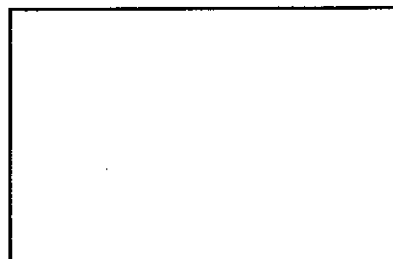
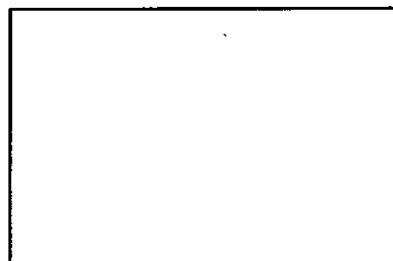
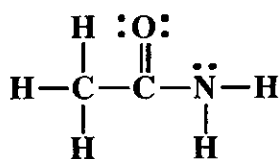


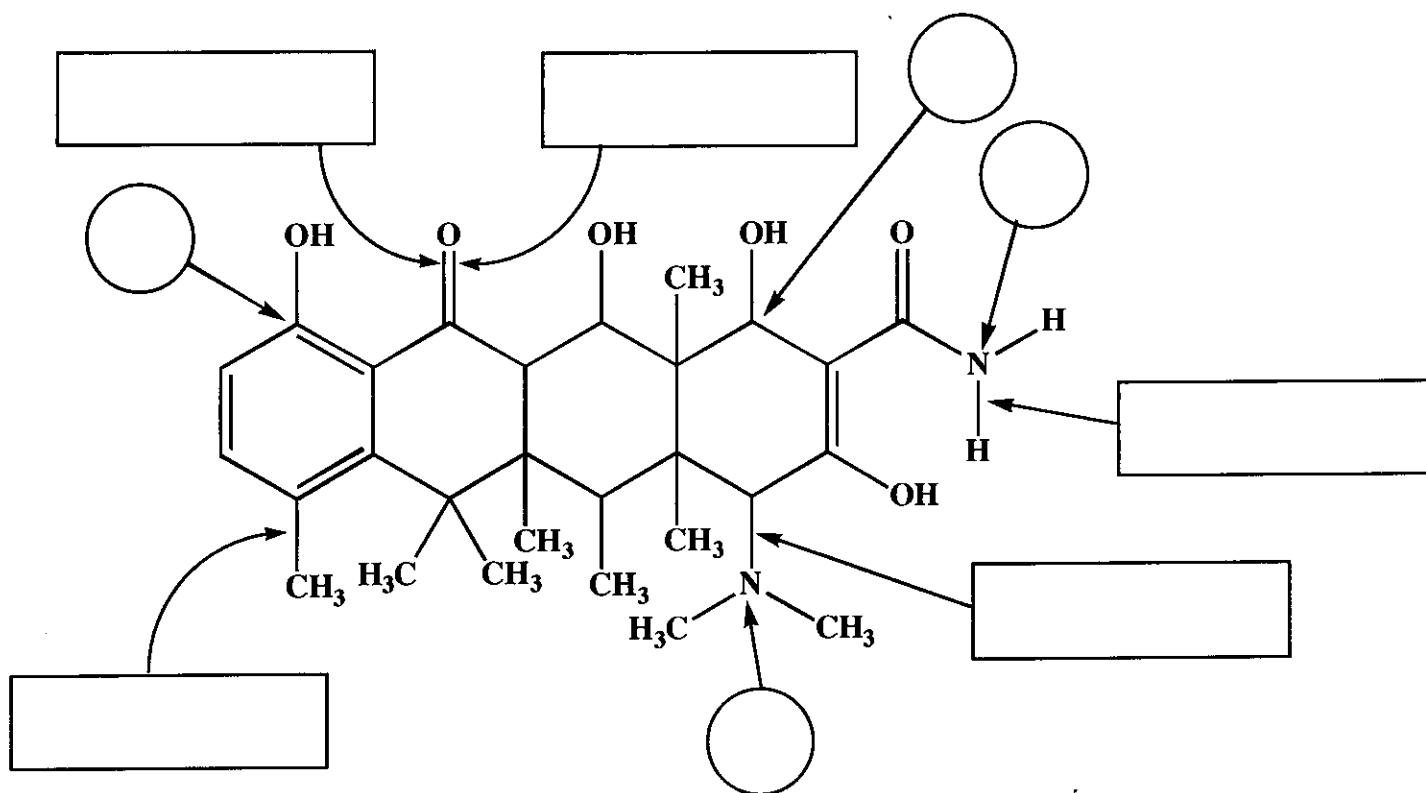
1. (5 pts) What is the most important question in organic chemistry?

