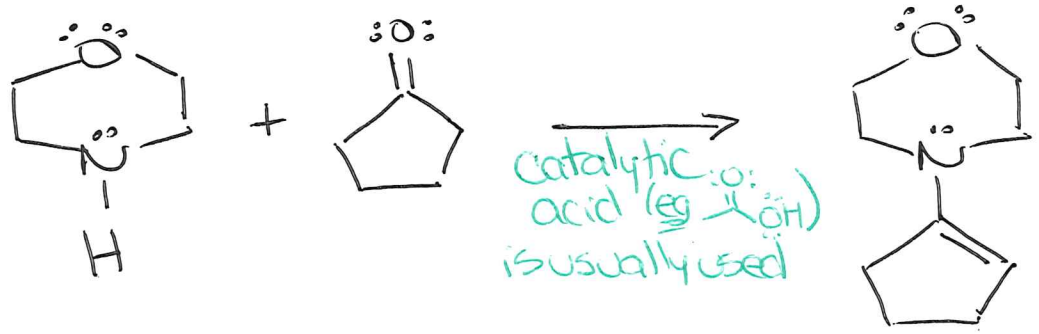
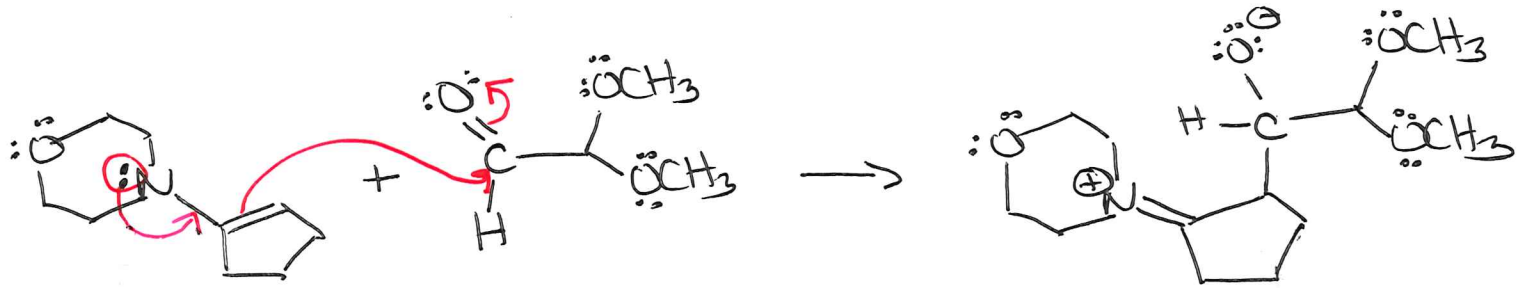
1 a)

