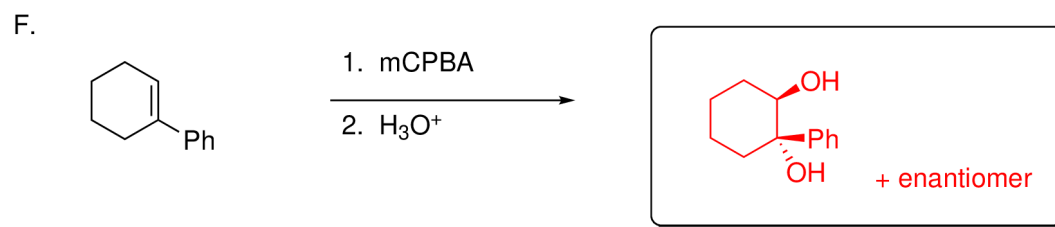
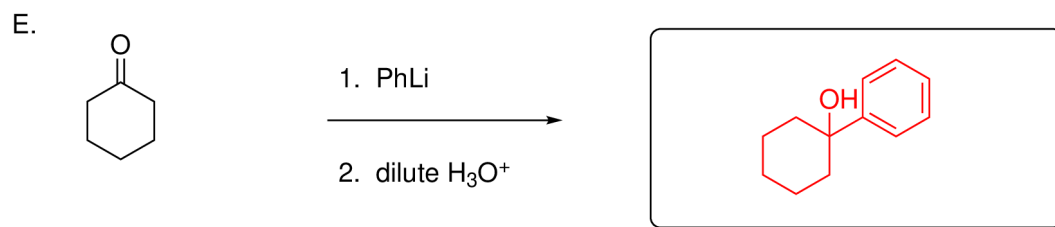
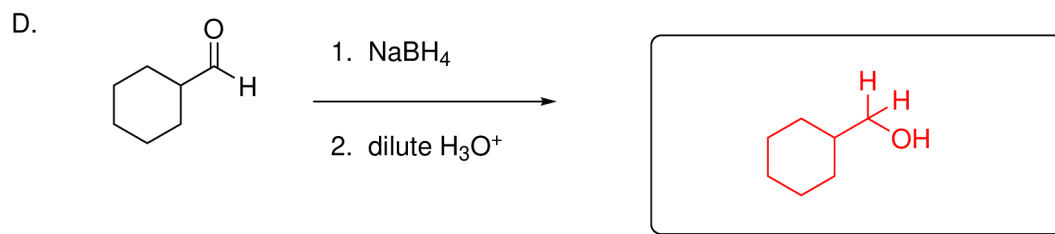
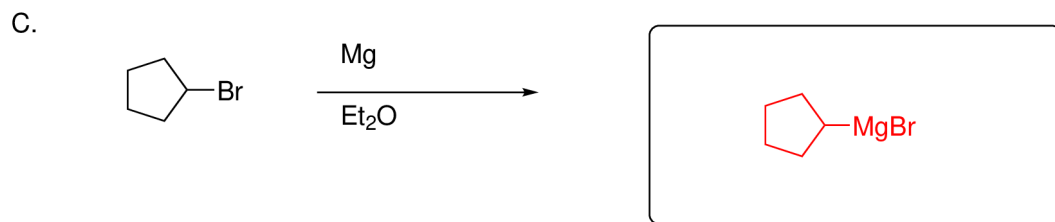
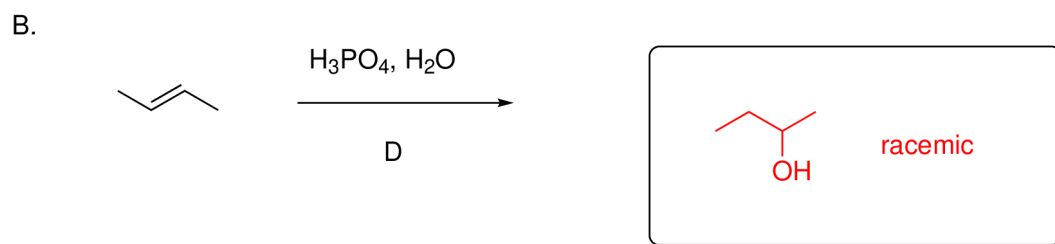
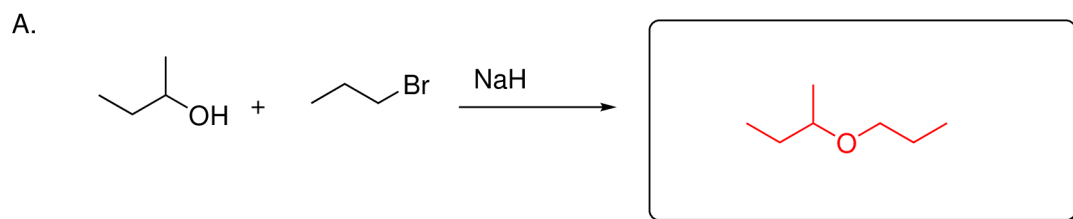


