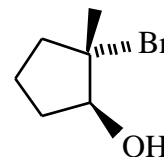
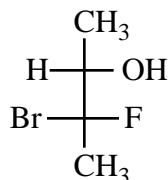
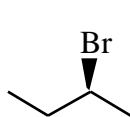


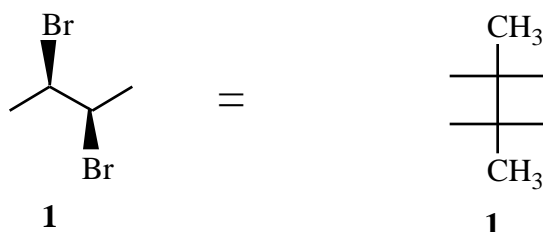


Name: \_\_\_\_\_

1) (19 pts) a) Label each stereocenter in the following structures using the CIP (R or S) system. Be careful to indicate which stereocenter goes with each descriptor.



b) Finish the incomplete Fischer projection of compound 1 below.

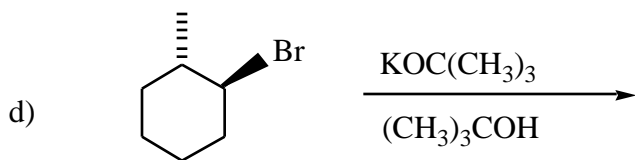
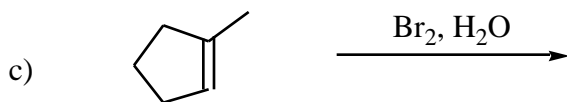
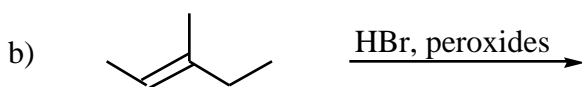
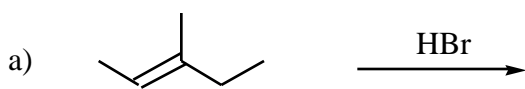


c) Label each of the following pairs of structures as homomers, enantiomers, diastereomers, or constitutional isomers, and indicate whether each compound is chiral or achiral using the check boxes.

|   |   |
|---|---|
| <br><input type="checkbox"/> Chiral<br><input type="checkbox"/> Achiral | <br><input type="checkbox"/> Chiral<br><input type="checkbox"/> Achiral |
| <br><input type="checkbox"/> Chiral<br><input type="checkbox"/> Achiral | <br><input type="checkbox"/> Chiral<br><input type="checkbox"/> Achiral |

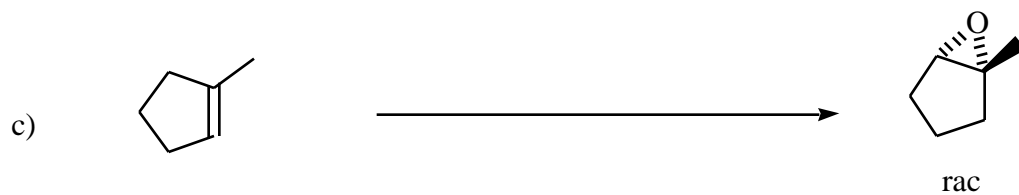
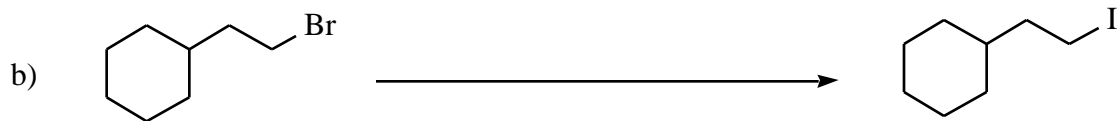
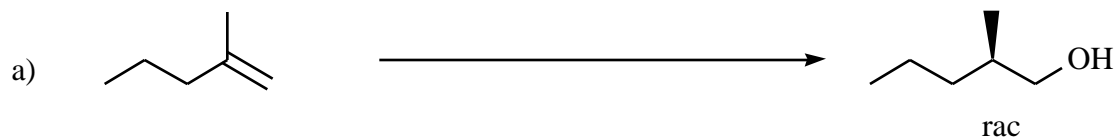
Name: \_\_\_\_\_

2) (20 pts) Give the single major organic product (or two products if more than one major product is formed) for each of the following reactions. If a racemate is formed, consider this to be one product, show only one of the enantiomers, and label the structure racemic (rac). Carefully show the stereochemistry of each product using wedges and dashes.

