

### I. CONCEPTS / NOMENCLATURE

1. a) (4 points) What is the single main physical feature influencing the boiling points of:

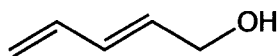
- i) Alcohols: hydrogen bonding +2
- ii) Ethers: molecular weight (Van der Waals interactions)  
(dipole-dipole) +2

b) (6 points) Rank the following compounds by *increasing* nucleophilicity and explain in 1 *short sentence* the origin of this difference:



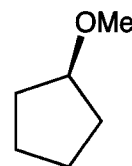
Why? increasing size of nucleophile, more diffuse charge

c) (8 points) Name the following compounds by the IUPAC convention, unambiguously specifying any stereochemistry:



+4

2,4-pentadien-1-ol



+4

methoxycyclopentane

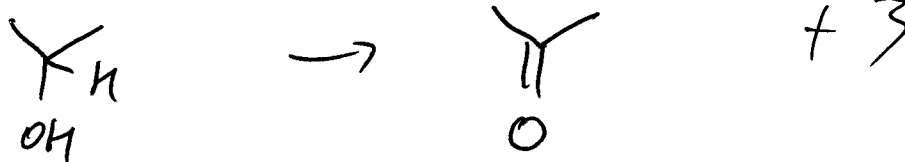
c) (7 points) Illustrate the following within the context of material seen this quarter:

carbocation rearrangement:



