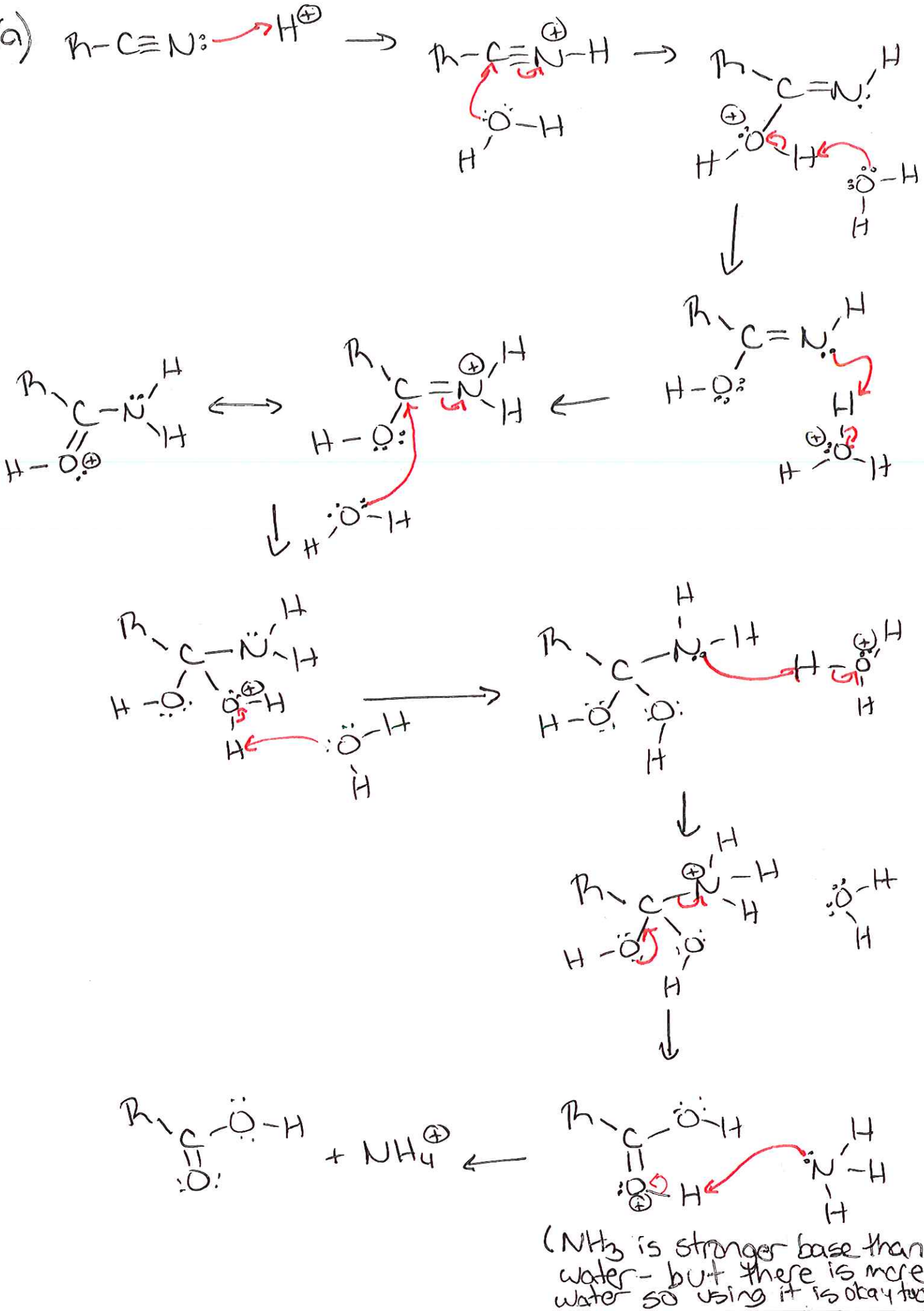
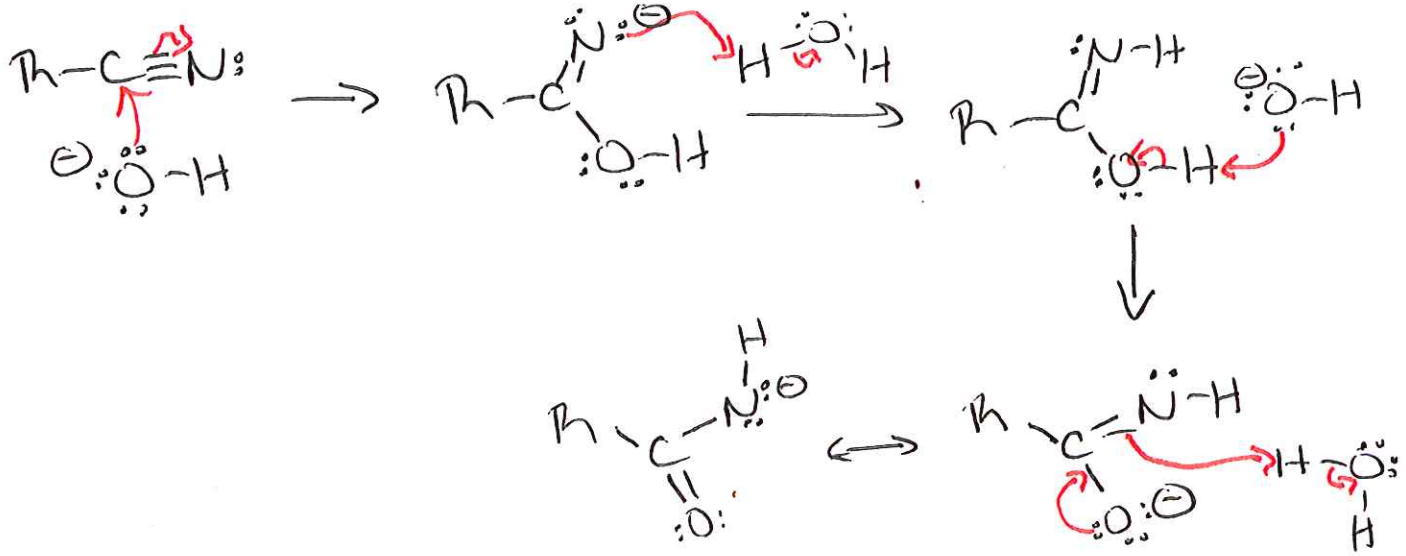
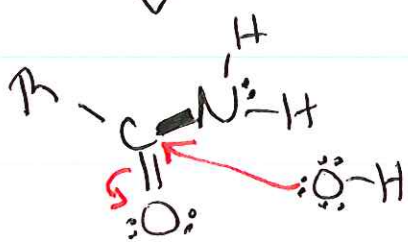
1(a)