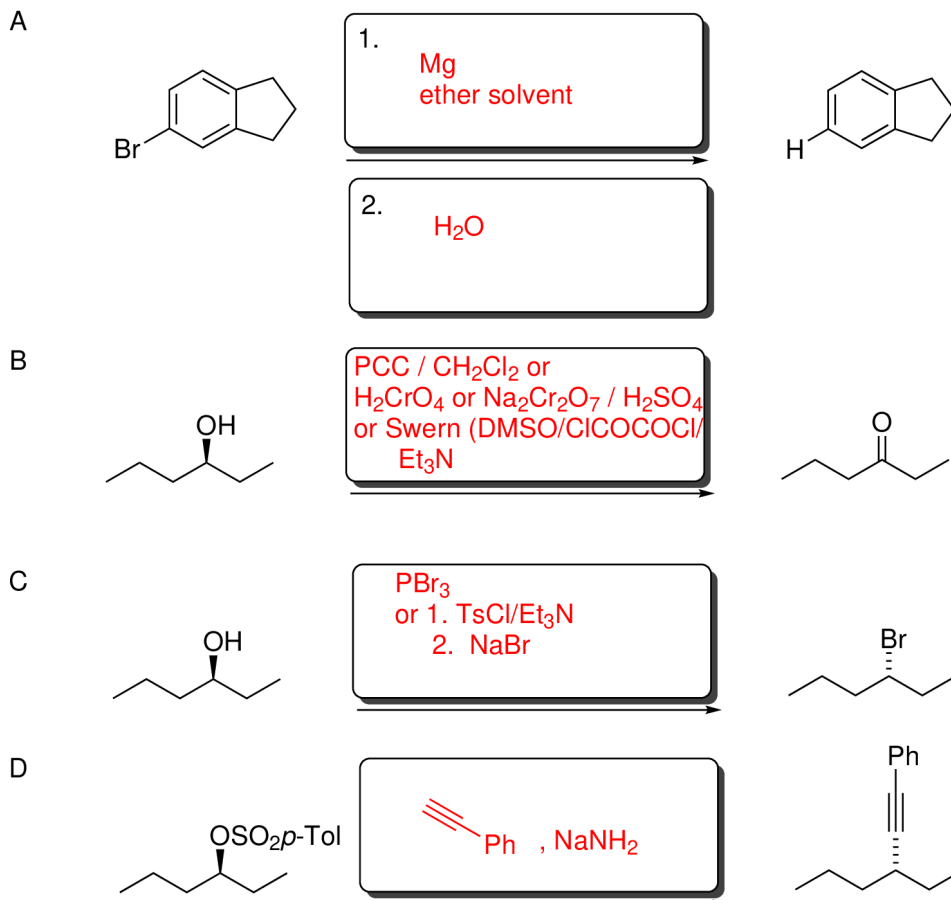
Name: _____

1. (5 points each; 30 total) Write the expected product(s) for each of the following reactions. Specify stereochemistry where appropriate, and include all expected products.



