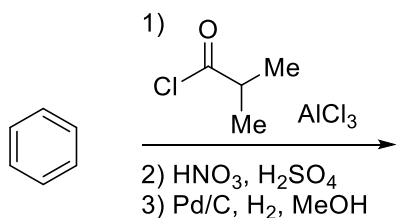


Organic Chemistry Cumulative Examination  
7 February 2019

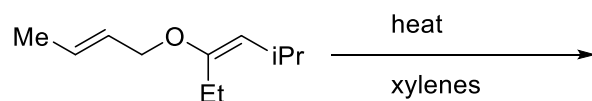
Total: **150 points**

1) Give the **products** of the following reactions. Carefully **indicate stereochemistry** where appropriate (**30 points**).

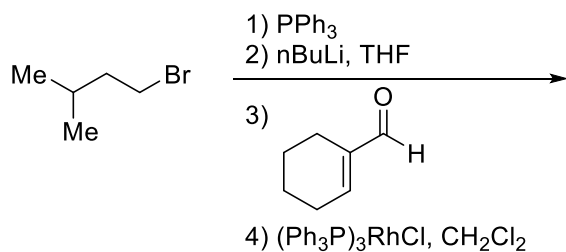
A)



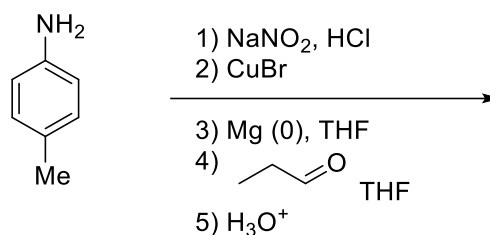
B)



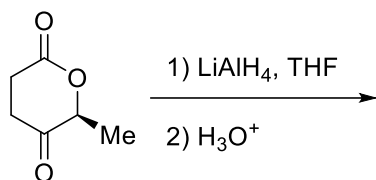
C)



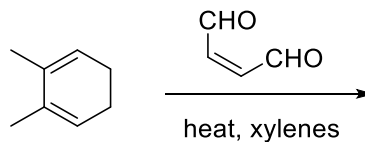
D)



E)

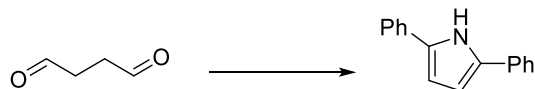


F)

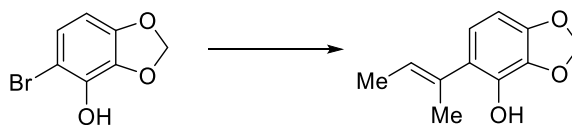


2) Provide **reaction conditions** to selectively effect the following transformations (**20 points**).

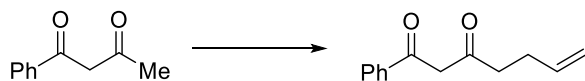
A)



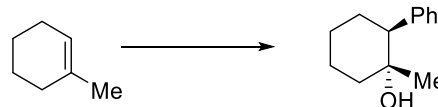
B)



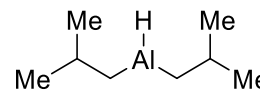
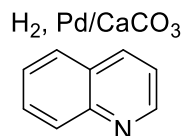
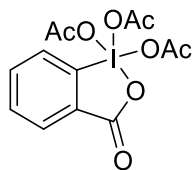
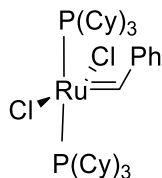
C)



