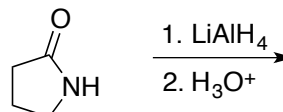
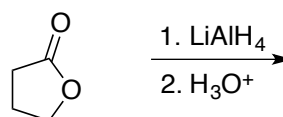
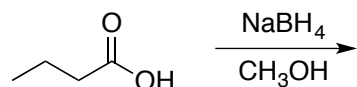
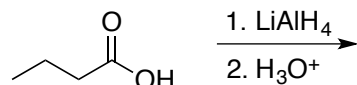
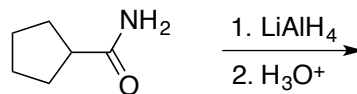
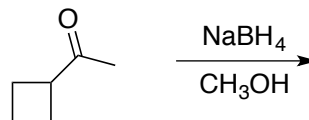
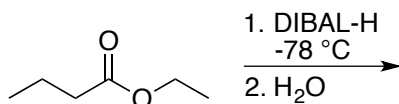
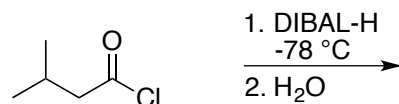
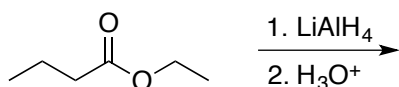
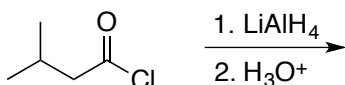
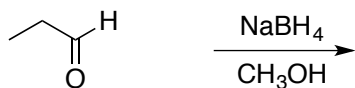
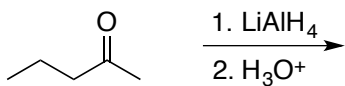
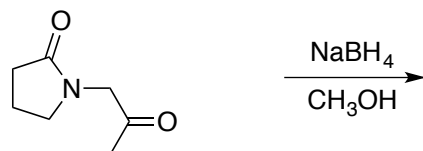
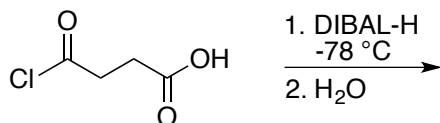
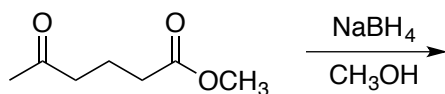


Reduction Reactions

1) Predict the product for each reaction shown below.

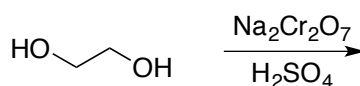
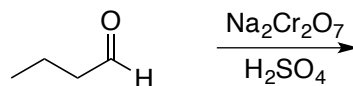
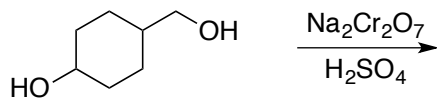
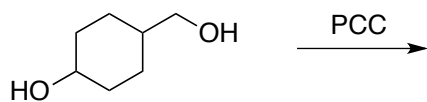


2) Predict the product for each reduction reaction below. Pay close attention to chemoselectivity.



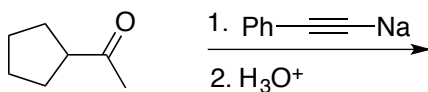
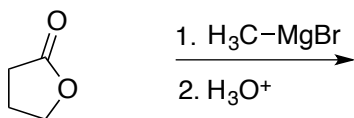
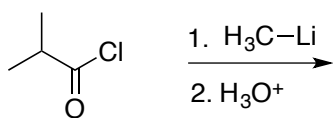
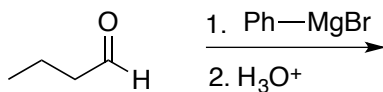
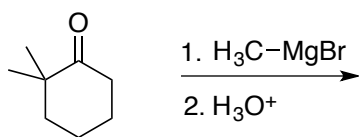
Oxidation Reactions

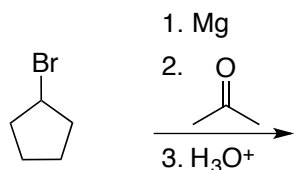
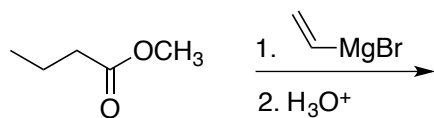
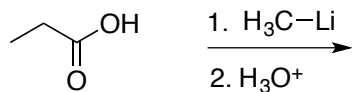
3) Predict the product for each reaction below. Assume an excess of oxidizing agent is present.