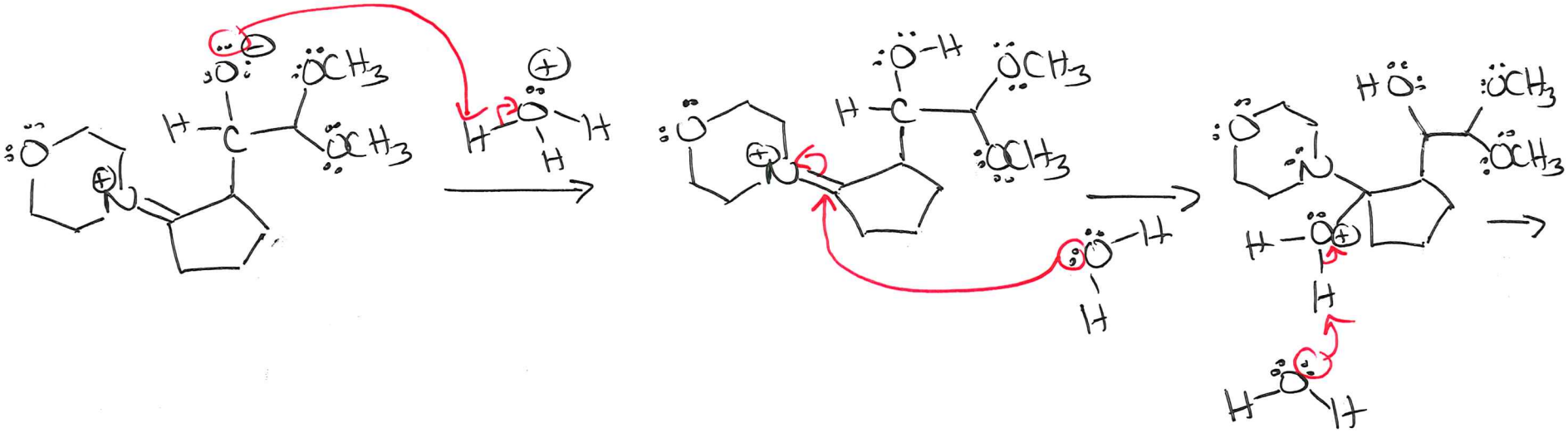


mechanism was not asked for so, while I made comments on mechanisms, I did not deduct marks for errors in them.

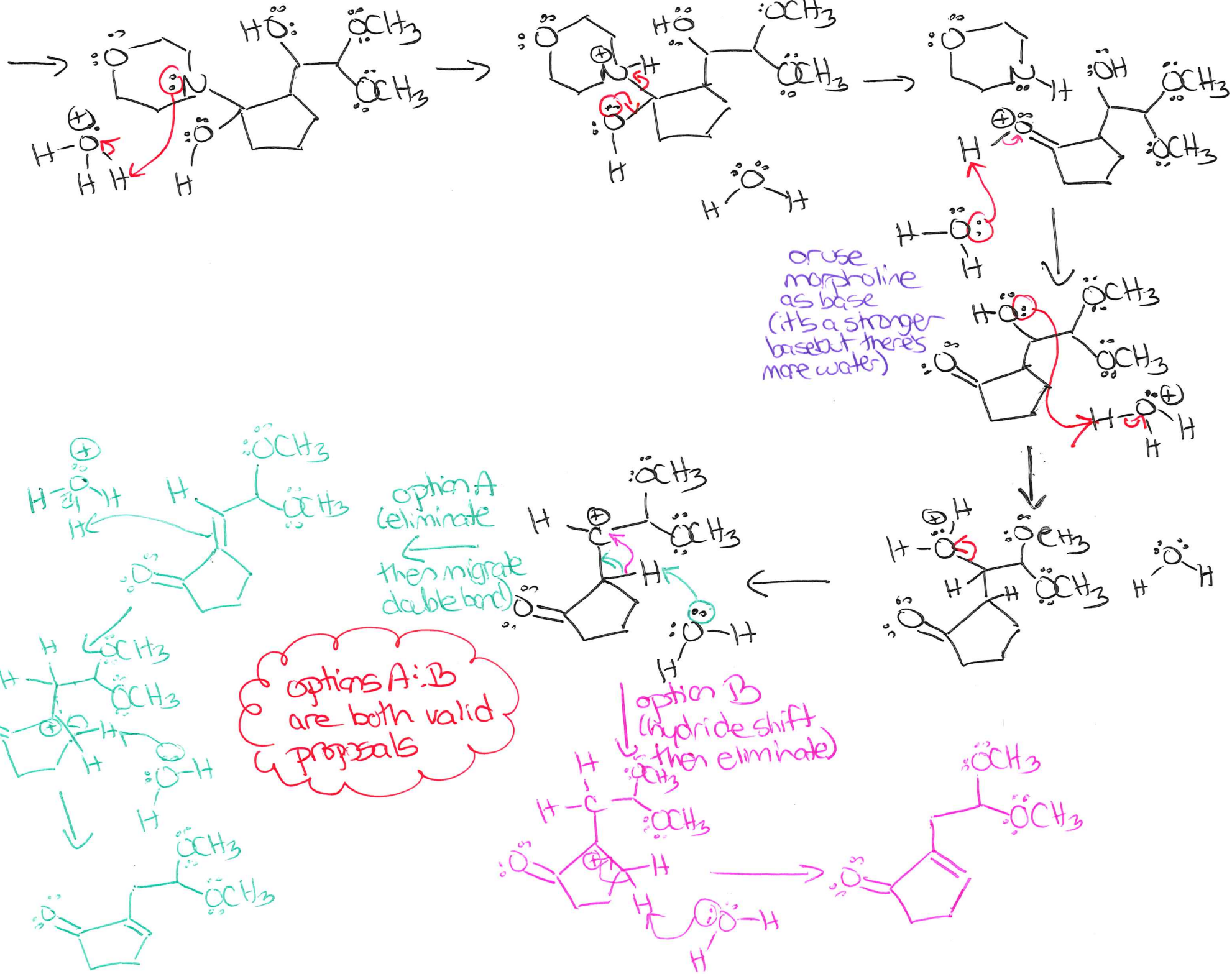
b)



