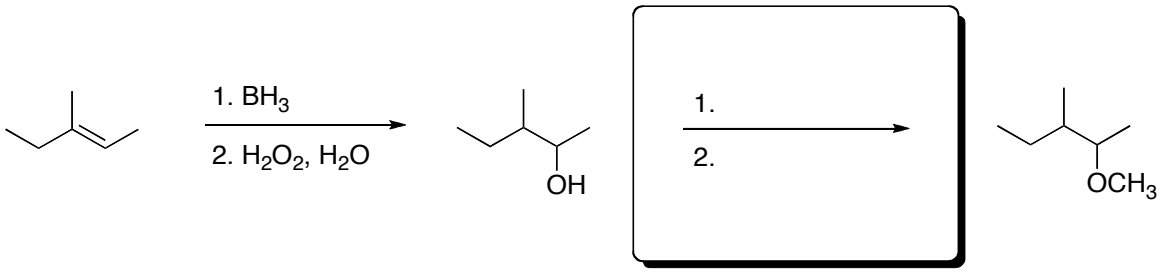
Organic Chemistry

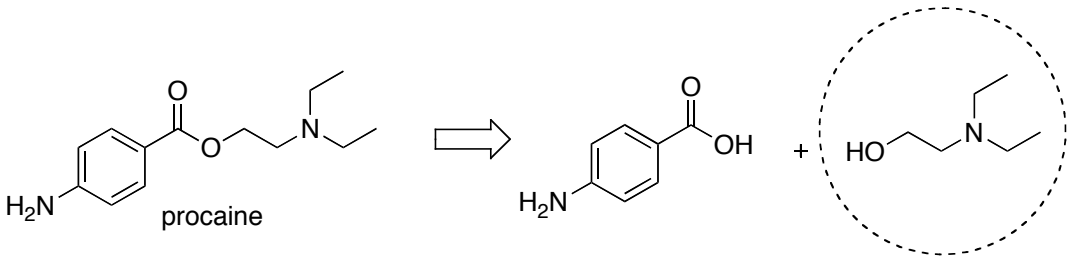
Exam III Questions

This set of questions is a compilation of old exams, and does not represent the typical length of an exam - this list is considerably longer than a standard 50 minute exam would be.

One method of creating ethers from alkenes is by conversion first to the alcohol (as shown below), then subsequent conversion to the ether. What reagents would you use to complete the following synthesis (fill in the two necessary reagents). This is an example of a Williamson ether synthesis.



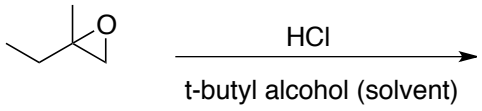
Procaine, a topical anesthetic, can be synthesized from a carboxylic acid and an alcohol (shown below) by an esterification reaction. The amino-hydroxyl starting material that is circled was created by reaction of an epoxide with a secondary amine. Draw these two starting materials in the boxes below.



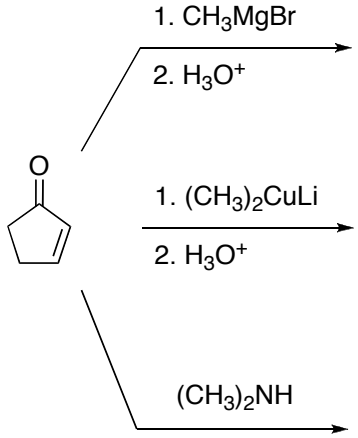
starting material 1

starting material 2

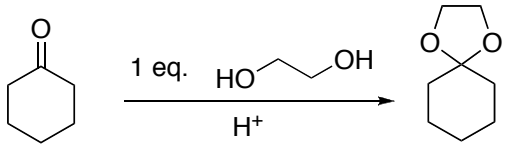
Draw the major product of the following reaction:



Draw the major organic product(s) of the following reactions:

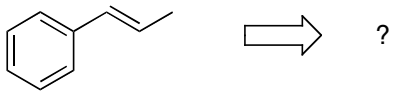


Draw a stepwise arrow-pushing mechanism that accounts for the following transformation:

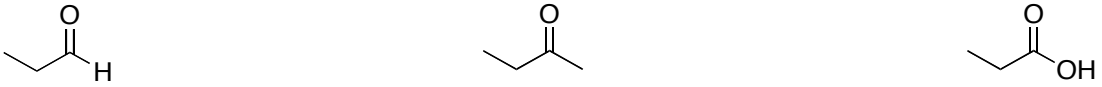


What will the resulting two organic products be after treating the ketal from the prior question with aqueous phosphoric acid?

