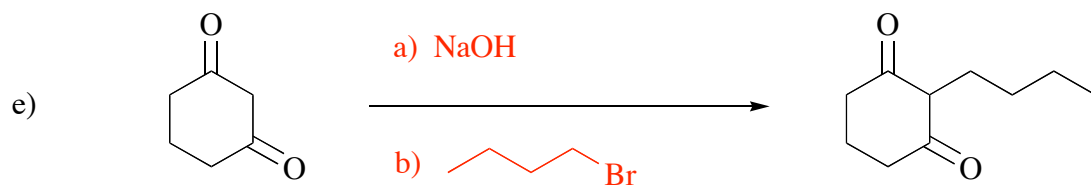
Name: \_\_\_\_\_

3) (30 pts) Propose reagents for accomplishing the following transformations. NOTE: more than one step may be required! Try to make your synthesis efficient (i.e. the desired product should be the major product, and generally a shorter synthesis is better than a longer one). You must use the starting material given; you may use any other reagents you need.



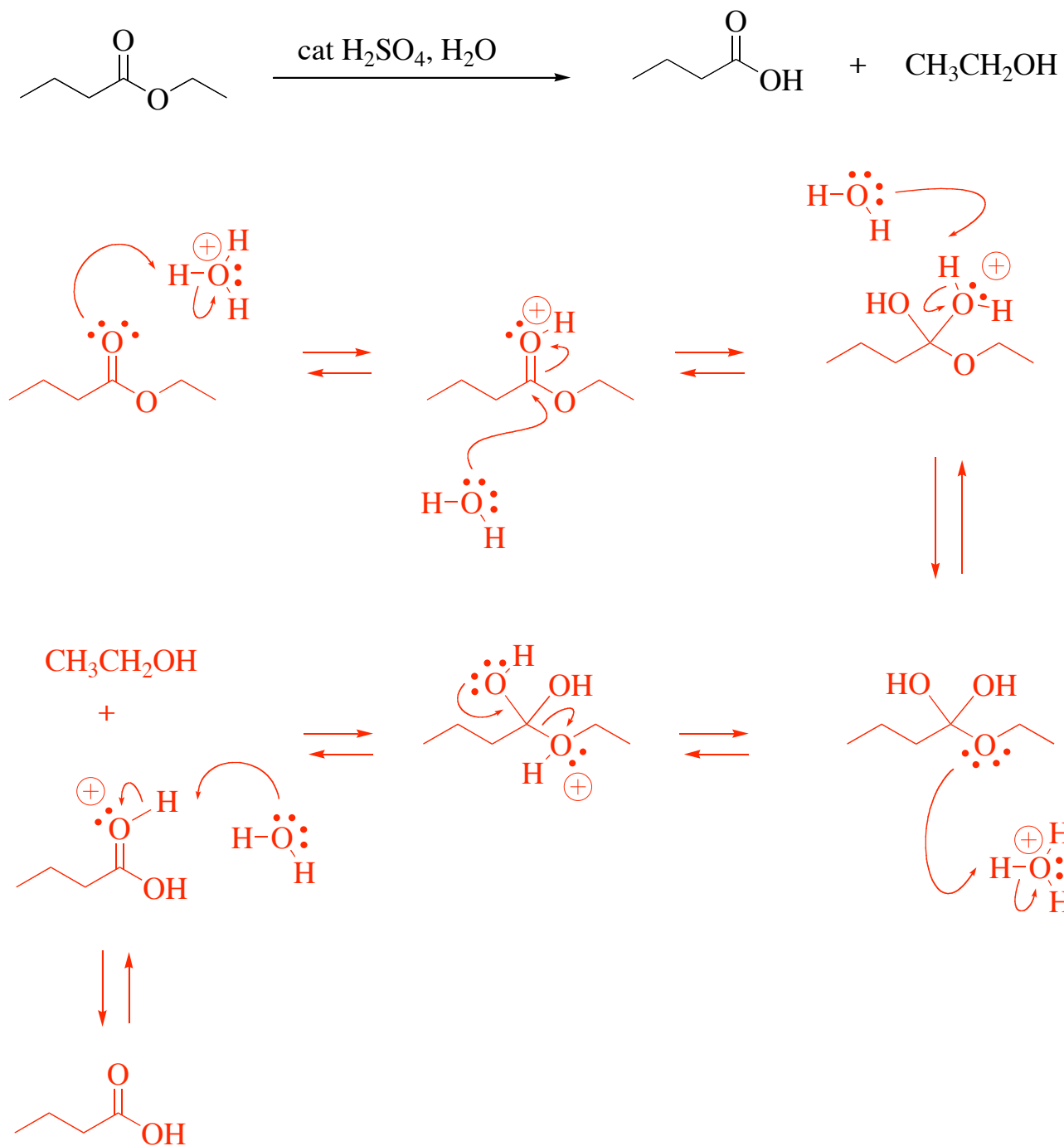
Name: \_\_\_\_\_

3) – continued



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

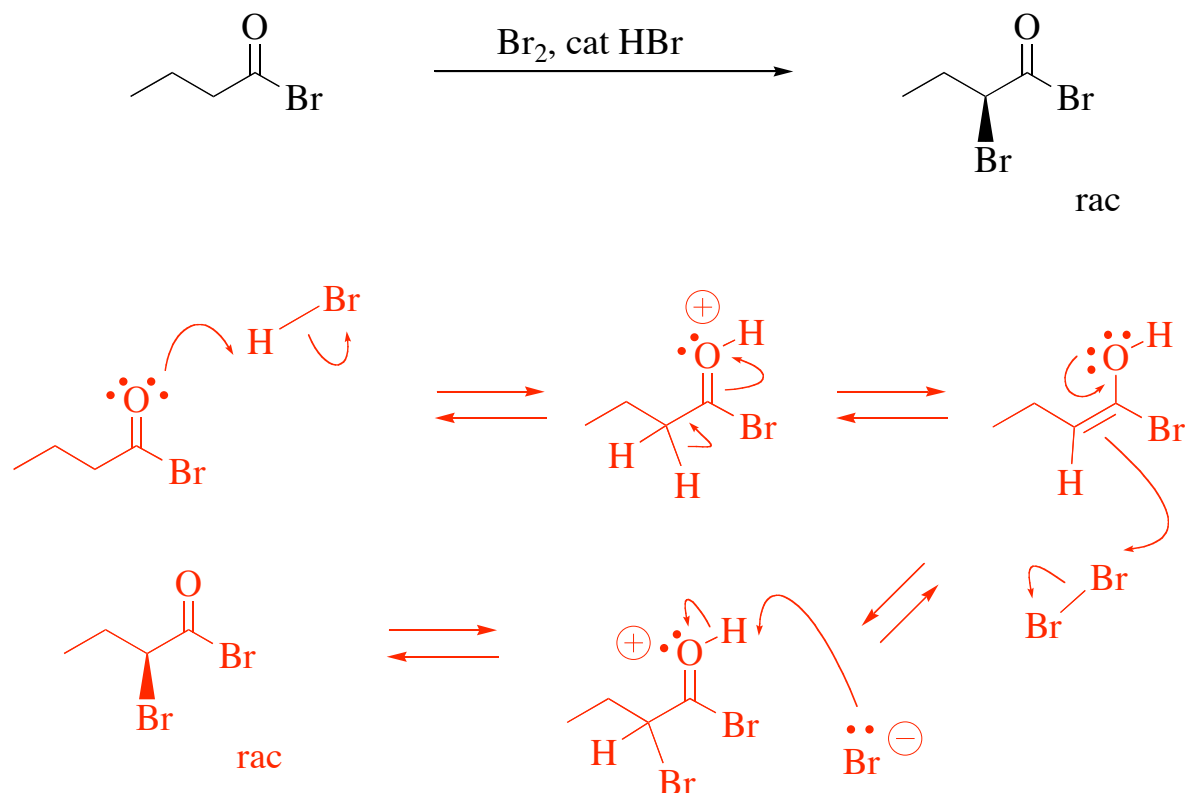
4) (25 pts) a) Propose an arrow-pushing mechanism for the following transformation.



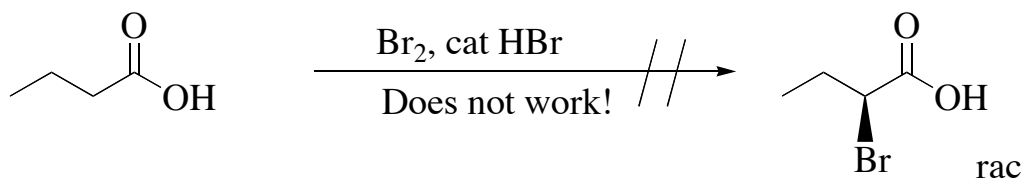
Name: \_\_\_\_\_

4) – continued

b) Propose an arrow-pushing mechanism for the following transformation.



c) The following reaction fails (you get none of the indicated product). **Briefly** explain why the reaction fails. Give a fundamental explanation – not just that the starting material must be acid bromide, or that there is no  $\text{PBr}_3$  catalyst.



For the acid, there is no enol at equilibrium. This is because the acid carbonyl group is more stable than the acid bromide carbonyl group.