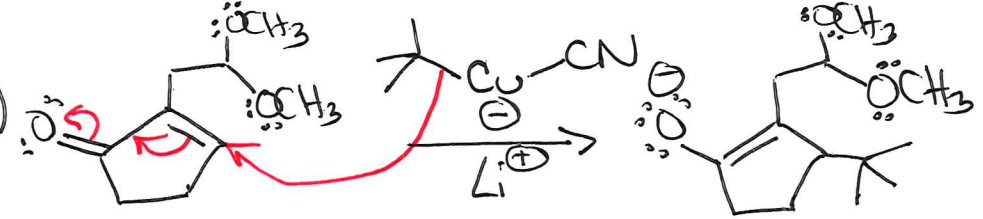
c)



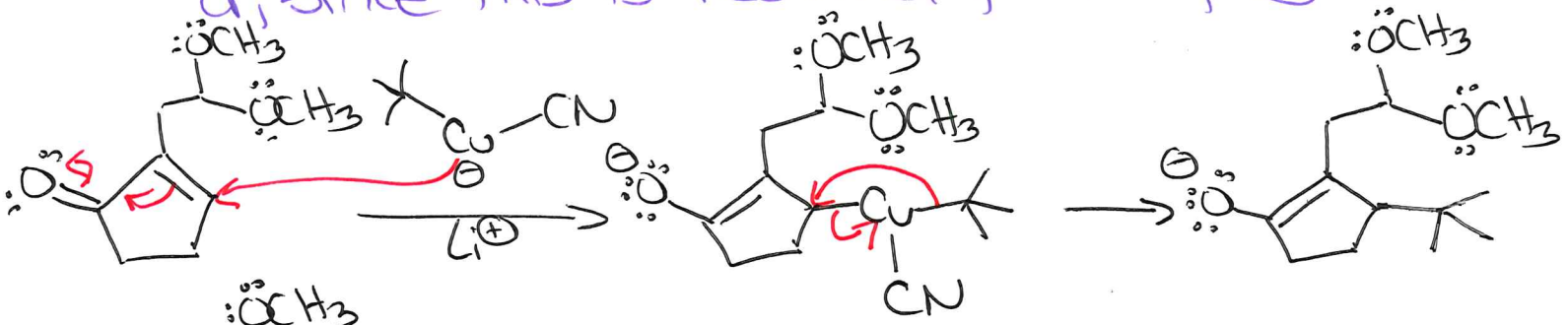
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or use morpholine as base (it's a stronger base but there's more water)
option A (eliminate then migrate double bond)
options A : B are both valid proposals
option B (hydride shift then eliminate)

