
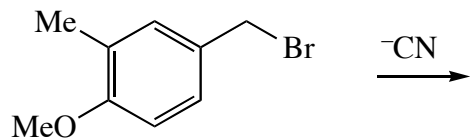
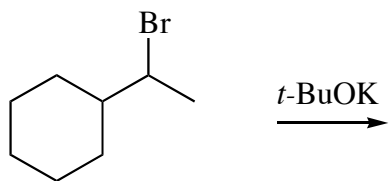


1. (4 pts. each, 24 pts. total) Draw the *major* product of each of the following reactions. If no reaction is expected to occur, write "No reaction." Be sure to indicate the stereochemistry of the product, if appropriate. (A mixture of configurations should be indicated with a squiggly bond  to one of the groups attached to the stereogenic C atom.)

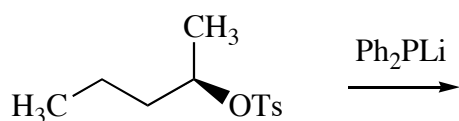
(a)



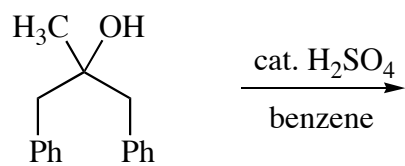
(b)



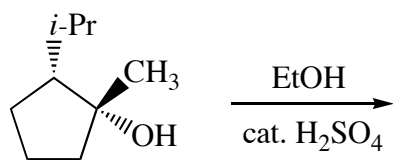
(c)



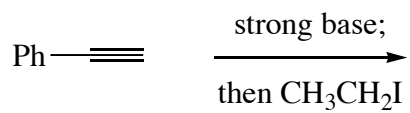
(d)



(e)

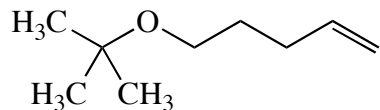


(f)



2. (16 pts. each, 32 pts. total) Design syntheses of each of the following compounds from the indicated starting materials. Show all reagents required for each transformation. You are advised to conduct a retrosynthetic analysis before working in the forward direction. *Either synthesis may require more than one step.*

(a)

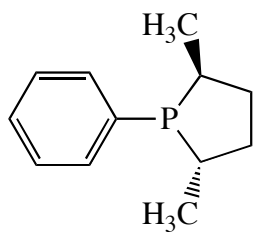


two starting materials, neither of which contains a π bond

Retrosynthetic analysis:

Forward synthesis:

(b)



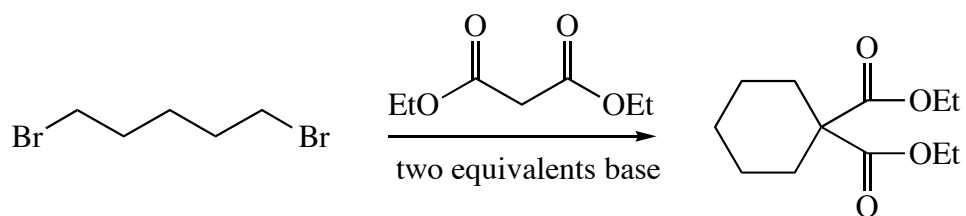
two starting materials, one of which contains only C, H, and P,
and the other of which contains only C, H, and O.

Retrosynthetic analysis:

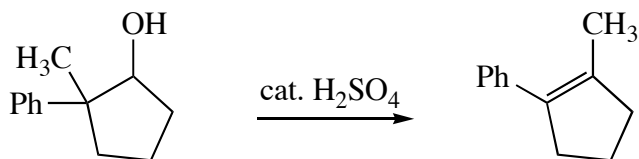
Forward synthesis:

3. (22 pts. total) Draw reasonable mechanisms for each of the following reactions. Use the curved arrow convention to show the movement of electrons. *Remember to obey Grossman's Rule!*

(a) (8 pts.)

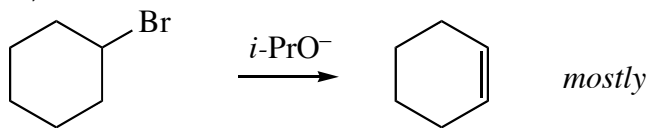


(b) (14 pts.)

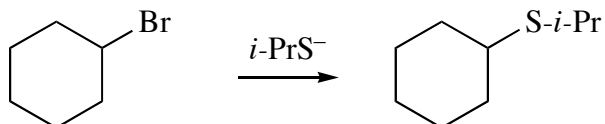


4. (22 pts. total) Explain each of the following observations in one or two brief, coherent, and grammatically correct sentences.

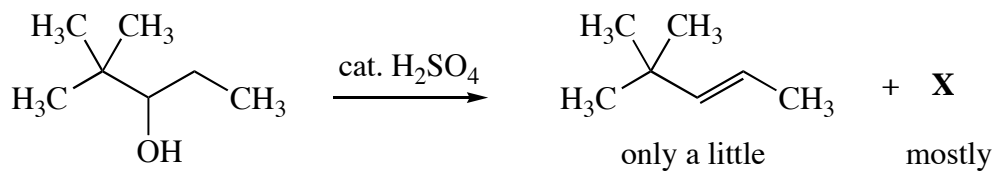
(a) (4 pts.)



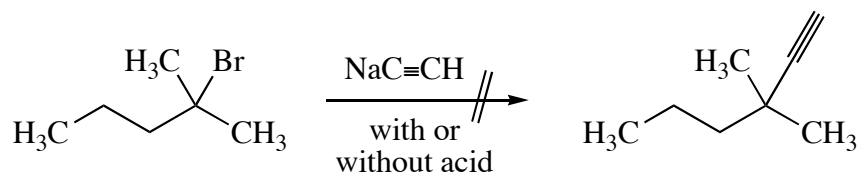
BUT



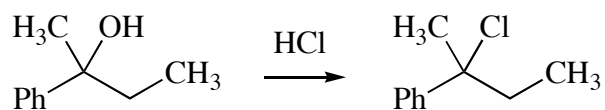
(b) (4 pts.) Only a little of the product shown is obtained; the major product is entirely different.



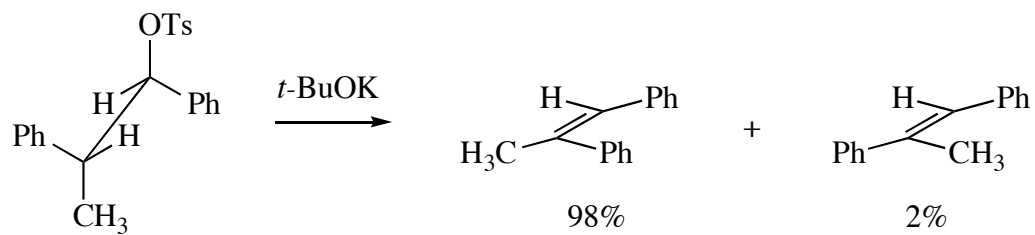
(c) (4 pts.) The reaction below fails regardless of whether or not acid is added. (Explain both cases.)



(d) (4 pts.) Undergraduate research assistant Sally Humdinger tries to double the rate of the reaction below by adding twice as much HCl, but it has no effect.



(e) (6 pts.) The non-Zaitsev product is obtained predominantly under basic conditions, but the Zaitsev product is obtained predominantly when no base is included.



BUT

