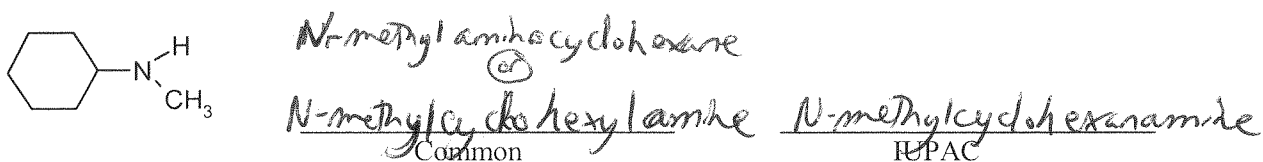
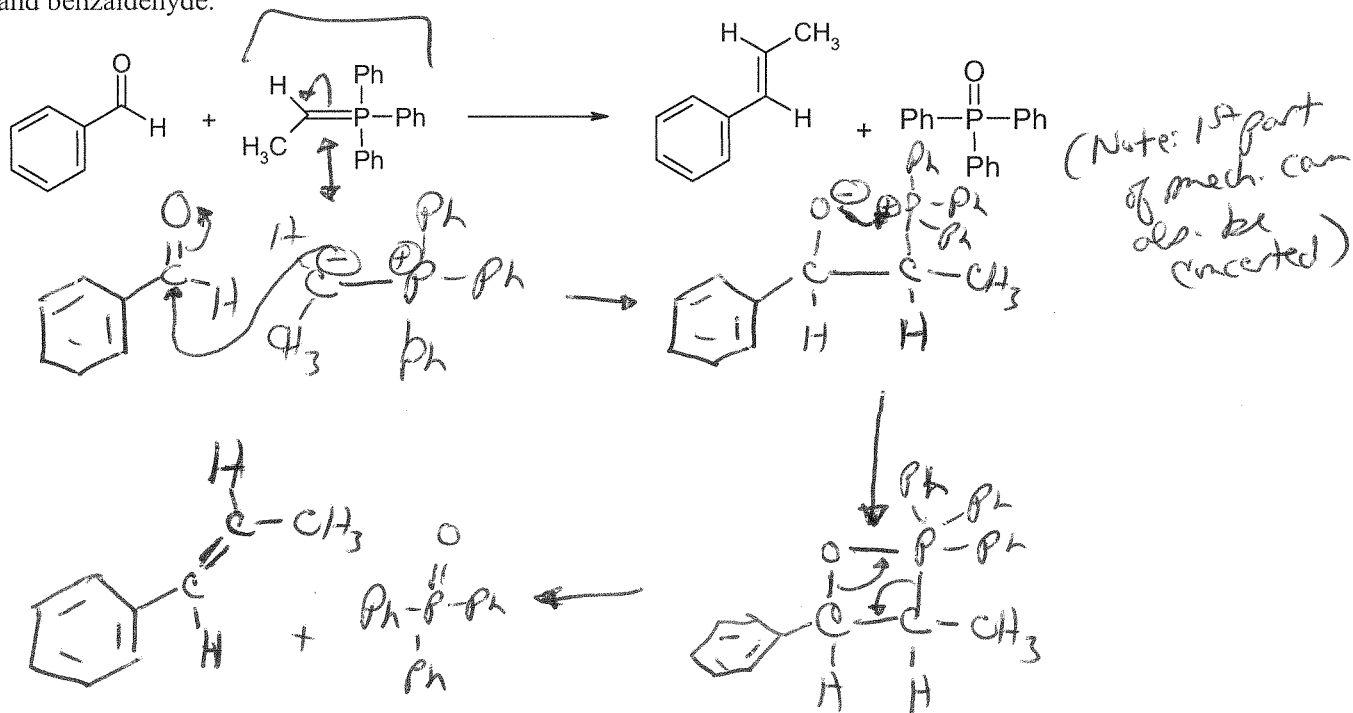


1. (5 pts) Give the **common** and **IUPAC** name of the following compound.

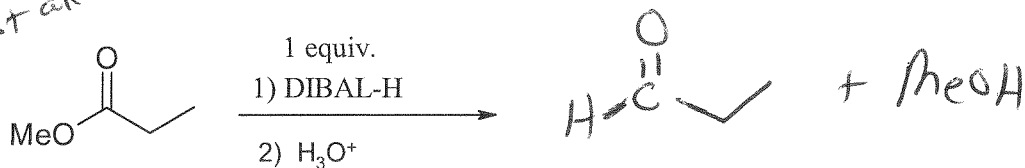


2. (7 pts) Write the mechanism of the following Wittig reaction using the phosphonium ylide shown and benzaldehyde.

