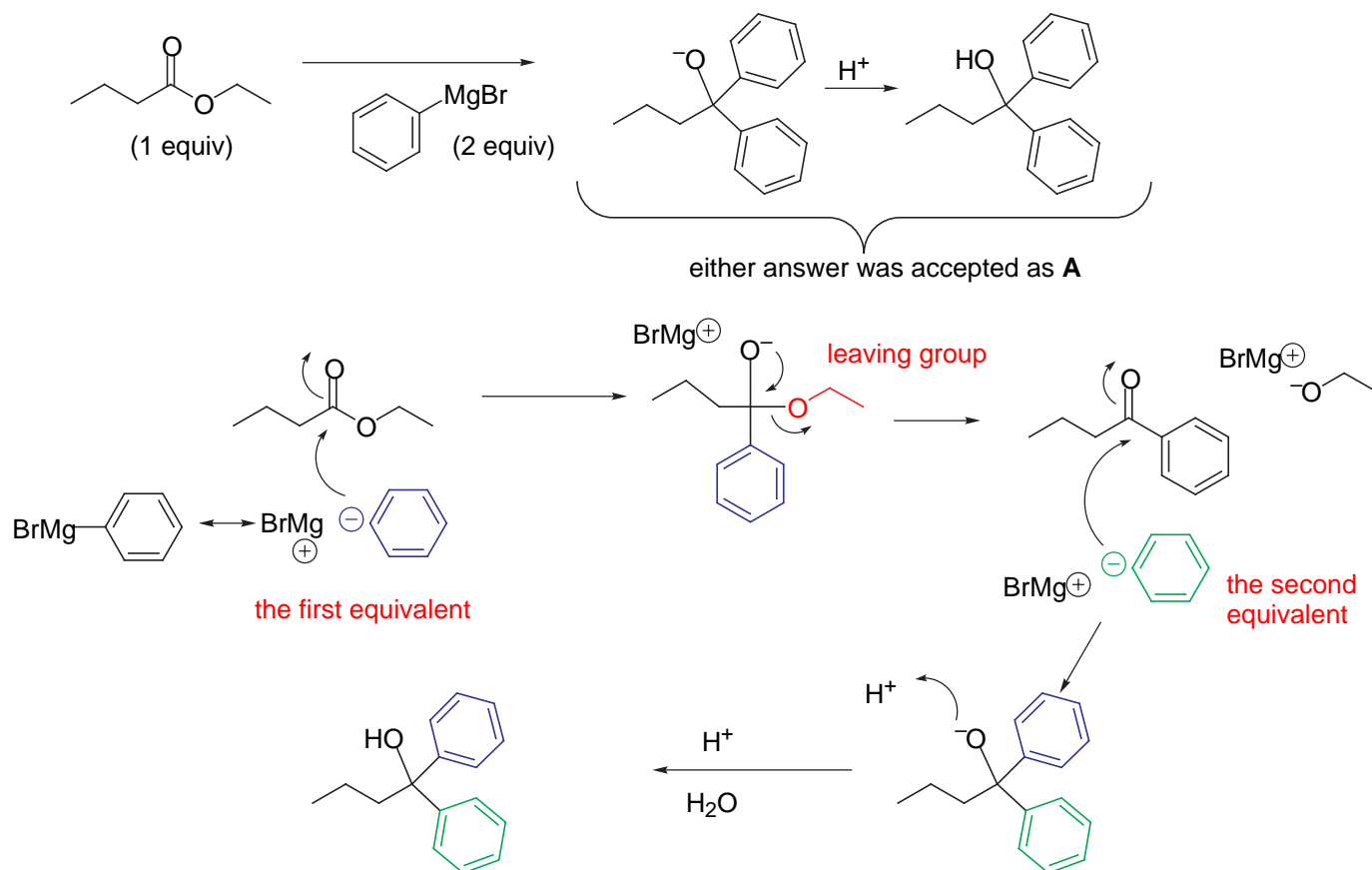