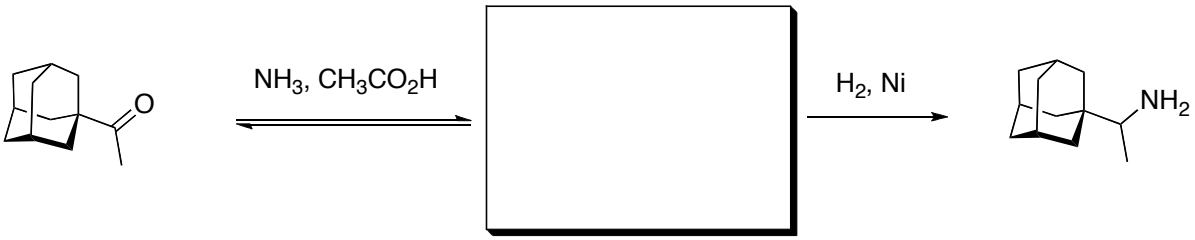
The following molecule can be generated via a Wittig reaction between an ylide and an aldehyde. Propose an aldehyde and ylide that would combine to form the following molecule. Subsequently, propose a synthesis of the slide from triphenylphosphine and an alkyl halide.



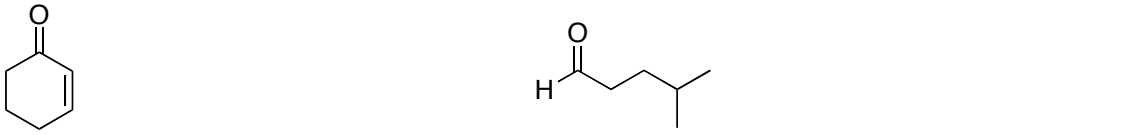
Provide IUPAC names for the following molecules



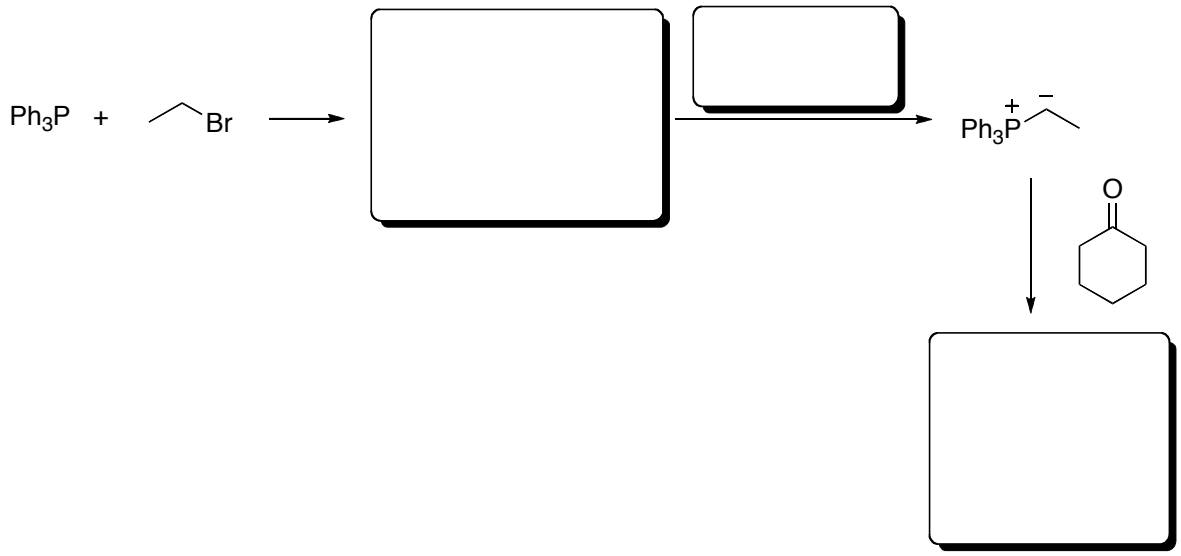
Following are the final synthetic steps towards the antiviral drug Rimantadine. Draw the intermediate imine in the empty box, below. You may abbreviate the adamantane ring system by using "R".



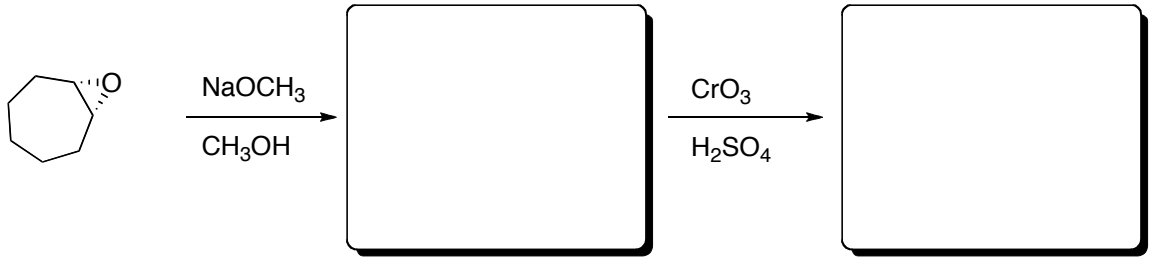
Provide the correct IUPAC names for the following molecules:



