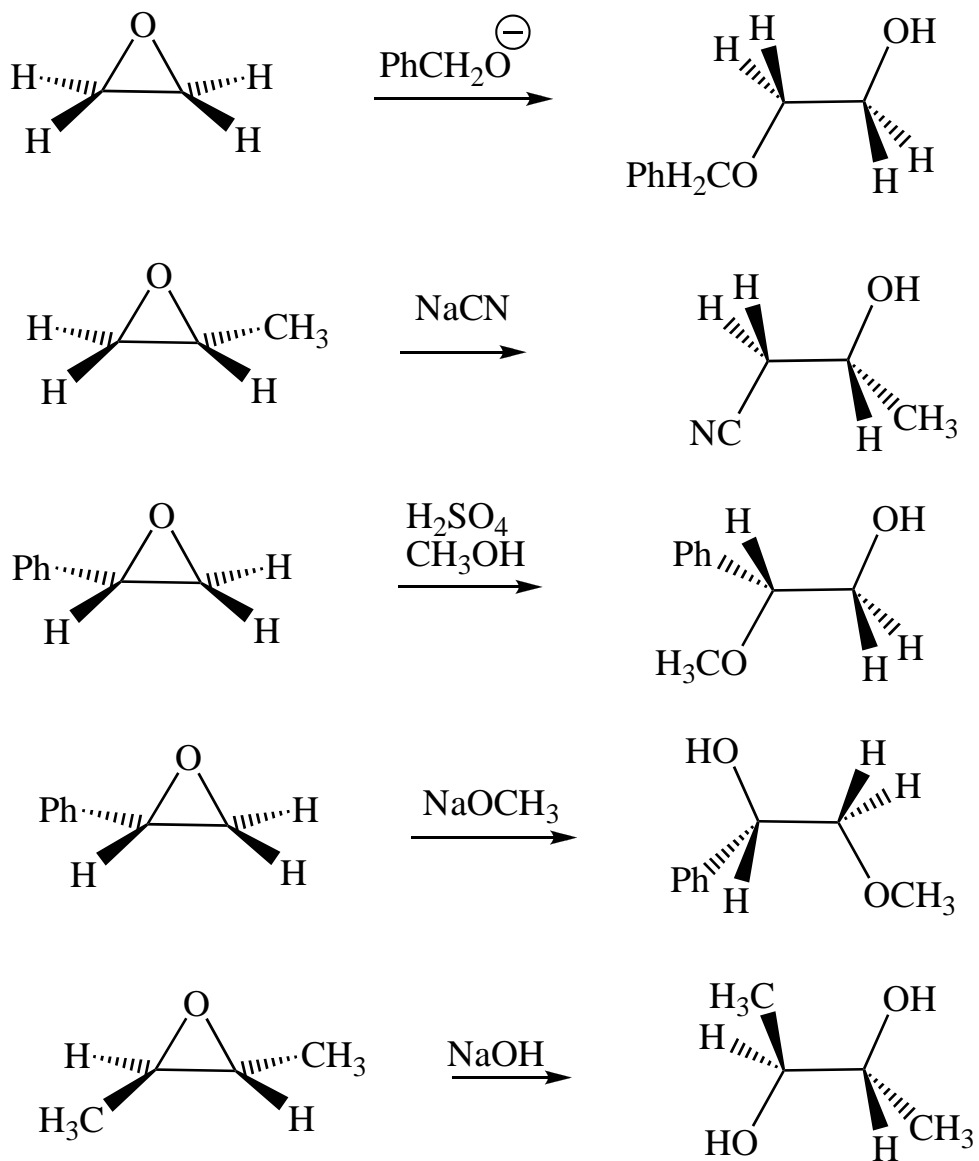


Exercise 64A - Epoxides

Question

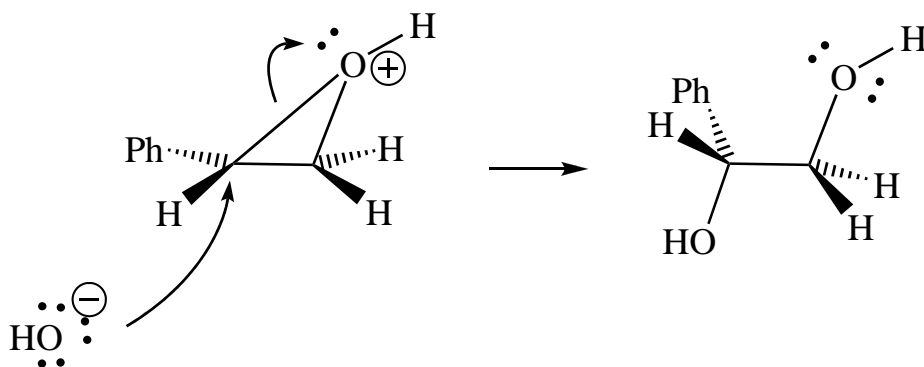
Show how you would prepare the following products from the substitution reactions of epoxides. Be careful of stereochemistry and regioselectivity.



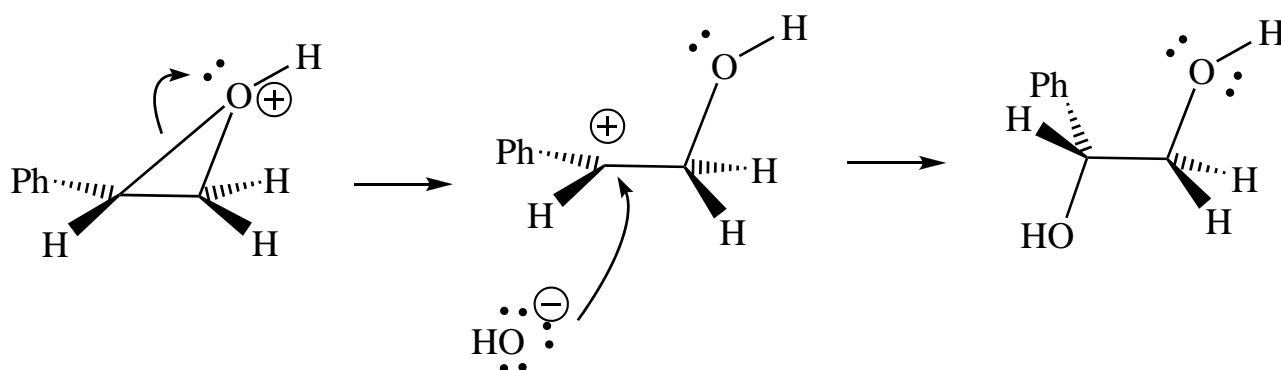
Question

The acid catalyzed opening of epoxides is said to involve a "carbocation-like" - but not a carbocation. Devise an experiment that would distinguish between the two possible mechanisms.

After protonation of the epoxide, expected to be a fast reaction, the question is whether this intermediate is attacked by the nucleophile



or whether it first opens to a carbocation and then reacts:



There are two things that would pin this down. Firstly, the top reaction would have a bimolecular elementary process (that shown) as the rate-determining step. The reaction would therefore follow second order kinetics. In the second, the rate-determining step would be expected to be the formation of the carbocation - a first order process. So determining the rate law would distinguish these two mechanistic possibilities. Secondly, I have used an epoxide that is chiral and optically pure. The top process gives stereospecific inversion giving a single chiral optically pure product. The carbocation in the second process can be attacked from either face with equal ease and must lead to a racemic mixture of products...