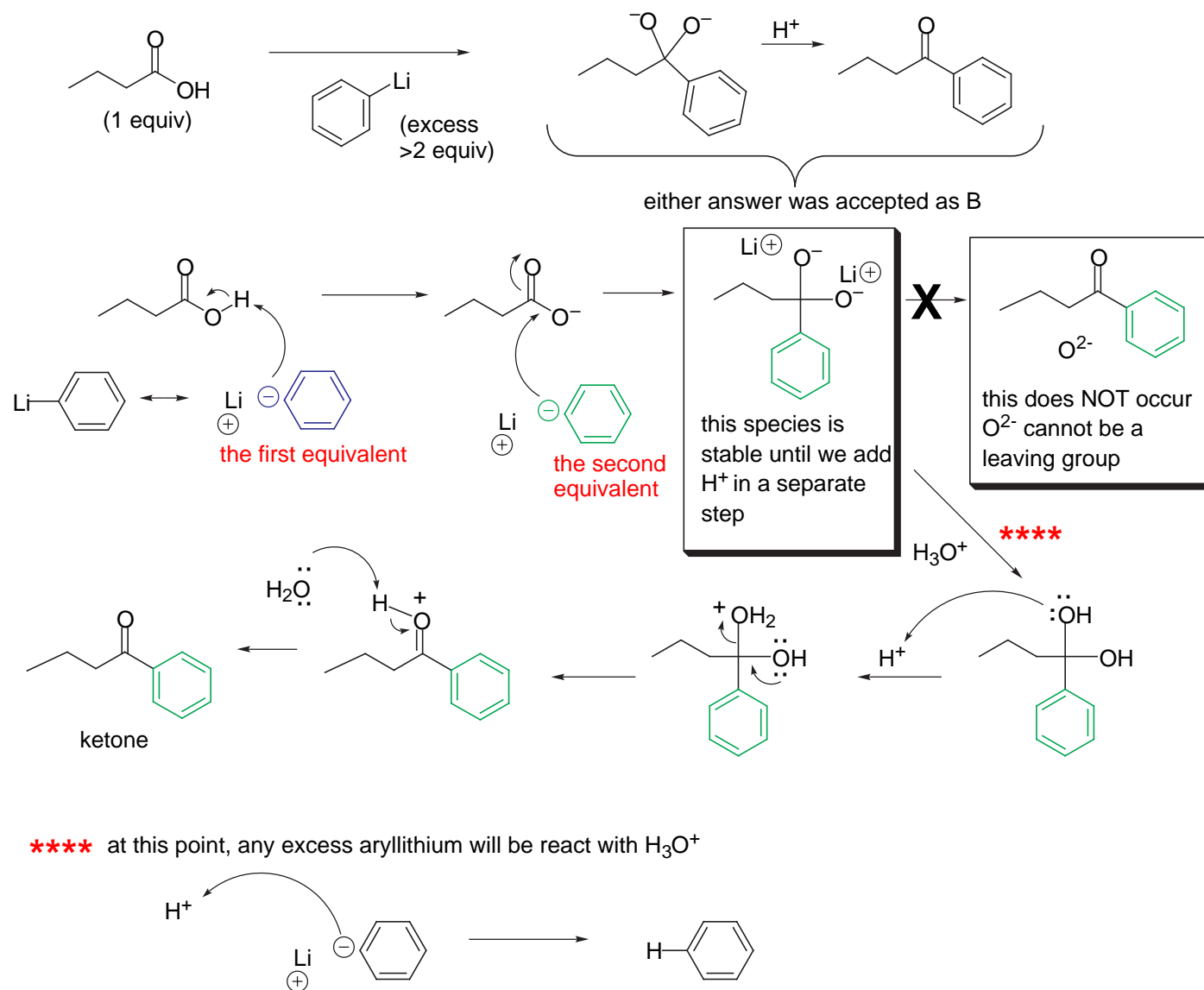