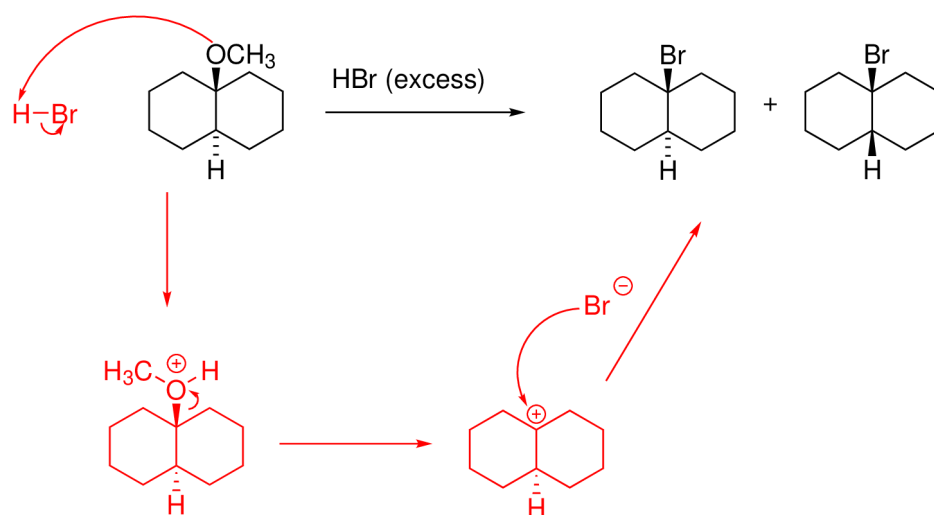
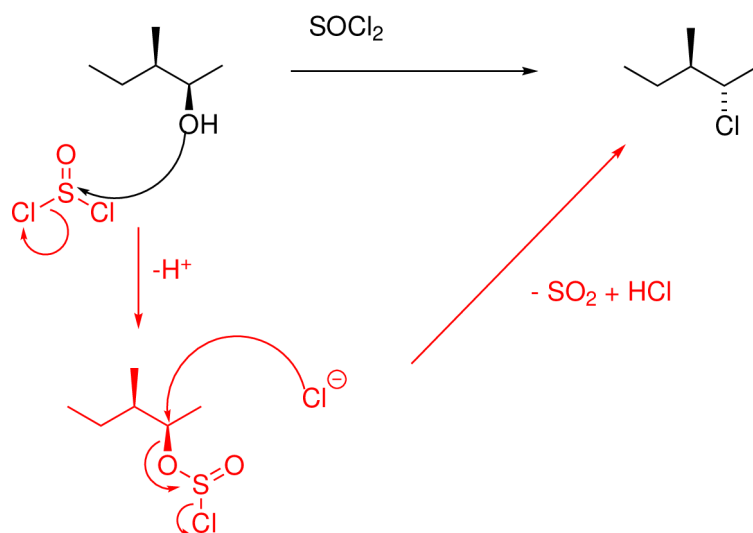
Name: _____

2. (5 points each; 25 total) Write (in the box provided) the reagents and/or conditions needed to accomplish the following transformations.



