

CHEM 8321/4321

October 2, 2023

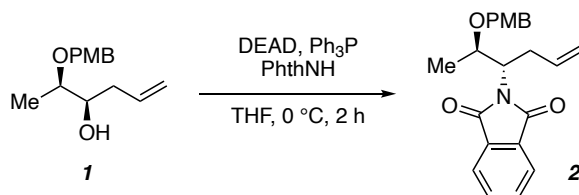
Problem Set #5

T. R. Hoye

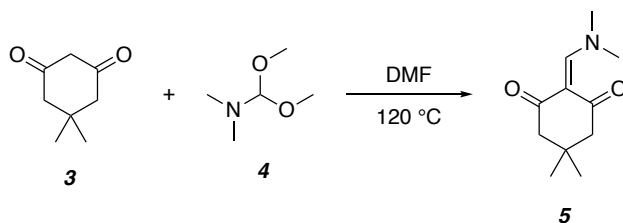
Due in class, Monday October 9, 2023

Detailed Mechanism Provide a detailed mechanism [i.e., *explicitly* show (using curly arrows) *EVERY* intermediate, formal charge (where relevant), equilibrium, and bond-making and -breaking step] to account for the following transformations:

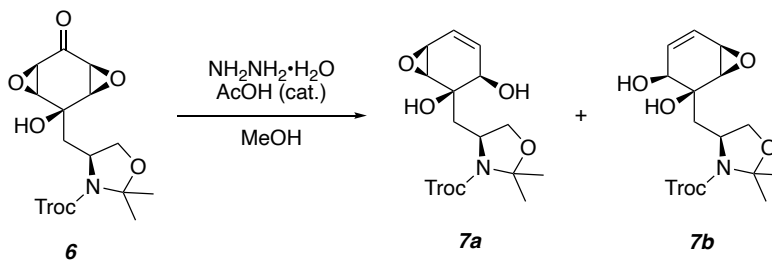
a) The reaction of the alcohol **1** to form the phthalimide derivative **2** via a Mitsunobu reaction. Diethyl azodicarboxylate (DEAD) first reacts with the triphenylphosphine to form a zwitterionic intermediate. The mechanism should account for the configuration of the amine-bearing carbon in the product **2**.



b) The formation of the dimethylaminomethylidenedione **5** from dimedone (**3**) and DMF dimethyl acetal (**4**). [*hints*: i) **4** initially dissociates to an ion pair in solution and ii) two moles of methanol are formed as the byproduct for each mole of dimedone that is converted to **5**.]

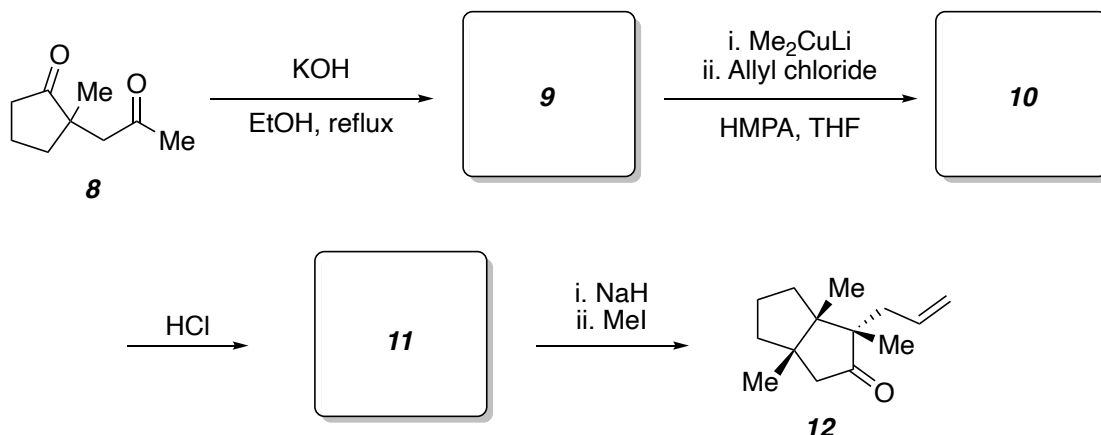


c) The Wharton reaction (look it up) of bis-epoxide **6** to form the allyl alcohols **7a** and **7b**. The acetic acid is catalytic and the hydrazine is consumed in this process. Note: **7a** and **7b** are formed in a nearly (but not exactly) equimolar ratio.

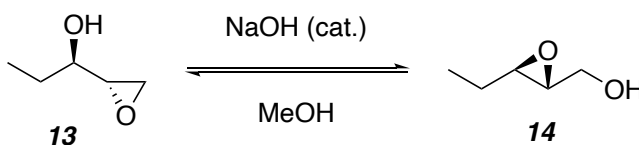


Other Problems

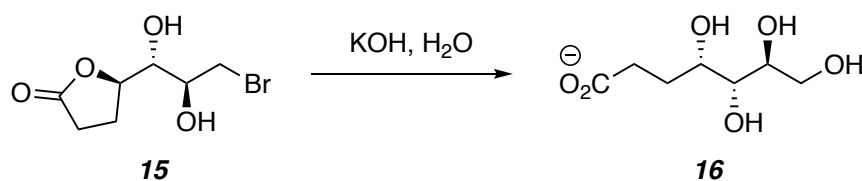
1) Provide the structures of the missing compounds in the sequence that converts the ketone **8** to the bicyclic ketone **12**. All compounds are racemates. *Hint*: the second ring is established in the first step.



2. The isomerization of the epoxyalcohols **13** and **14** is an example of a Payne rearrangement.



The following reaction involves inversion of configuration at all three stereogenic centers in the substrate **15**. Two Payne rearrangements are involved. Several intermediates are involved; in order, they include: i) a lactone-alcohol-epoxide; ii) a different lactone-alcohol-epoxide; iii) a carboxylate-diol-epoxide; iv) a different carboxylate-diol-epoxide; and v) a lactone-triol. Deduce and show the structures of each intermediate.

**3. Reaxys Search Problem(s)**

- How many substances are in the Reaxys database having a 2,3'-disubstituted biphenyl substructure?
- How many publications (documents) are in the Reaxys database that are coauthored by Kay Brummond (University of Pittsburgh) and published between 2005 and 2015?