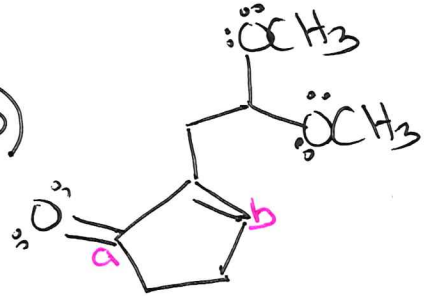
2 a)



or, since this is technically a coupling reaction



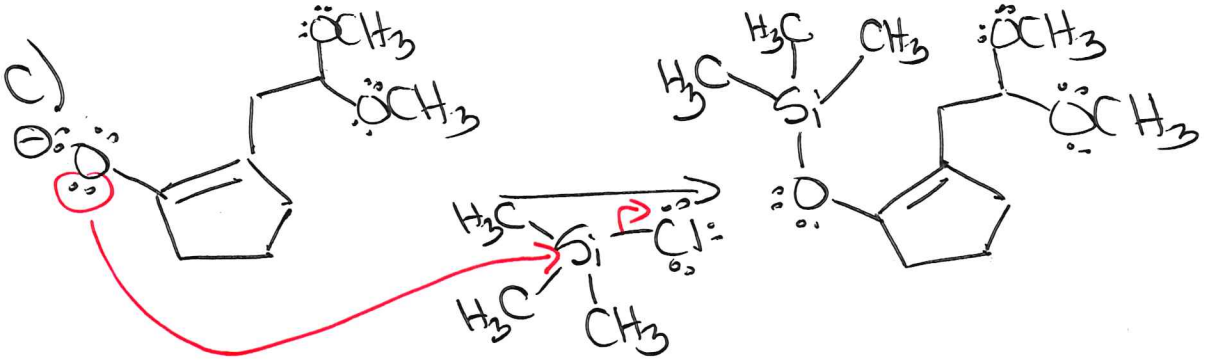
b)



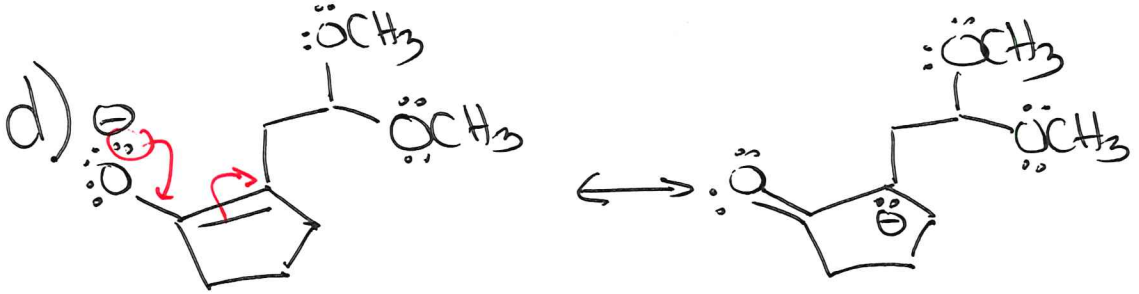
The two electrophilic sites have been labeled 'a' and 'b'. Because it is immediately attached to an oxygen atom, carbon 'a' bears a stronger partial positive than 'b' and is therefore a harder electrophilic site.

Organocuprates are soft nucleophiles so they tend to react at softer electrophilic sites (in this case, 'b').

2 c)



d)