2. (10 pts) Amides are best represented as the hybrid of three contributing structures. Draw the second and third important contributing structures in the spaces provided, including all lone pairs and formal charges. For the two structures on the left in each problem, use arrows to indicate the movement of electrons to give the structures you drew. There is no need to draw any circles around any of these contributing structures. You might want to read these directions again to make sure you know what we want



4. (1 pts each) Below is the structure of the antibiotic tetracycline. **In the rectangles provided, indicate the type of bond and the hybridized orbitals that overlap to form the bond.** For example, one answer could be:  $\sigma$  Csp<sup>3</sup>-H1s

Next, in the circles provided, write the hybridization state of the atoms indicated with the arrows.

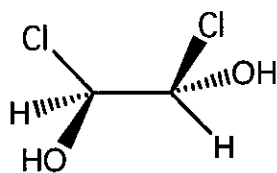
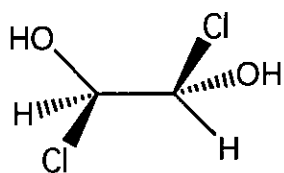


5. (1 pt each) On the above structure of tetracycline, the stereochemistry is not indicated. On the above structure indicate **EACH CHIRAL CENTER WITH AN ASTERISK (\*)**.

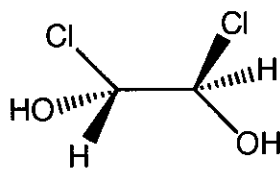
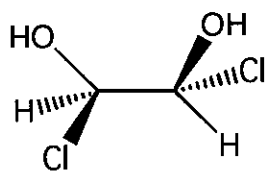


16. (8 pts) On the line provided, state the stereochemical relationship between each pair of molecules: **enantiomers, diastereomers, or the same molecule**. I recommend you assign R and S to each chiral center to help answer this question. **Circle all meso compounds.**

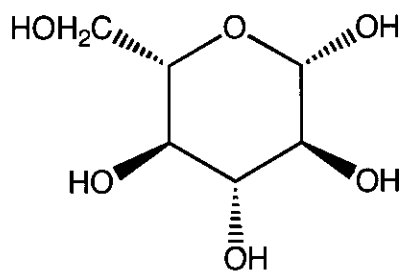
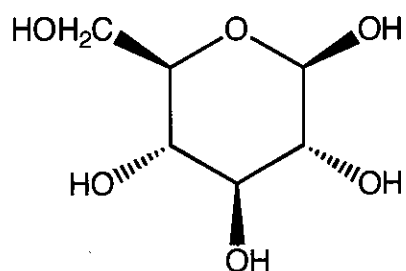
Relationship



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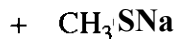
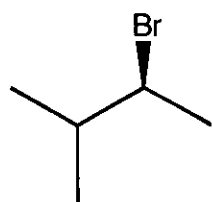
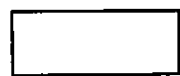
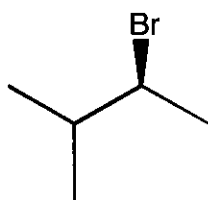
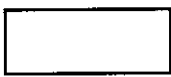
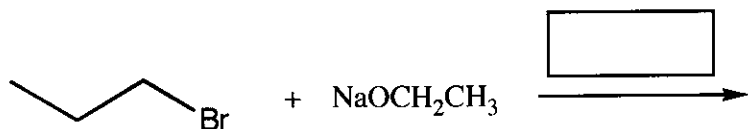