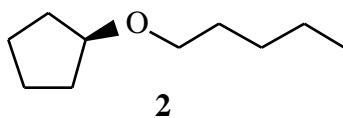


Name: \_\_\_\_\_

3) (26 pts) Propose reagents for accomplishing each of the following transformations.

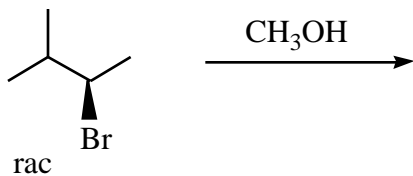


d) Propose a synthesis of target compound 2 starting with any alkenes containing five carbons or less, and any inorganic reagents you need.

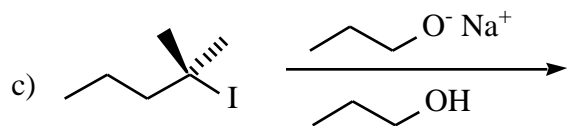
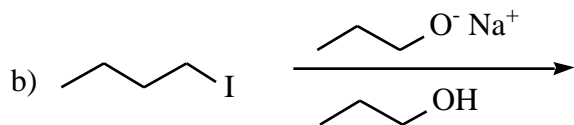


Name: \_\_\_\_\_

4) (15 pts) a) Give structures for all of the possible products of the following reaction. Draw each product only once, and as usual, if a racemate is formed, draw only one enantiomer and label it racemic (rac).

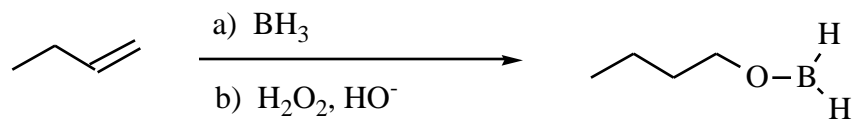


For each of the following reactions, give the structure of the single major product.

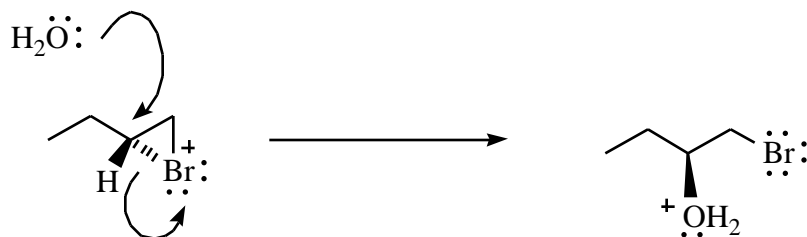


Name: \_\_\_\_\_

5) (20 pts) a) Propose an arrow-pushing mechanism for the following reaction (the product shown hydrolyses to the alcohol under the reaction conditions, but don't worry about that step).



b) A key step in the reaction of  $\text{Br}_2/\text{H}_2\text{O}$  with 1-butene is the following:

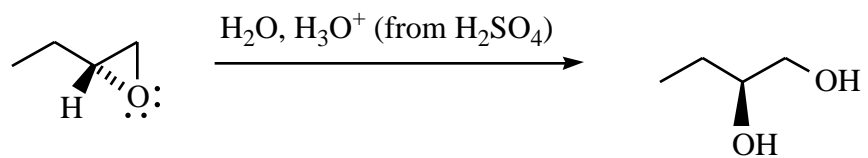


This step is an  $\text{S}_{\text{N}}2$  reaction, but it shows unusual regiochemistry. Explain why the nucleophile (water) attacks the more substituted carbon in this reaction.

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

5) continued

c) Epoxides react with water and acid to give 1,2-diols with the stereochemistry shown below.



Propose an arrow-pushing mechanism for this reaction.