+4

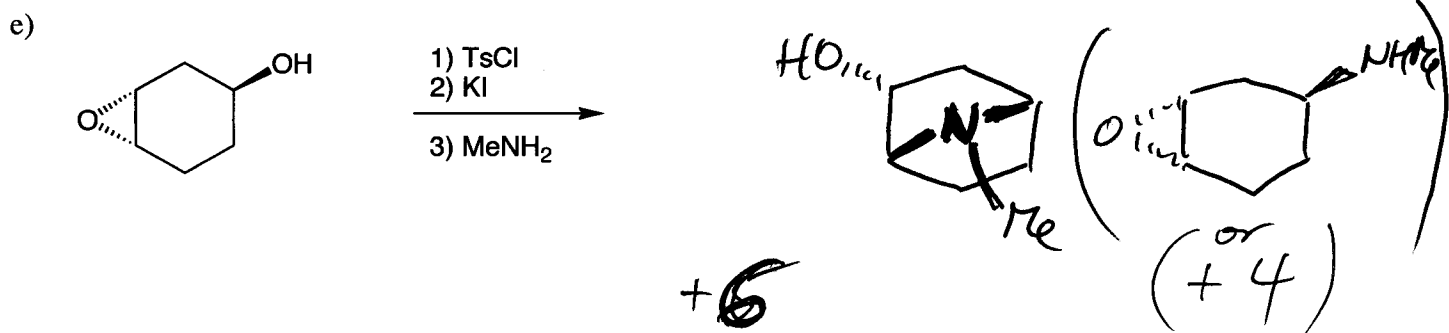
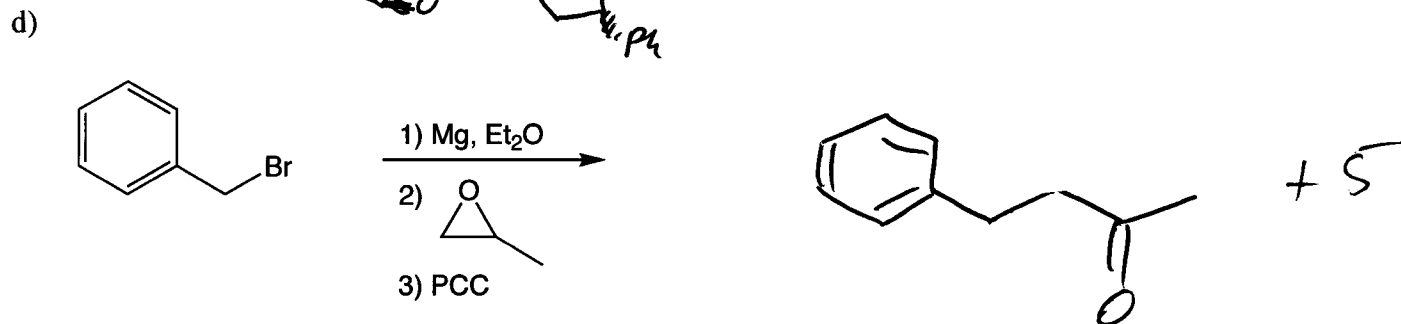
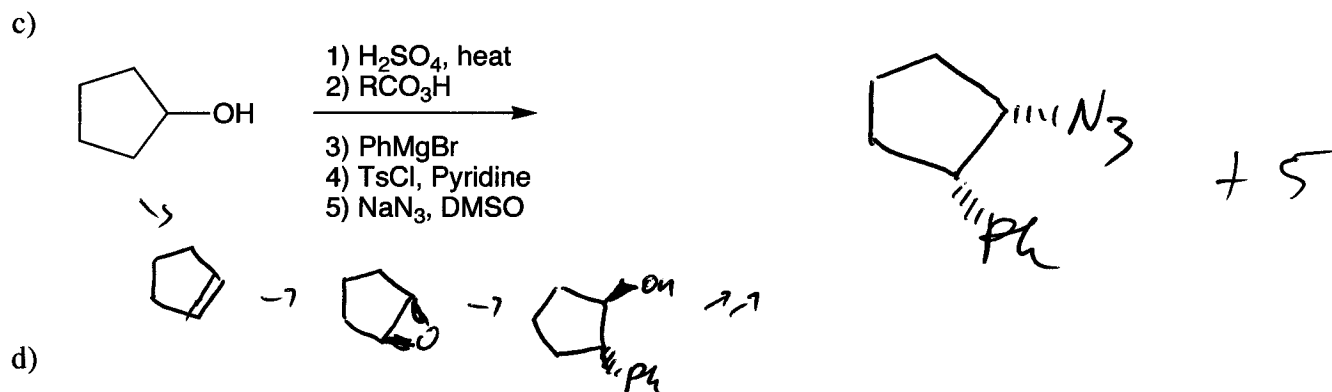
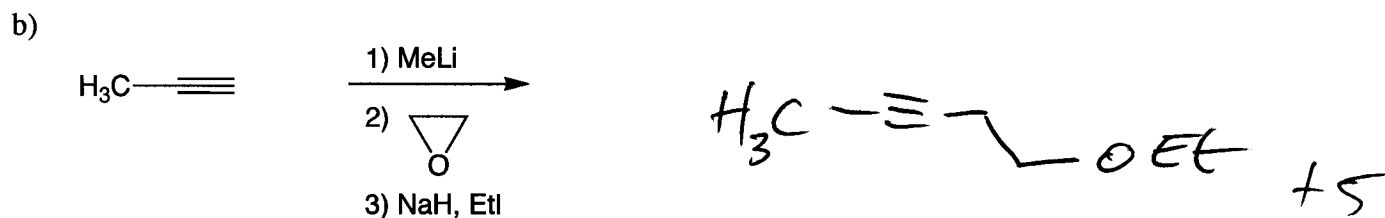
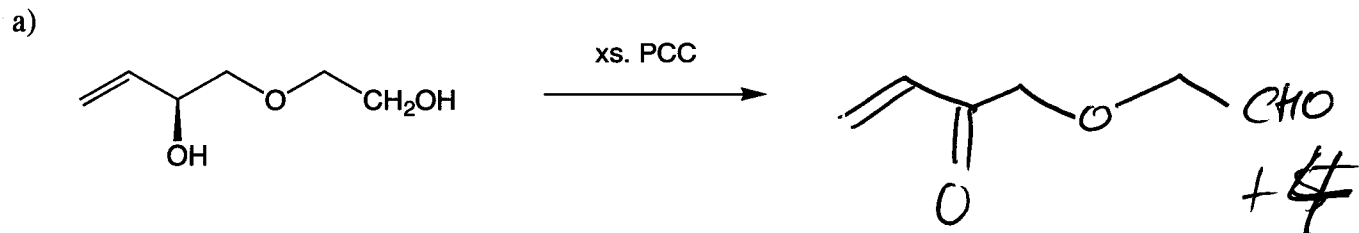
oxidation:



