



CHEM 8410_6410_4410 – Organic Synthesis

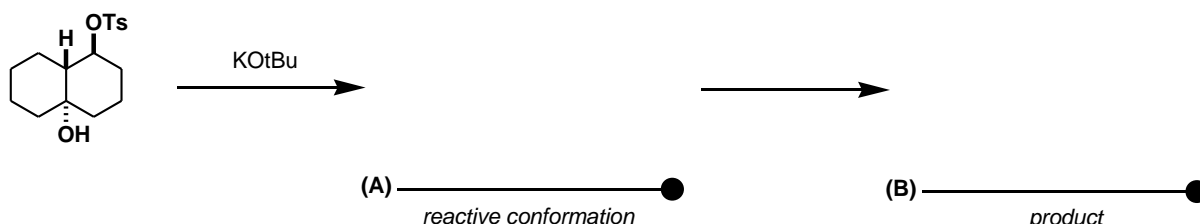
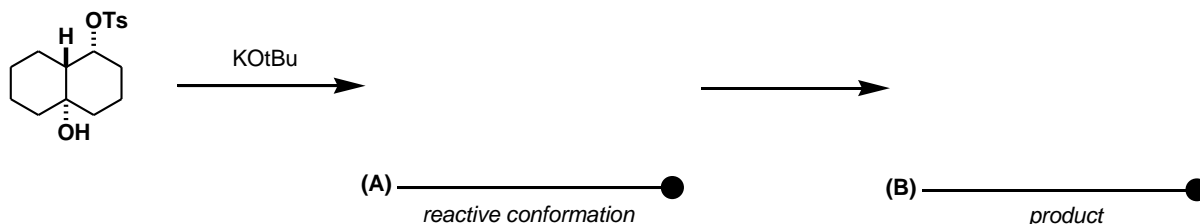
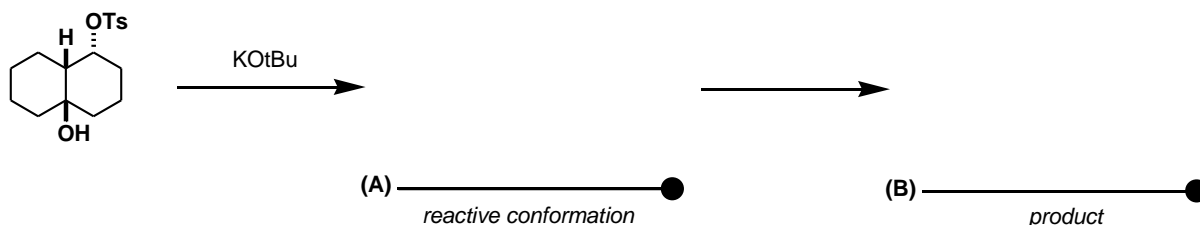
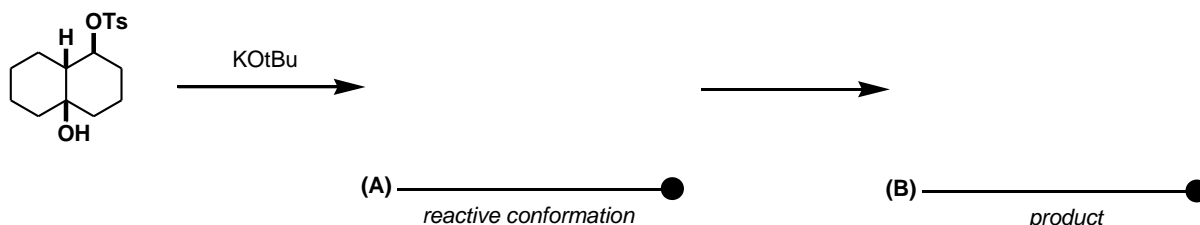
THE UNIVERSITY OF
TOLEDO
1872

Problem Set 1: This problem set is now available at (www.blackboard.utdl.edu). It will be due in class 21 days (02/18/20) from today (01/28/20). Grades will be administered as follows: 10 (exceptional effort), 8 (complete), 5 (incomplete or inadequate effort), 2 (poor effort), 0 (nonexistent).