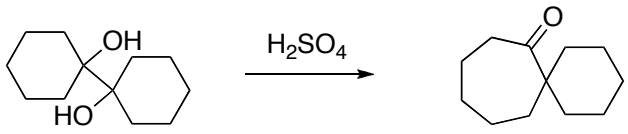
Fill in the blanks with the appropriate products or reactants:



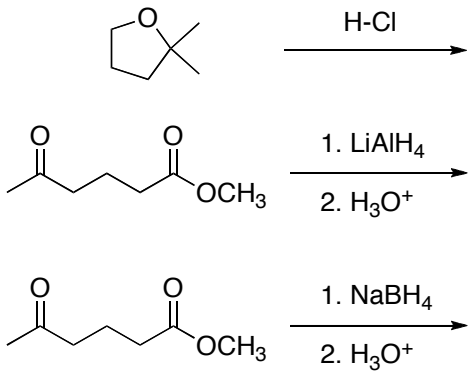
Complete the following scheme by filling in the empty boxes with the correct chemical structures. Show all relevant stereochemistry.



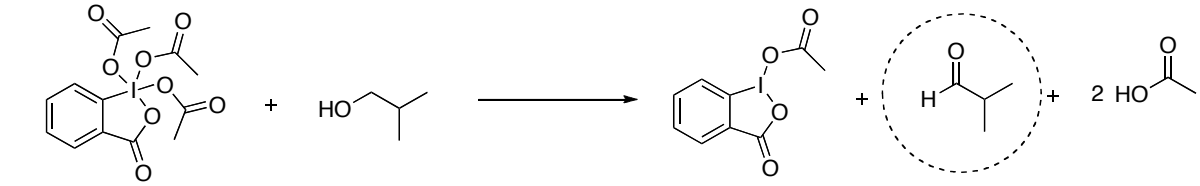
The major organic product of the following Pinacol rearrangement is shown below. Provide a stepwise arrow-pushing mechanism for this transformation.



Give the major organic product(s) for each of the following reactions or sequences of reactions.



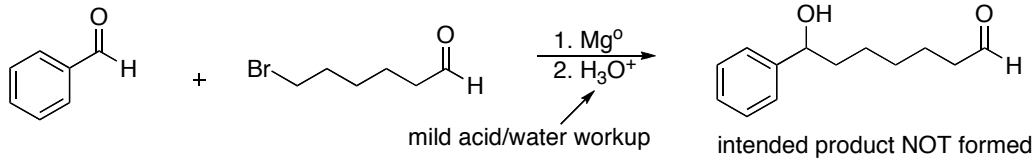
Dess-Martin periodinane cleanly oxidizes primary alcohols to aldehydes (see below). Draw a stepwise arrow-pushing mechanism that accounts for this conversion (the aldehyde product is circled).



Dess-Martin periodinane

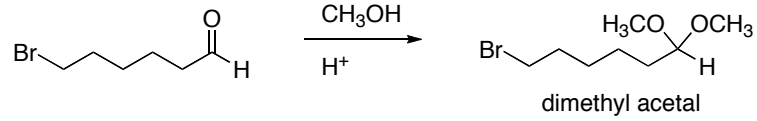
The ability to read a synthesis and ask WHY one would have done it THAT way is important. Consider the following: When Mg^o was added to a mixture of 6-bromohexanal and benzaldehyde (scheme **A**), the intended product (via Grignard reaction) was not formed. However, when 6-bromohexanal was first converted to the dimethyl acetal (scheme **B**) and then reacted in the same manner, the intended product was created in high yield. Provide a detailed rational for WHY scheme **A** did not work, and WHY the two-step scheme **B** does... Hint: It might be helpful to try and determine what WAS formed in scheme A.

A)

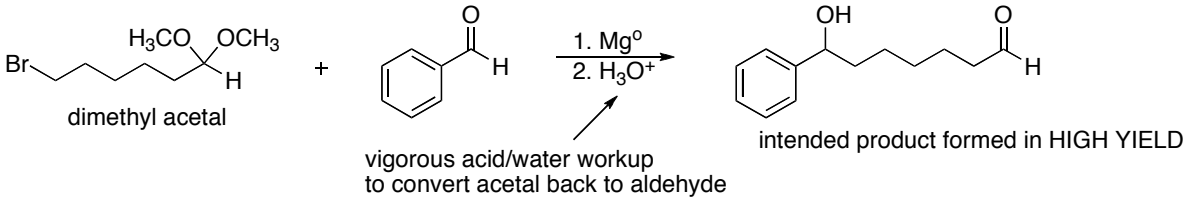


intended product NOT formed

B)