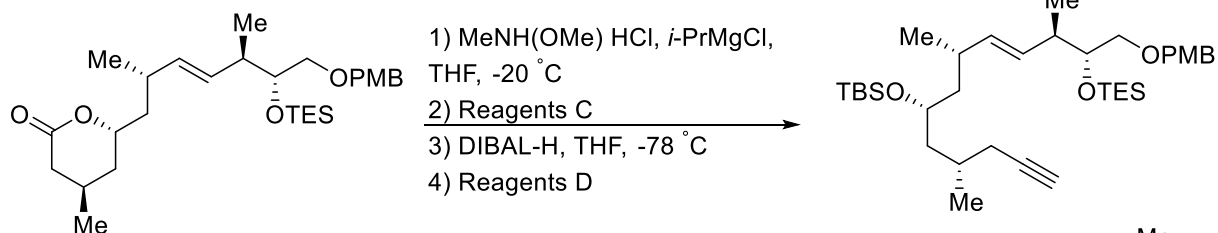
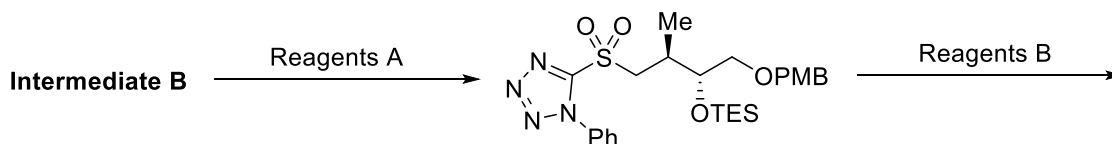
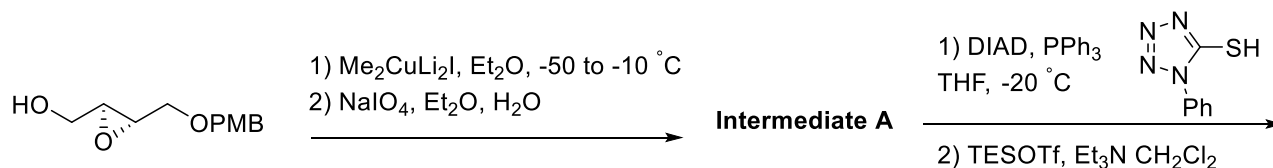
D)



3) The following reagents are very useful for organic synthesis. **For each reagent, give its common name (e.g. Wilkinson's catalyst, Swern Oxidation) and an example of the reagent's use.** Select a substrate of your choice to best illustrate each transformation and the reagent's selectivity (20 points).



4) In the following synthetic route, **provide the missing reagents, intermediates, and mechanisms** as indicated (50 points).

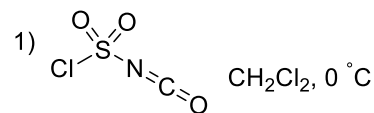


1) *n*-BuLi, ClCO<sub>2</sub>Et, THF, -78 °C  
2) PPTS, MeOH, 0 °C  
3) LiOH, THF/H<sub>2</sub>O

Provide a Mechanism for Step 3

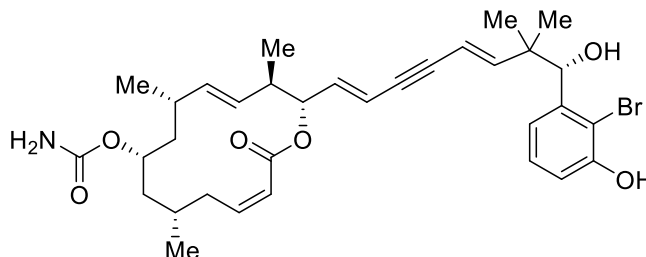
Intermediate C

1) Reagents E  
2) Reagents F  
3) HF pyr, MeOH, 0 °C

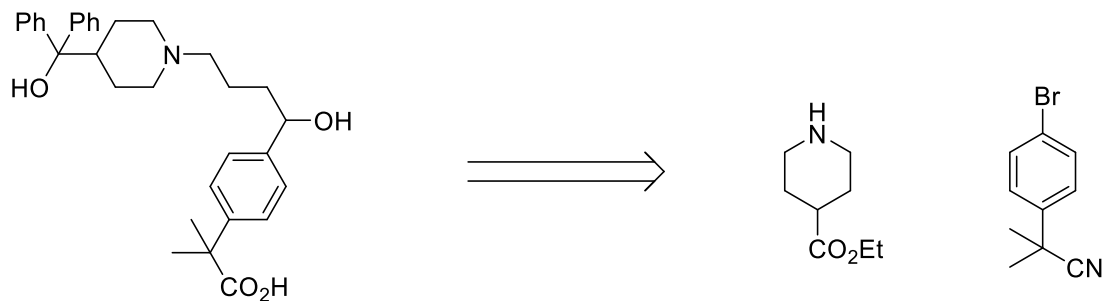


2) DDQ, DCM/pH 7 buffer  
3) Reagents G  
4) Reagents H  
5) Reagents I

Provide a Mechanism for your chosen reagents G



5) **Fexofenadine** is an antihistamine used to relieve allergy symptoms. **Propose an efficient synthesis of this drug from the given starting materials. (15 points).**



6) **Fentanyl** is an opioid analgesic (painkiller). **Propose an efficient synthesis of this drug from the given starting materials. (15 points).**