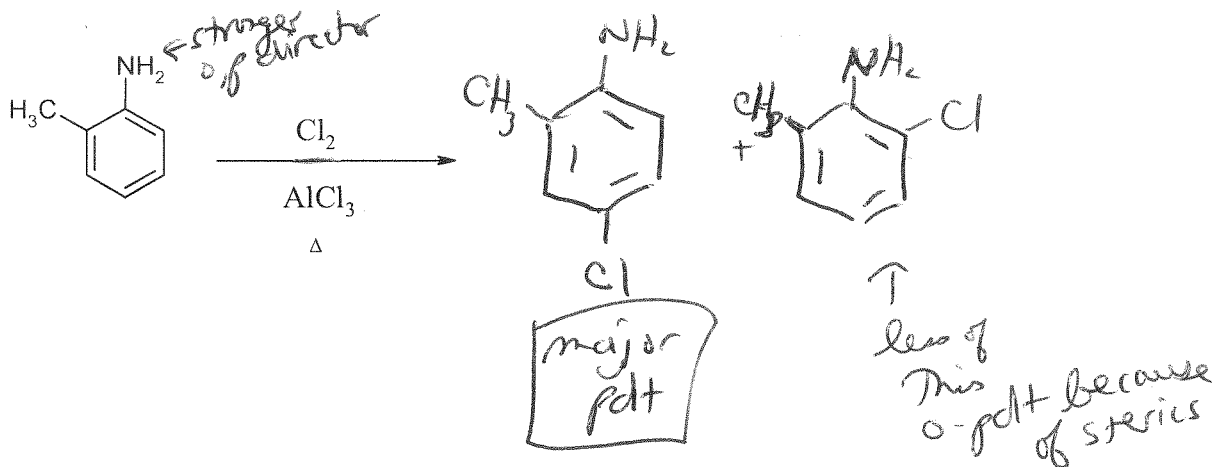


3. (36 pts, 4 each) Give the **major product(s)** or the **reagents needed** or **starting material** for the following transformations. Be sure and indicate stereochemistry where necessary.