Addition of Organometallic Reagents (Grignard, Lithiates, and Acetylide ions)

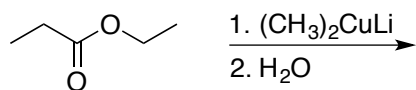
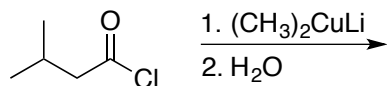
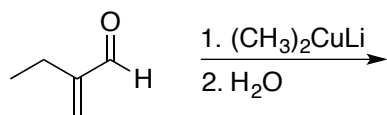
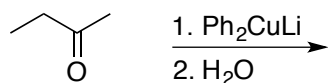
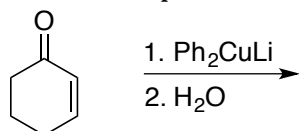
4) Predict the product for each reaction shown below. Assume an excess of organometallic reagent.



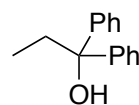
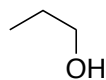
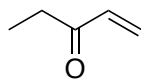
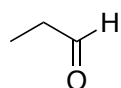


Addition of Organometallic Reagents (Organocuprates)

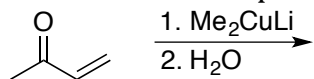
5) Predict the product for each reaction shown below.



6) What reagent is needed to convert propanoyl chloride to each of the following?

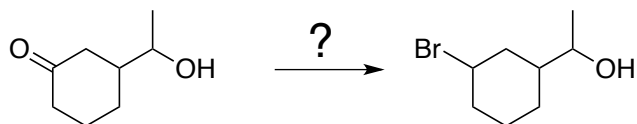


7) Draw the electron pushing mechanism for the addition of methyl cuprate to 3-buten-2-one.

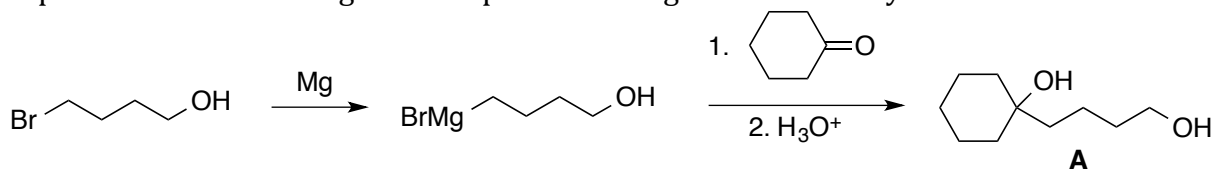


Protecting Groups in Organic Synthesis

8) Propose how you could carry out the following synthetic sequence. *Hint: PBr₃ converts alcohols to bromides.*

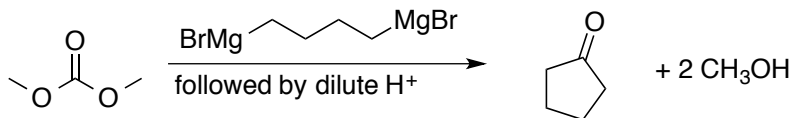
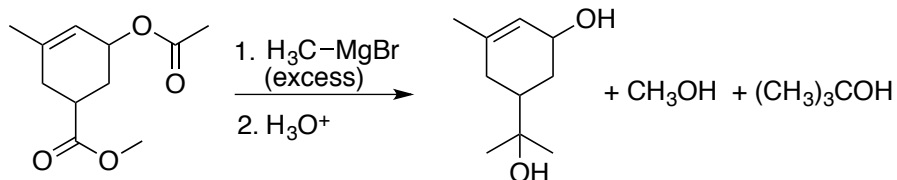
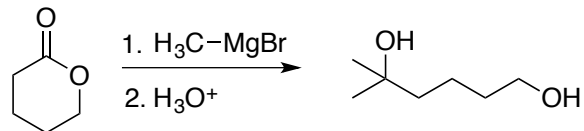


9) A student tried to carry out the reaction sequence below, but none of the diol (**A**) was formed. Explain what went wrong with the plan and design a successful synthesis of **A**.