No late problem sets will be accepted. Total PTS = 30

1. **Problem:** The following alkoxide-induced reactions have been systematically studied by Wharton *et. al.* (*JOC*, **1965**, 30, 3254.) The illustrated substrates will undergo fragmentation to an olefinic ketone **IF** the appropriate stereoelectronic constraints are met. If these constraints cannot be met, E2 elimination to the derived bicyclic olefinic alcohol will take place.

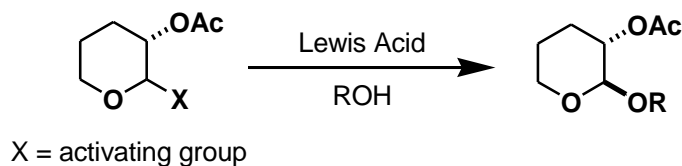
Predict the principle product observed in each instance (**B**) and draw the reactive conformation (**A**) that meets the stereoelectronic conditions for the reaction. Put your answers in the space provided.



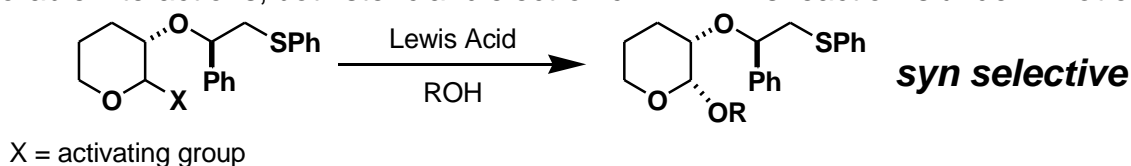


2. **Problem:** Stereoselective formation of the glycosidic linkage is the principal challenge in the synthesis of biologically important oligosaccharides. Anchimeric assistance (neighboring group participation) can be a powerful tool for the selective construction of glycosidic bonds (we discussed this briefly in class).

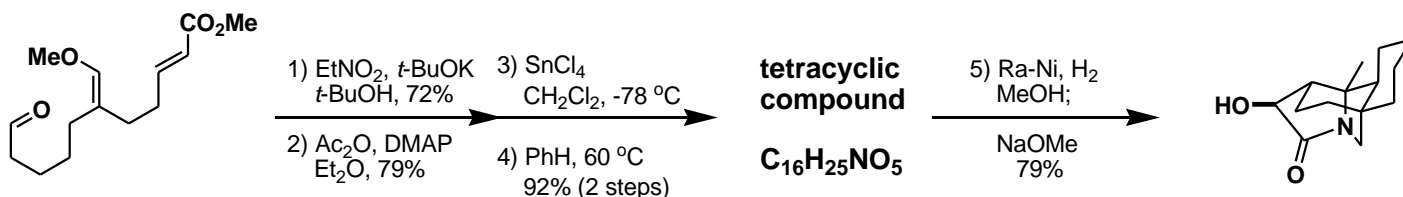
Part A. For the following α -selective glycosylation, please provide a clear mechanism, using three-dimensional representations, that accounts for the observed stereochemical outcome. Indicate all relevant orbital interactions.



Part B. Boons and co-workers (*JACS*, **2005**) have reported a highly selective synthesis of the corresponding *syn* di-substituted system by employing a participating phenyl-2-(phenylsulfanyl)ethyl moiety, as indicated below. Using three-dimensional drawings, provide a rational mechanism for this interesting reaction. Be sure to indicate all favorable and unfavorable interactions, both steric and electronic. **NB:** This reaction is under *kinetic* control.



3. **Problem:** Pericyclic reactions remain to be one of the most fascinating yet elegant transformations in organic synthesis. Denmark and co-workers use a Henry reaction to position themselves for a Lewis Acid assisted concerted cyclization followed by a thermodynamic $2\pi + 3\pi$ cycloaddition to give tetracyclic compound $C_{16}H_{25}NO_5$. Provide the complete mechanism for all of the transformations and render three-dimensional drawings for the cyclization events. **NB:** Rainey Ni cleaves N-O bonds.



S. C. Denmark