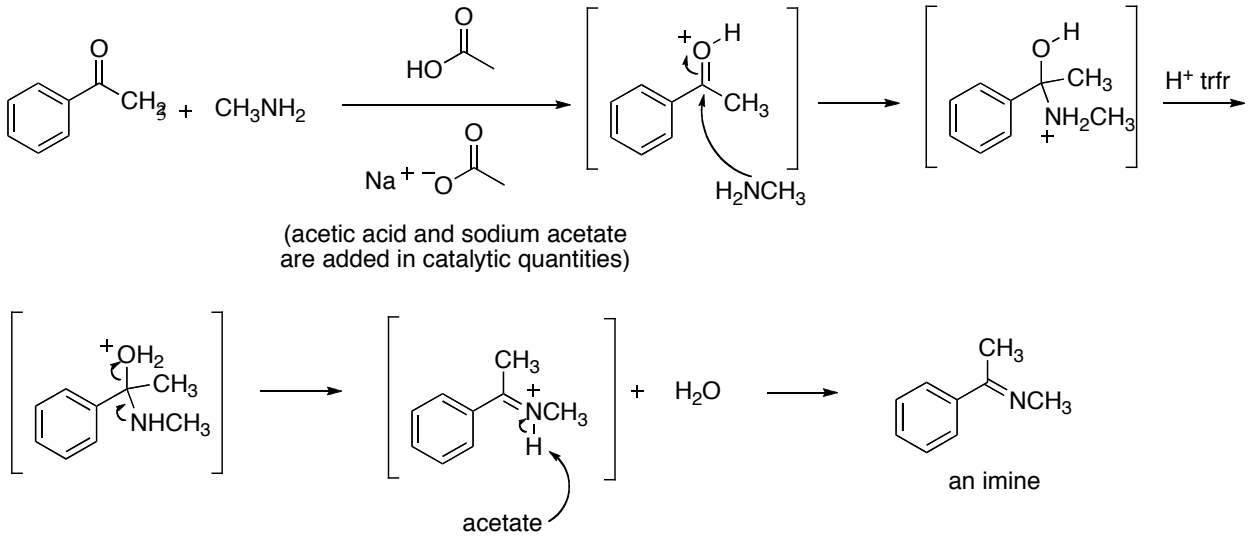


dimethyl acetal

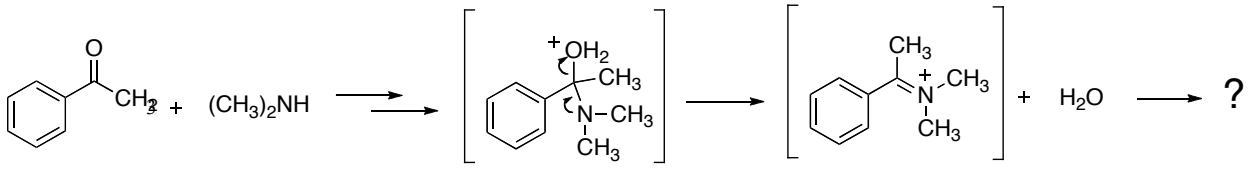


intended product formed in HIGH YIELD

Study the mechanism below, that details the transformation of benzophenone and methyl amine to create an imine. An imine is a functional group that contains a carbon-nitrogen double bond.

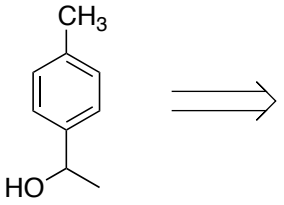


Under IDENTICAL REACTION CONDITIONS, benzophenone and dimethylamine react to form an enamine (designated by the question mark).



Propose a structure for this molecule and an arrow-pushing mechanism to account for its formation starting from the charged iminium intermediate that is drawn.

Propose a synthesis of the following alcohol from an alkyl or aryl halide and an aldehyde. Show all starting materials and chemical reagents needed.

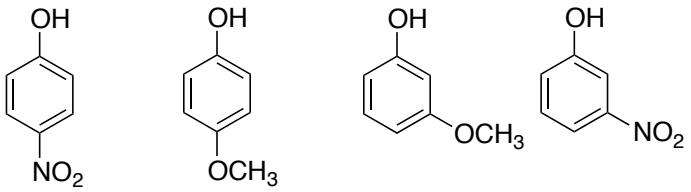


Circle the base that would most likely cause the equilibrium in the following reaction to shift to the right?

$$CH_3OH + base^- \rightleftharpoons CH_3O^- + base\text{-}H$$

Base choices: $CF_3CH_2O^-$, $CH_3CO_2^-$, $(CH_3)_3O^-$,

Place the following phenols in order of INCREASING acidity:



A **B** **C** **D**

place letters in boxes