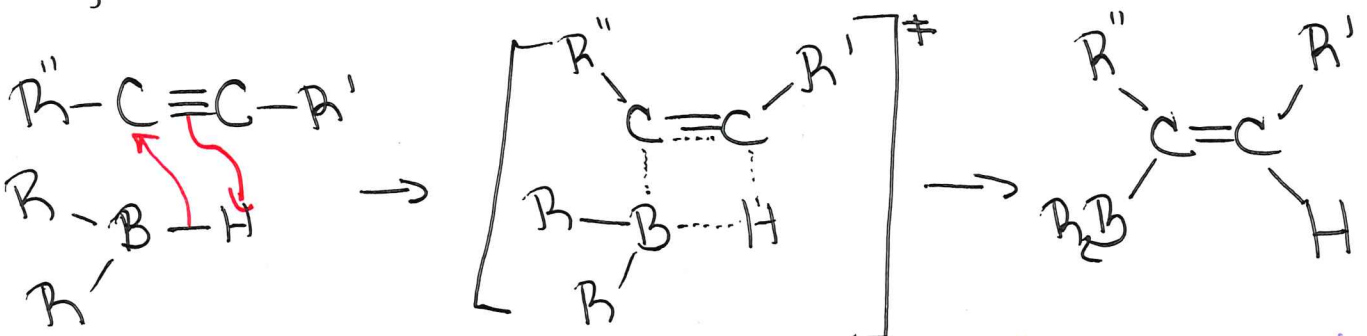


The two atoms sharing the negative charge are the two nucleophilic sites. (Some students labeled $O^{\ominus}$ and the C=C pi bond. That was fine.)

Since O is more electronegative, it bears most of the negative charge, making it a harder nucleophilic site than the C.

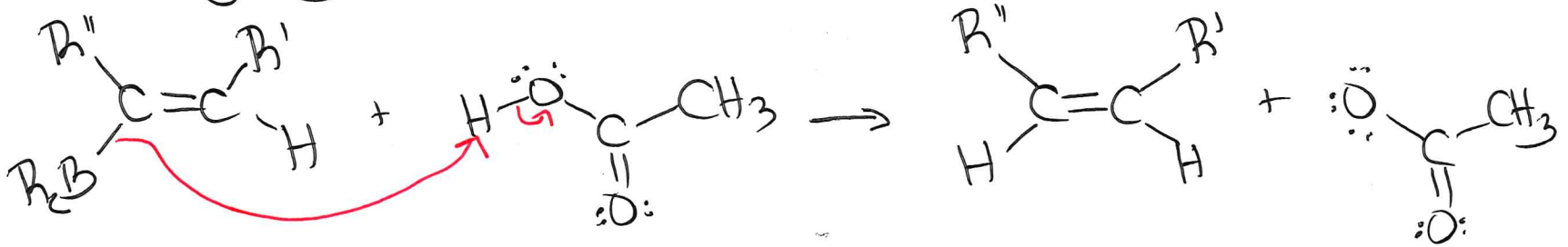
Si is less electronegative than C (and a lot less electronegative than Cl) so the Si in $(CH_3)_3SiCl$ bears a significant partial positive charge and acts as a hard electrophile, reacting with the harder nucleophilic site.

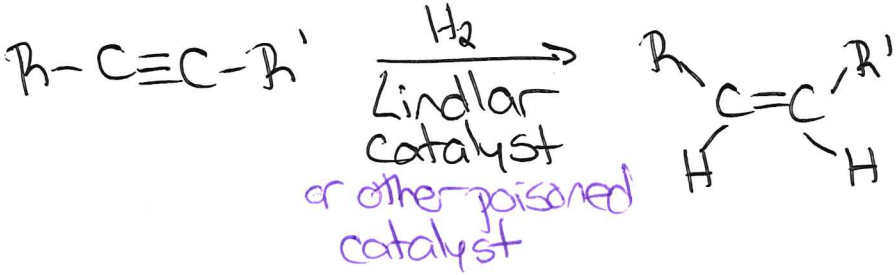
3. a) Hydroboration reactions are concerted, going through a 4-atom-ring transition state. As such, they are stereospecific for syn addition:



I had a few students ask me about the regioselectivity of this reaction. Since both R' and R'' are pretty big, there probably isn't much regioselectivity - but it doesn't matter because R_2B gets replaced by H anyway.

b) Acetic acid is added before the peroxide workup. B is less electronegative than C, so C attached to B bear a partial negative charge and are therefore somewhat basic. As such, the C attached to B deprotonates the acetic acid, giving a cis alkene:



3. c) 

d) This mechanism is very similar to hydrolysis of an acetal. Try not to be intimidated by all the rings!