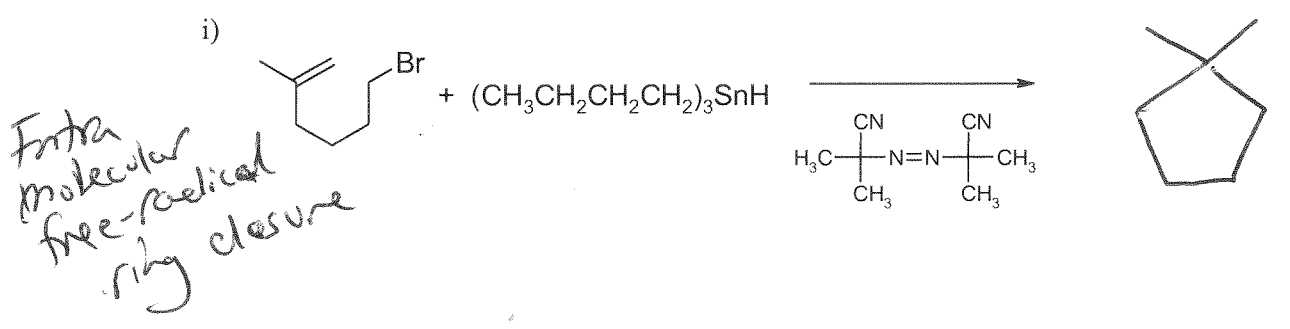
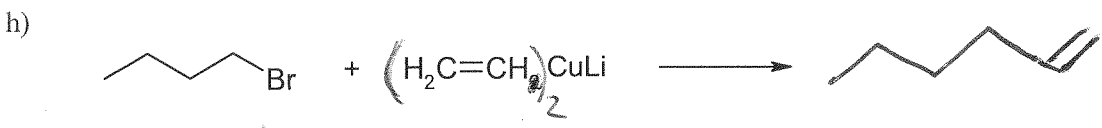
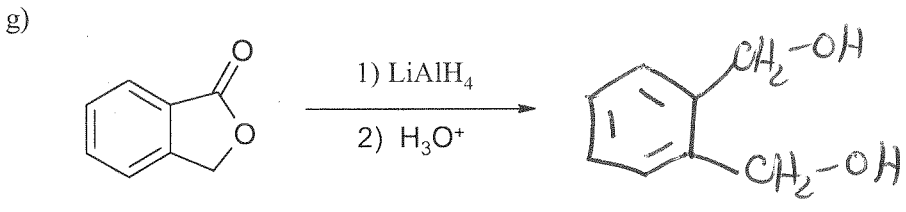
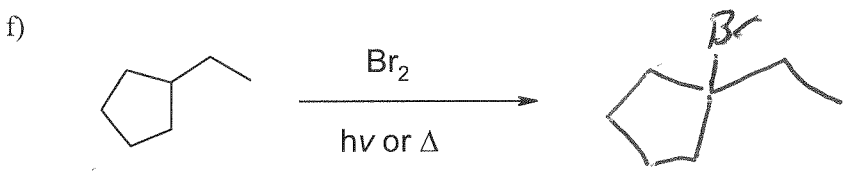
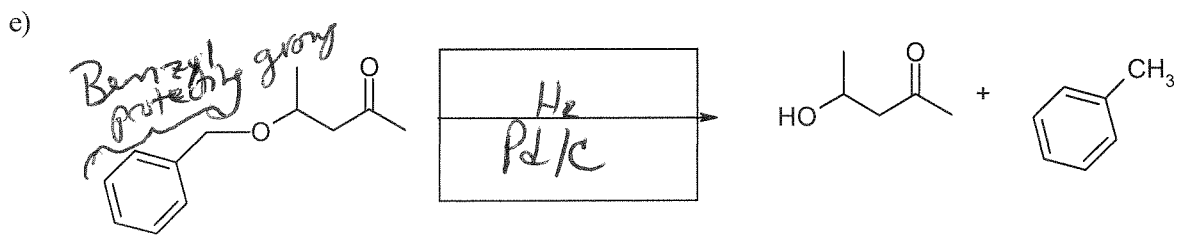
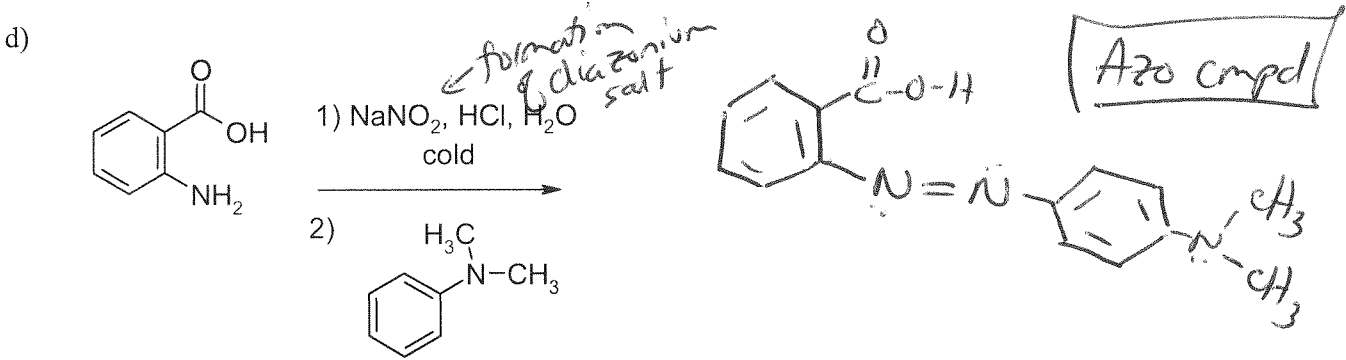
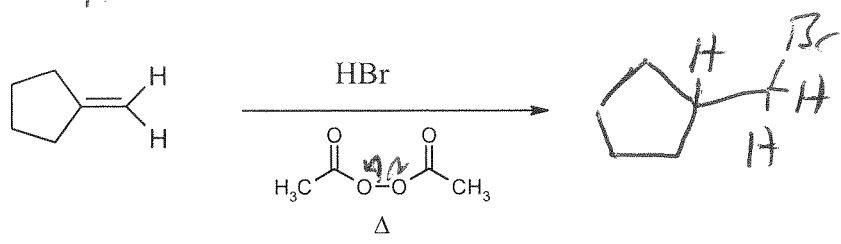
1 equiv. DIBAL-H reduces ester a) to aldehyde - not alcohol



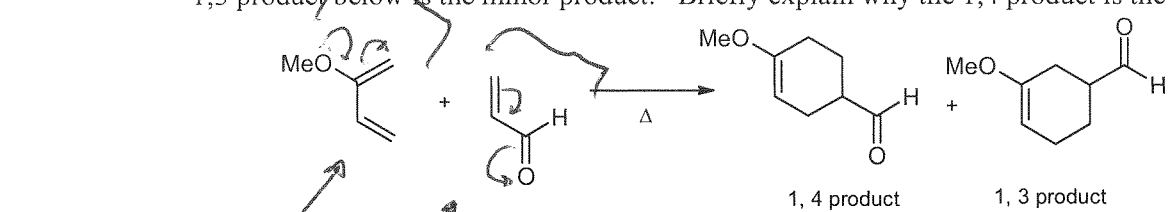
b)



c) Free-Radical
Anti-Markovnikov
H-Br addn



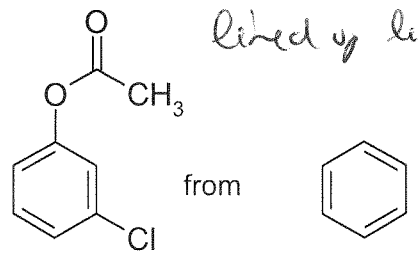
7. (7 pts) In the following Diels-Alder reaction, the 1,4 product shown is the major product, while the 1,3 product below is the minor product. Briefly explain why the 1,4 product is the major product.