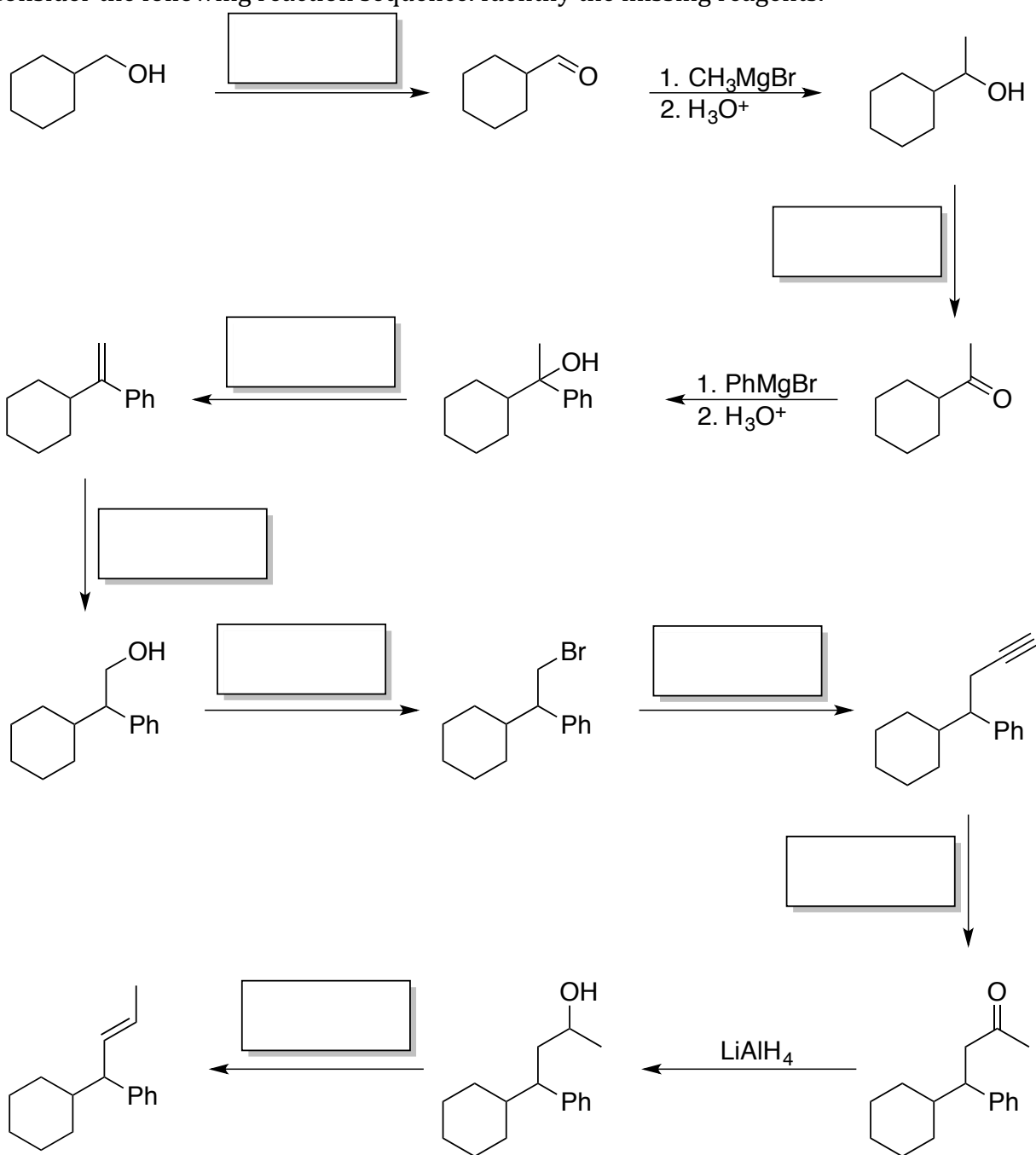
General Mechanisms

10) Draw the electron pushing mechanism for each reaction shown below.

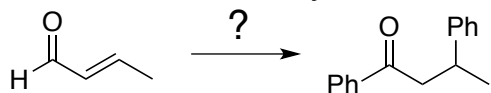


Synthesis

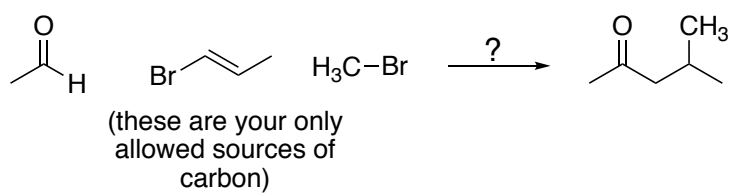
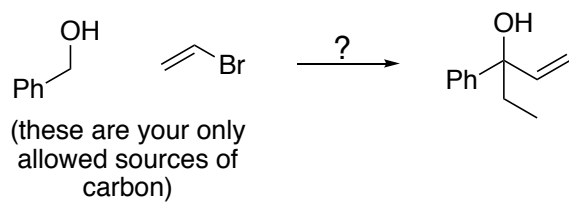
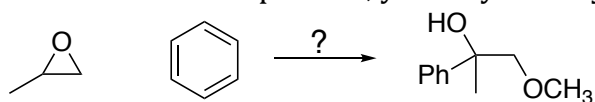
11) Consider the following reaction sequence. Identify the missing reagents.



12) Provide a reasonable synthetic route to carry out the synthetic transformation shown below.



13) Design a reasonable synthesis for each of the following using the provided starting materials.
 Unless otherwise specified, you may use any other organic or inorganic reagents as necessary.



14) **Challenge Question:** Show how 2-hexanone could be synthesized using only ethanol and any other inorganic reagents. *Hint: you might need to use a couple of reactions from organic 1.*