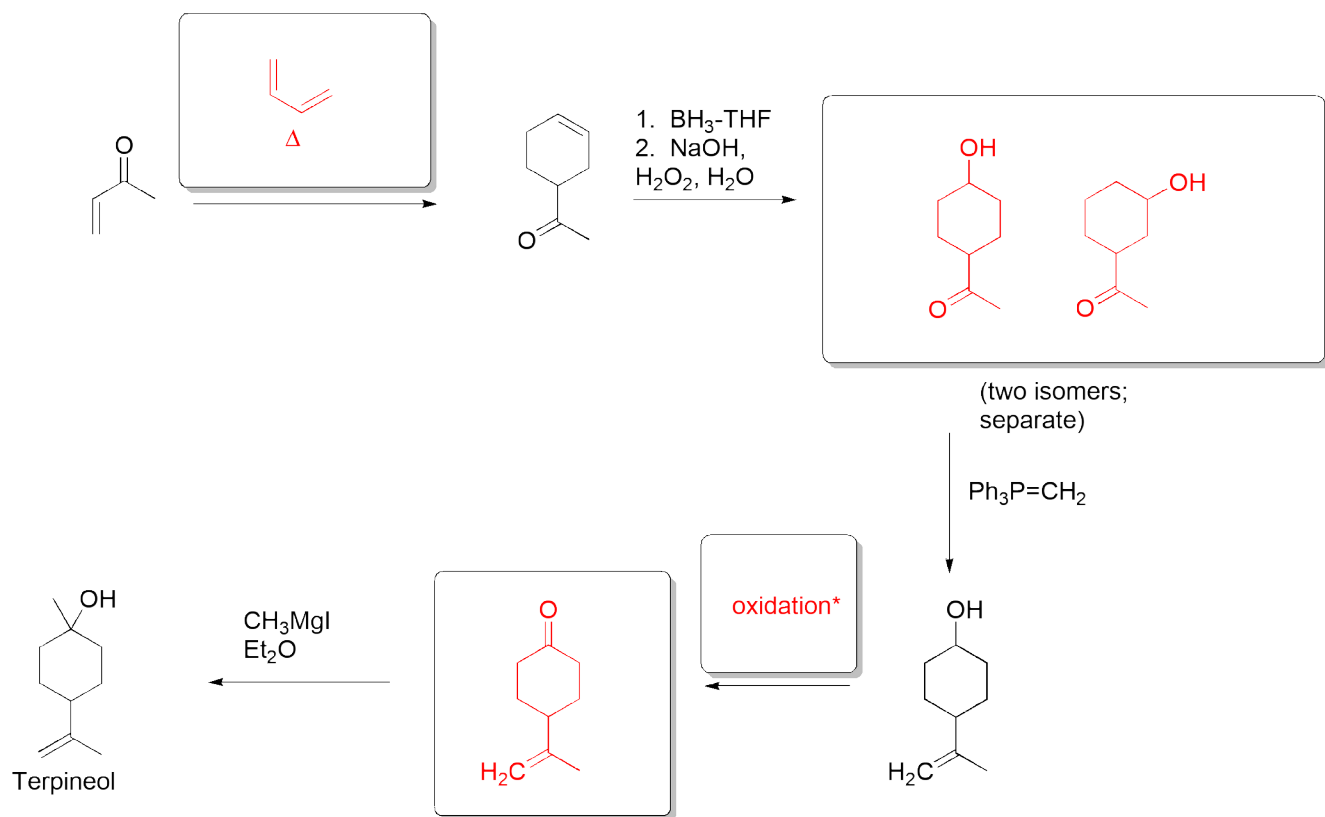
Name: _____

3. (10 points each; 20 total) Write multistep mechanisms (using the correct electron-pushing formalism, and as many steps as needed) for each of the following transformations. Be sure to draw resonance structures for any intermediate so stabilized.



Name: _____

4. (4 points per box for A, B and D plus 3 points for C; 15 total) Fill in the blanks (intermediate structures—molecular formulas given--or reagents/conditions) for the following multistep synthesis.



*Oxidation Options:
 $\text{CrO}_3/\text{H}_2\text{SO}_4$
 $\text{Na}_2\text{Cr}_2\text{O}_7/\text{H}_2\text{SO}_4$
 $\text{PCC}/\text{CH}_2\text{Cl}_2$
 $\text{DMSO}/\text{Oxallyl Chloride}/\text{Et}_3\text{N}$

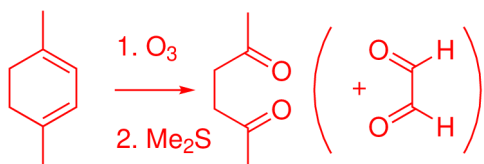
Name: _____

5 (10 points) Ozonolysis and reductive workup of 1,4-dimethyl-1,3-cyclohexadiene (**A**), gives a compound **B**. NaBH_4 reduction and acidic workup of **B** leads to two compounds (**C** and **D**) that are separable. Surprisingly, both have almost identical IR spectra (a broad, strong peak $3600\text{-}3400\text{ cm}^{-1}$) and almost identical but different ^1H NMR spectra (a 6H doublet at 1.1 ppm, a complex 4H multiplet at 1.4 ppm, a broad 2H singlet at 3.0 ppm, and a 2H sextet at 3.3 ppm).

Treatment of either **C** or **D** with PCC gives **B**.

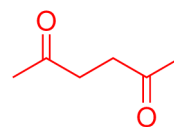
What are **B**, **C** and **D**? Explain as much of the reaction chemistry and spectroscopic behavior as you can for partial credit.

Ozonolysis of a cyclic diene gives a dicarbonyl compound as one of two products:

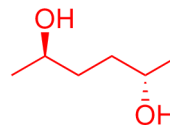


Reduction gives a diol (IR, ^1H NMR) which can be formed in either of two diastereomers. The (R,R) and (S,S) forms are enantiomers and inseparable, but the (R,S) form is a meso compound and distinct from the racemate. Both will show similar but different NMR spectra. Reoxidation regenerates Compound **B**.

B



C



D