1) Draw the structure of **A** and provide detailed arrow pushing mechanisms for its formation.



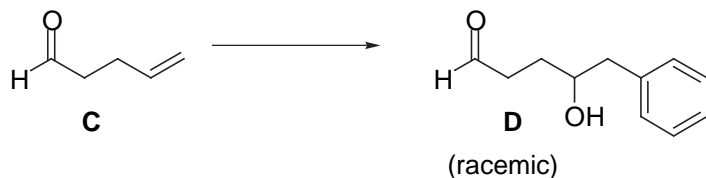
The key is that a ketone is generated while the Grignard reagent is still present. Thus, a second Equivalent can add

2) Draw the structure of **B** and provide detailed arrow pushing mechanisms for its formation. Explain why **A** [your answer from question 1] is not formed instead.

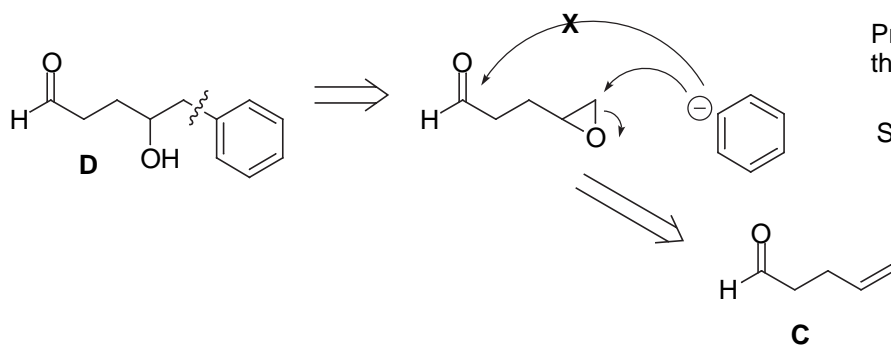


Thus, because the ketone is only generated under acidic conditions, the organometallic reagent gets protonated before it has the chance to add a second time!

4) Propose a multistep synthesis of **D** using **C** as a starting material.



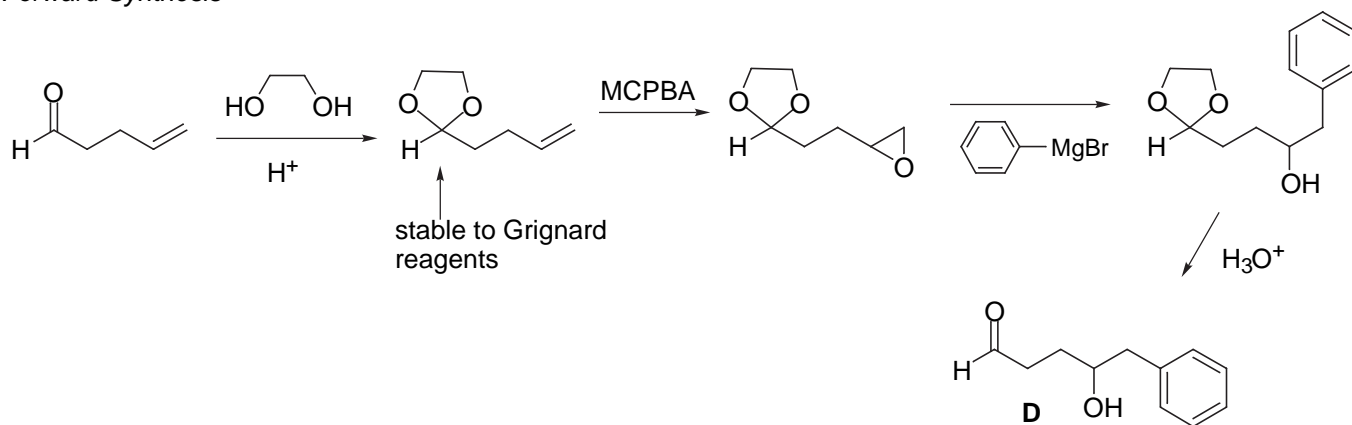
Retrosynthesis:



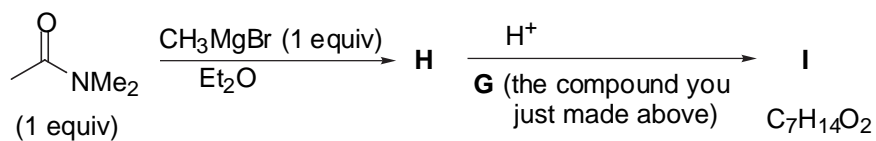
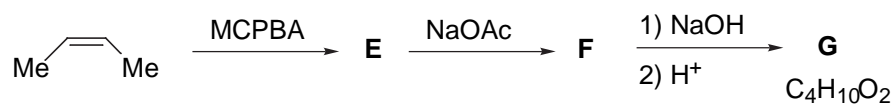
Problem: we need to selectively add to the epoxide and not to the aldehyde

Solution: use an acetal protecting group

Forward Synthesis



5) Deduce the structures of **E–I**



$^1\text{H}$  NMR spectrum of **I**

3.38 (m, 2H)  
 1.28 (s, 6H)  
 1.15 (d, 6H,  $J=5.9$  Hz)

