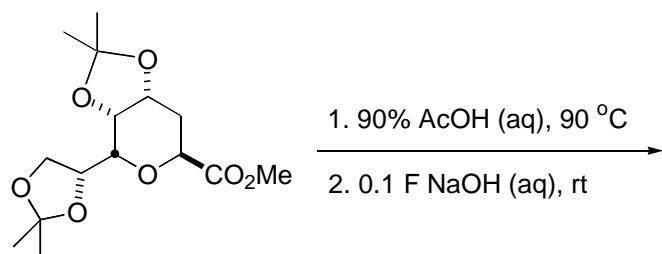
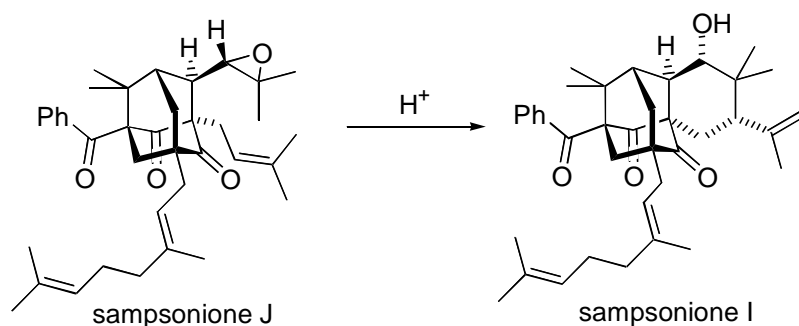


1. Predict the product(s) and provide reasonable mechanisms for the process illustrated below.

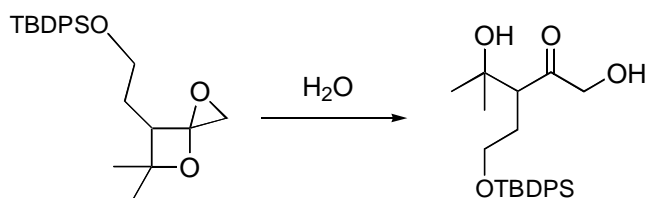


2. Sampsoniones are cytotoxic, structurally unusual adamantane-based natural products isolated from *Hypericum sampsonii*, a plant used in Chinese medicine. Two recently-discovered members of this group, sampsonione J and sampsonione I, are related in that the former can be transformed into the latter by treatment with *p*-toluenesulfonic acid in toluene at room temperature. Provide a reasonable mechanism for the transformation.



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3. The transformation shown below occurs under extremely mild conditions (treatment with water). Provide a reasonable mechanism for the transformation, along with a rationale as to why the transformation occurs with such ease. TBDPS is an acronym for *t*-butyldiphenylsilyl.



4. The example below is from a recent report of a Lewis acid-catalyzed, stereospecific reaction that makes use of allylsilanes. Provide a reasonable mechanism for the process.

