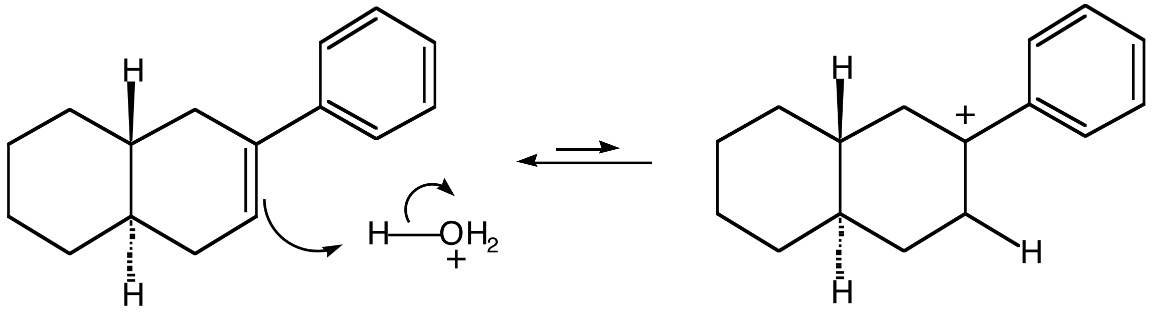
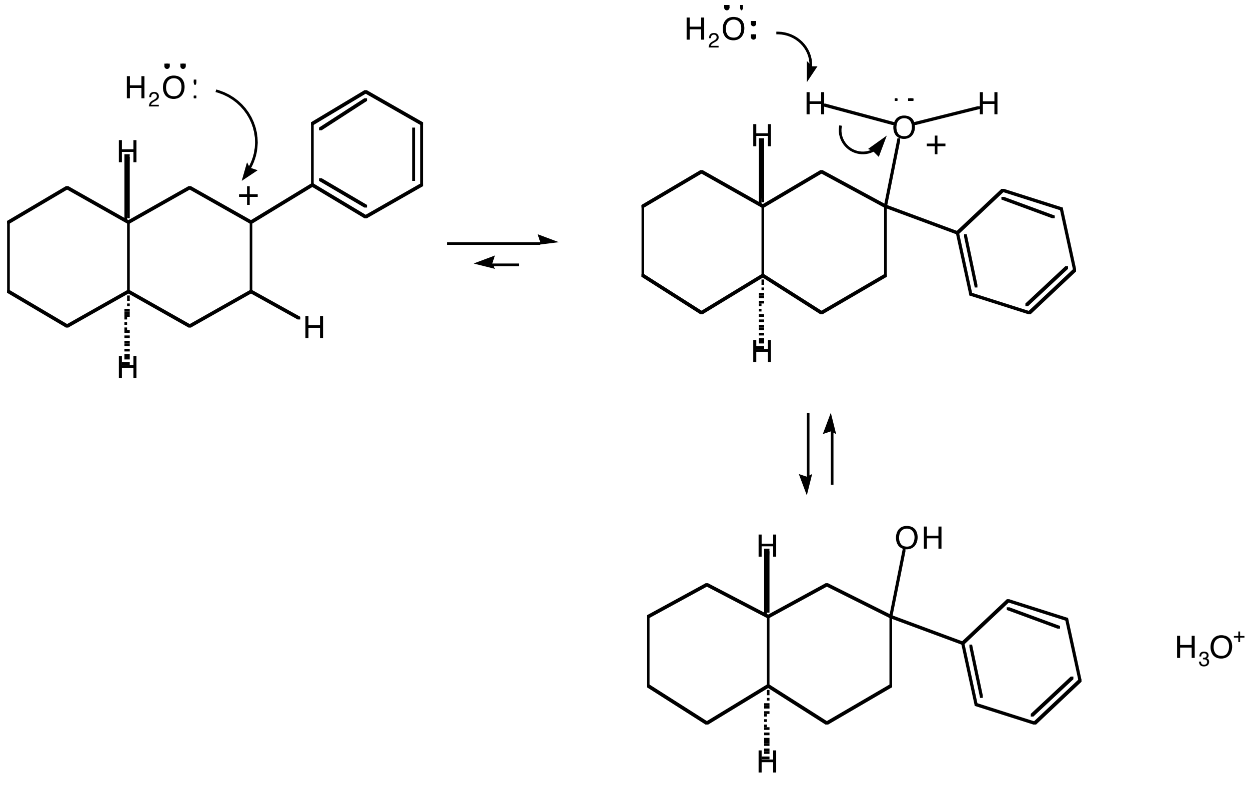
Answers to Problem 41, Chemistry 301X -2006