+3

## II. REACTIONS

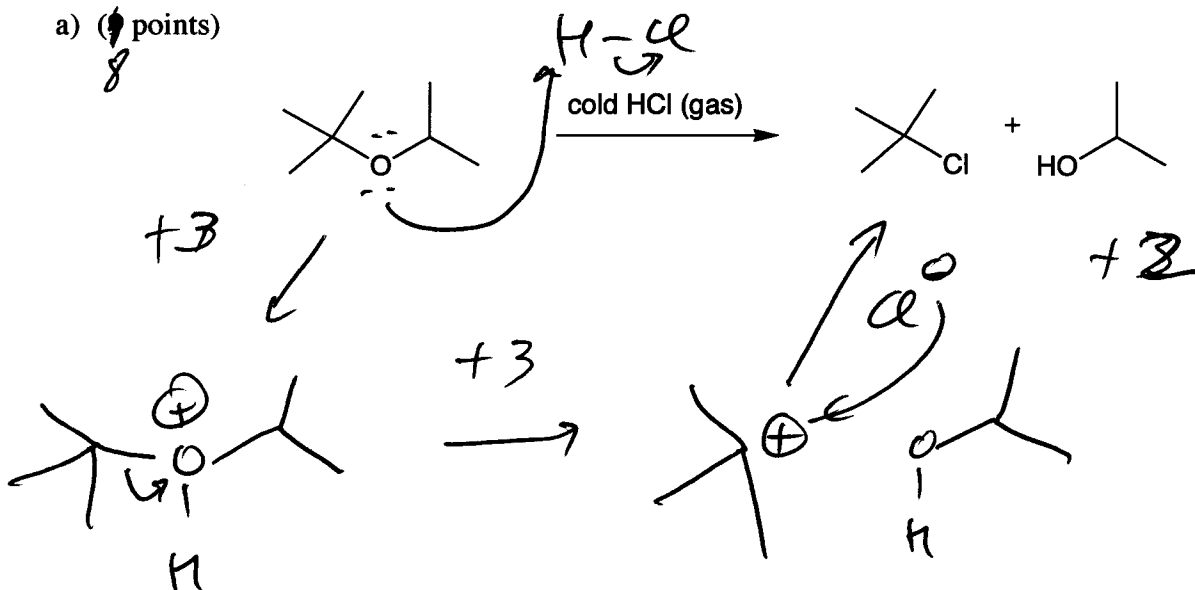
2. (25 points) Draw the **major product** for the following reactions (if there are several enantiomers or diastereomers formed, show only one, but pay attention to stereochemistry where needed!):



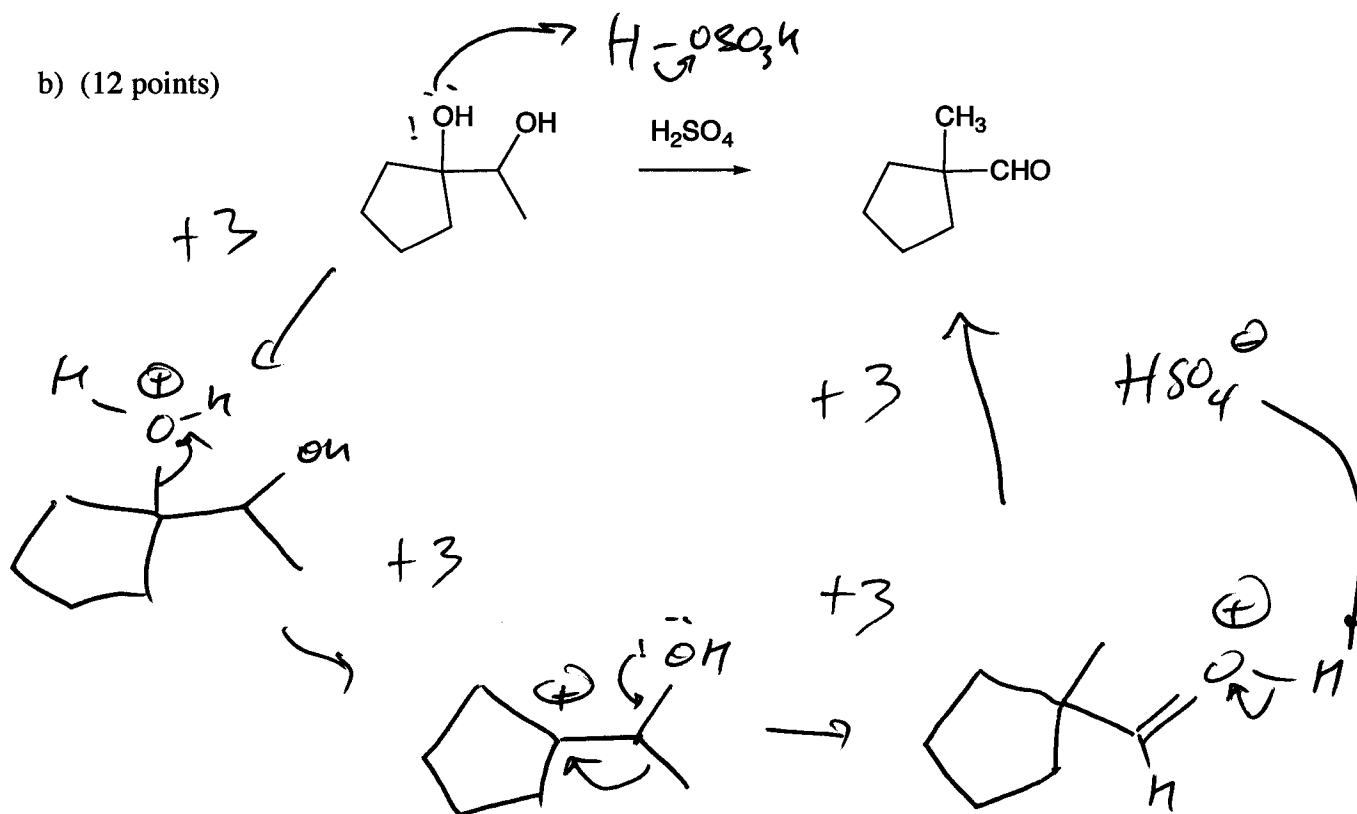
III. MECHANISMS

3. (20 points) Provide a complete, detailed mechanism with curved arrow formalism for the following reactions. **Each step must be explicitly written down**, i.e. every attack of reagent, bond breaking and bond forming steps must be shown!