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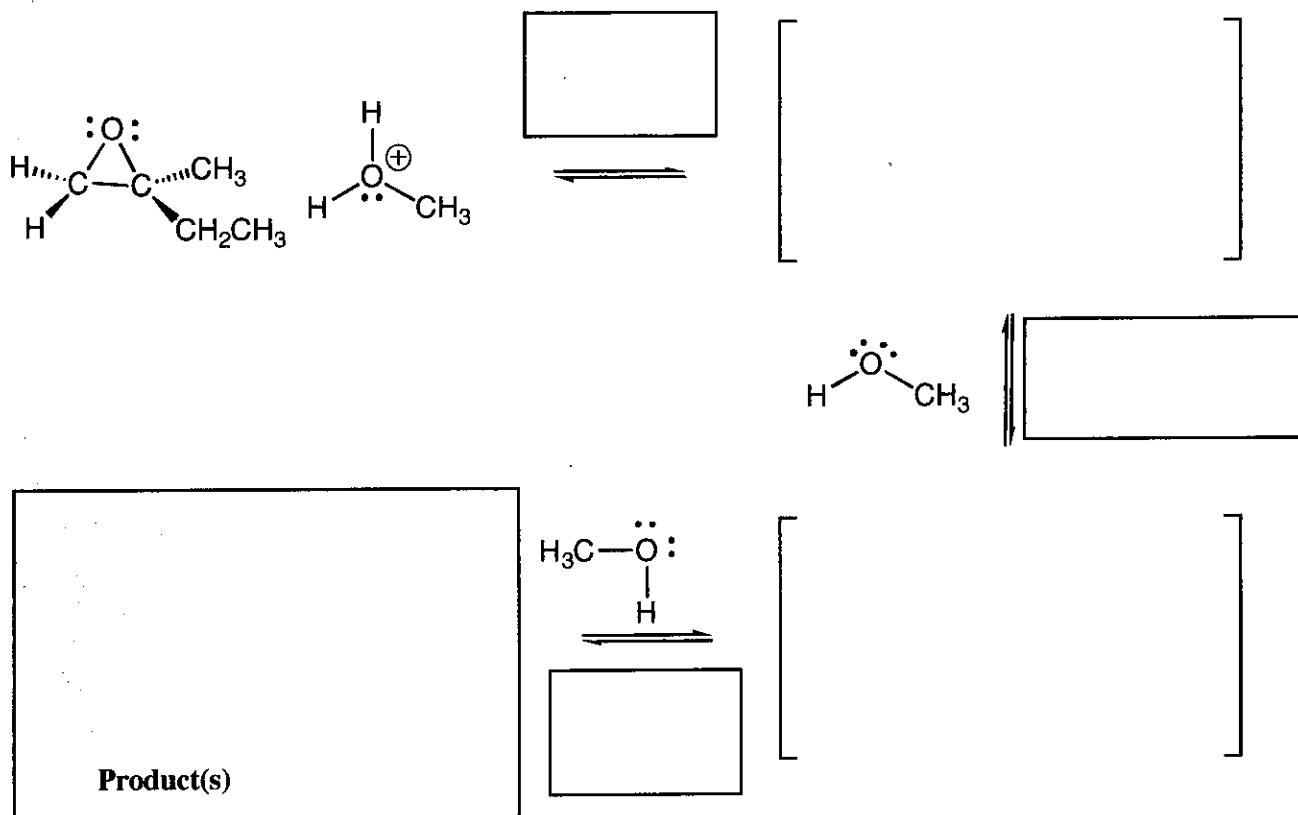
17. (13 pts) For the following reactions, draw the predominant product(s), and in the box over the arrow, write the predominant mechanism(s) ( $S_N2$ , E2 or  $S_N1/E1$ )



Signature \_\_\_\_\_

Pg.13 \_\_\_\_\_ (25)

20. (25 pts.) For the reaction of this epoxide with methanol in acid, fill in the details of the mechanism. Draw the appropriate chemical structures and use arrows to show how pairs of electrons are moved to make and break bonds during the reaction. For this question, you must draw all molecules produced in each step (yes, these equations need to be balanced!). Finally, fill in the boxes adjacent to the arrows with the type of step involved, such as "Make a bond" or "Take a proton away". MAKE SURE TO NOTICE THE QUESTIONS AT THE BOTTOM. Use wedges and dashes to indicate stereochemistry where appropriate, BUT if an intermediate or product is really a racemic mixture, you only need to draw one enantiomer for this problem (we are making this easier for you).

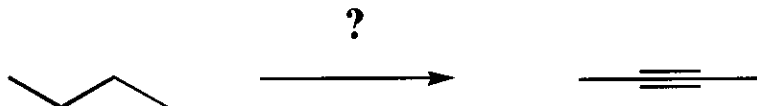


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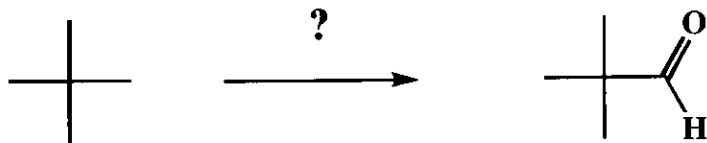
Pg 17 \_\_\_\_\_(17)

24. These are synthesis questions. You need to show how the starting material can be converted into the product(s) shown. You may use any reactions we have learned provided that the product(s) you draw for each step is/are the predominant one(s). Show all the reagents you need. Show each molecule synthesized along the way and be sure to pay attention to the regiochemistry and stereochemistry preferences for each reaction. You must draw all stereoisomers formed, and use wedges and dashes to indicate chirality at each chiral center. Write racemic when appropriate.

A) (10 pts)



B) (7 pts)



24 (cont.) These are synthesis questions. You need to show how the starting material can be converted into the product(s) shown. You may use any reactions we have learned provided that the product(s) you draw for each step is/are the predominant one(s). Show all the reagents you need. Show each molecule synthesized along the way and be sure to pay attention to the regiochemistry and stereochemistry preferences for each reaction. You must draw all stereoisomers formed, and use wedges and dashes to indicate chirality at each chiral center. Write racemic when appropriate. **All the carbons of the product must come from carbons of the starting material.**

D) (16 pts)