The reason the 1,4 product is the major product can be explained by looking at the secondary resonance structures of the diene + dienophile. When the \oplus + \ominus charges of the 2° resonance structures line up it gives a lower energy T.S. than if the diene + dienophile are lined up like this:

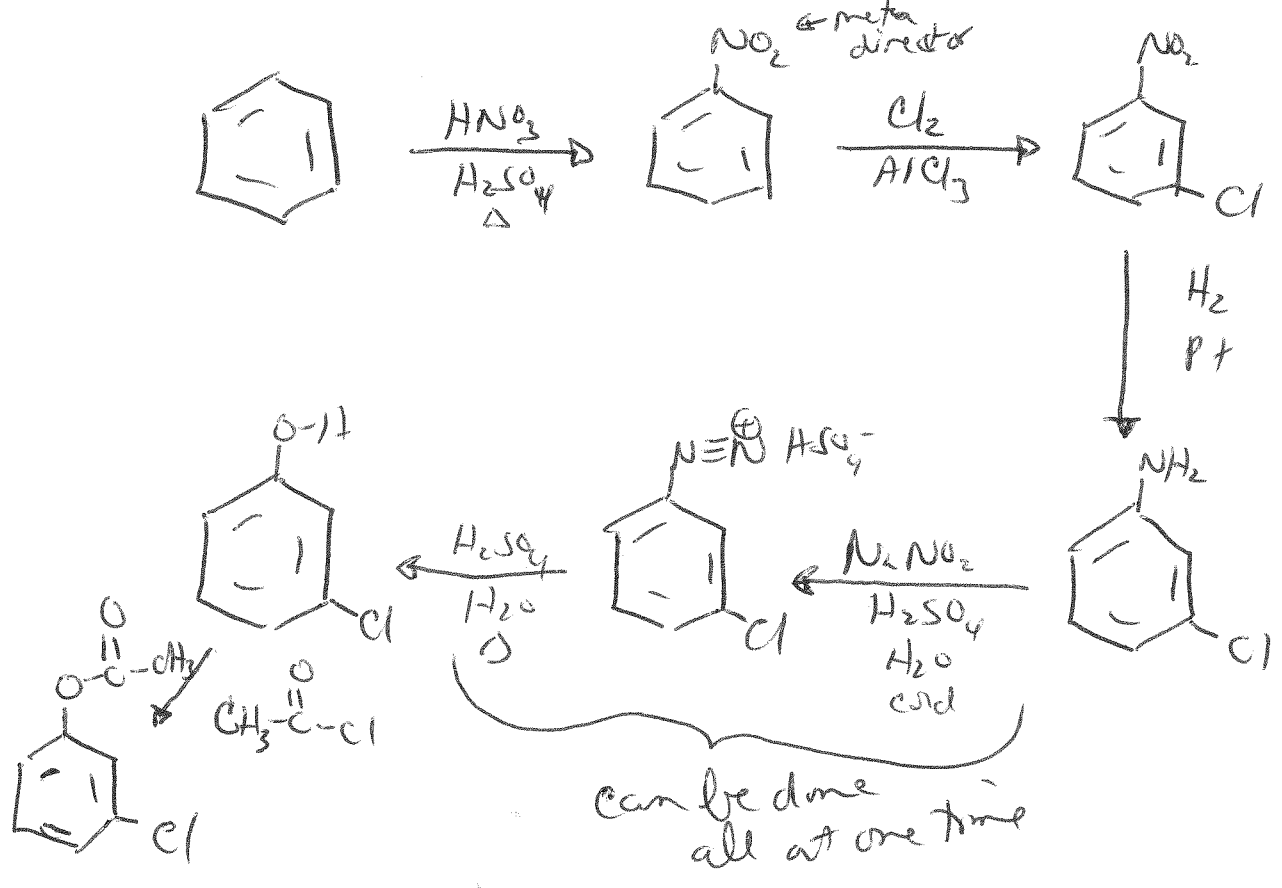
$\left(\oplus + \ominus \right)$
 not aligned
 in this
 case

8. (11 pts) Prepare



Consequently, the 1,4 product is the major product

Show all reagents and the structure of the product after each step.



9. (11 pts) Design a synthesis using the given starting materials and any other needed reagents to make the compound shown below. Show all reagents and the structure of the product after each step.