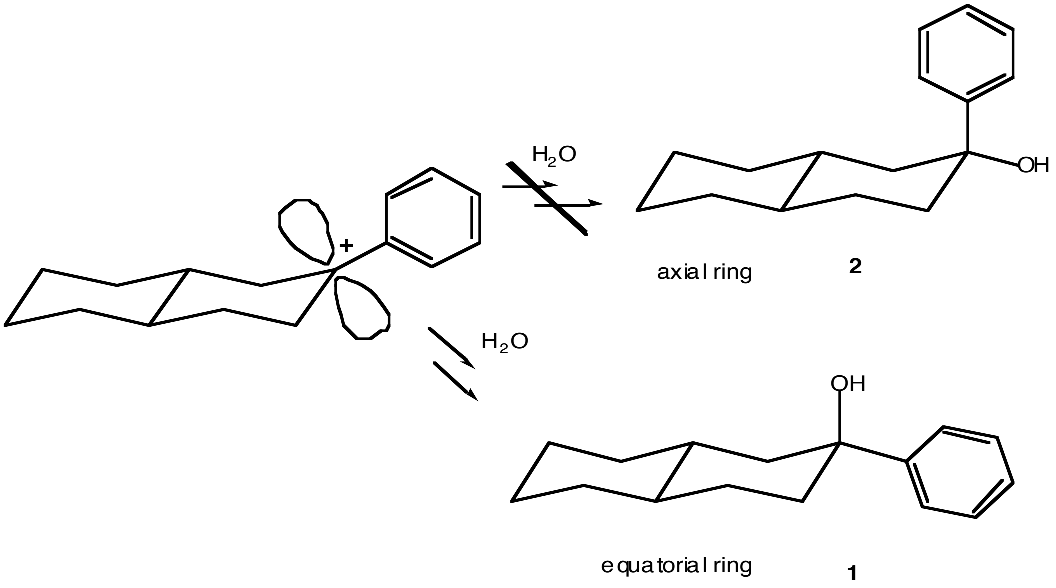
The first step in this reaction is protonation of the double bond to give the resonance-stabilized, tertiary carbocation, *not* the unstabilized secondary carbocation. If this statement is the least bit - even the slightest bit - inscrutable to you, there is a BIG problem.



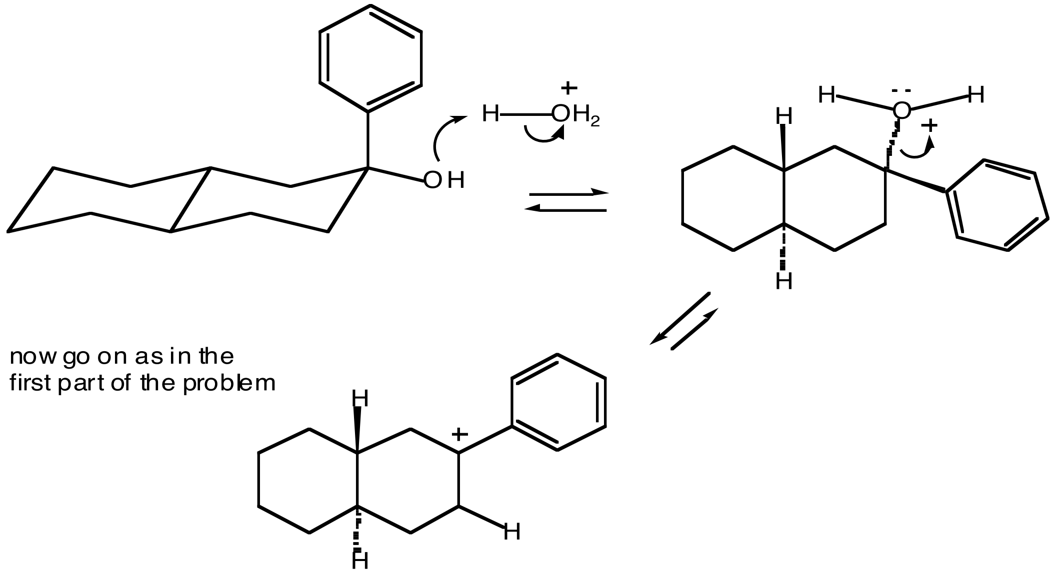
Now water adds and the resulting oxonium ion is deprotonated:



That gives you the overall structure, but not the stereochemistry. Why is the ring "down" and the OH "up"? To answer this question we need three dimensional pictures, starting with the carbocation. In the product, **1**, it is the small OH group that is axial. In the non-product, **2** it is the large ring that is axial. That's all there is to it.

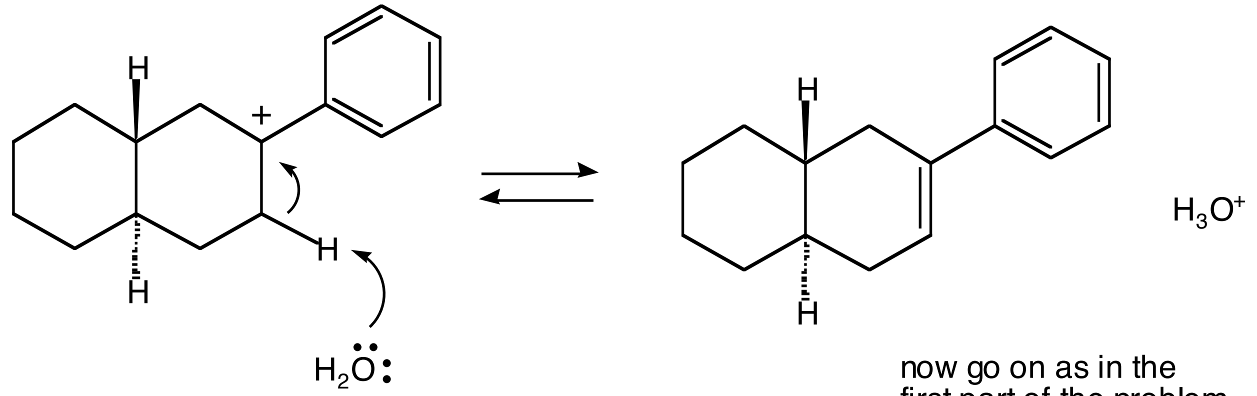


Now how to get from **2** to **1**? Most organic reactions are reversible, so one way is to protonate the OH, lose water ( the reverse of the last two steps of the forward mechanism written above, but done from **2** not **1** - important point!). Now we are at the carbocation and we simply go forward as above to **1.**



now go on as in the first part of the problem

Alternatively, we could go all the way back to starting material by deprotonating the carbocation and starting all over again as in the original problem. You'll see both these reactions in Chapter 7.



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