a) (8 points)



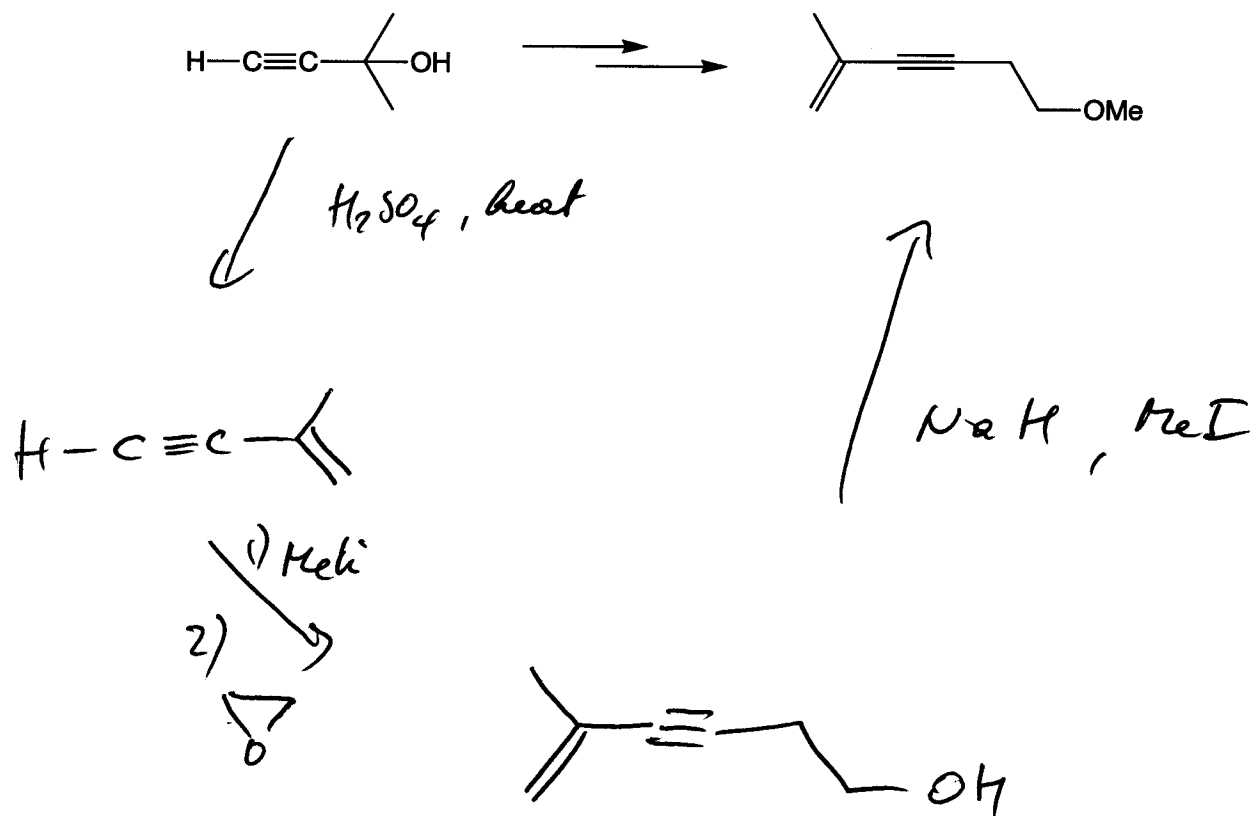
b) (12 points)



#### IV. TRANSFORM

4. (10 points) Devise a reasonable synthesis for the following compound from reagents you are familiar with and the starting materials provided:

*Note: do no "invent" new reagents or reactions. Use only those specifically taught in class or previous quarter's reactions. There should not be more than 10 steps necessary in these syntheses, although longer ones may also be correct.*



5. (20 points) Devise a reasonable synthesis for the following compound from reagents you are familiar with and the starting materials provided:

*Note: do no "invent" new reagents or reactions. Use only those specifically taught in class or previous quarter's reactions. There should not be more than 10 steps necessary in these syntheses, although longer ones may also be correct.*