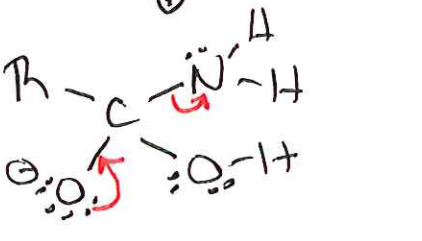


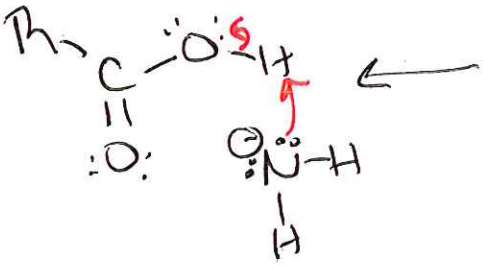
(NH3 is stronger base than water - but there is more water so using it is okay too)

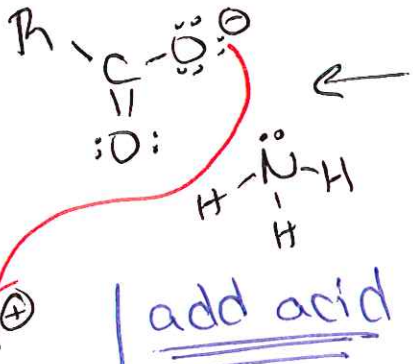
1(b)



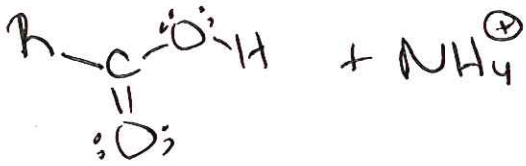








add acid



1(c) Any molecule which you would reasonably expect to undergo a side reaction with strong base.

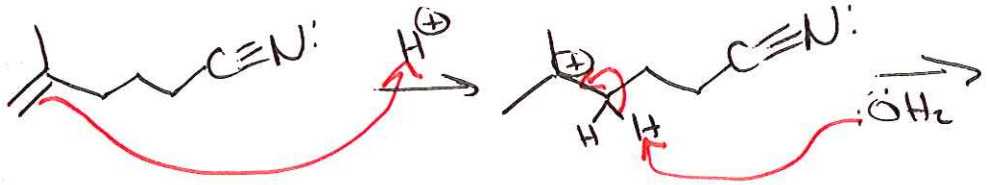
eg 

runs the risk of an E2 elimination if heated with base (giving )

1 (d) Any molecule which you would reasonably expect to undergo a side reaction with strong acid.

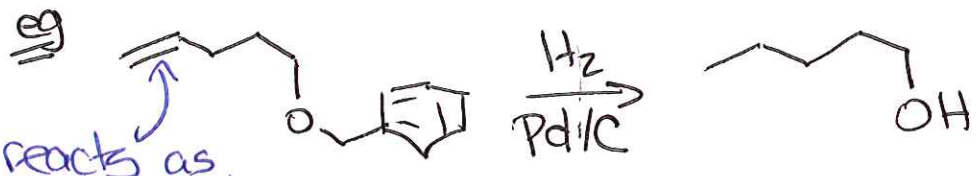
eg 

will almost certainly have its double bond protonated, giving a 3° carbocation that will form a different alkene upon deprotonation:

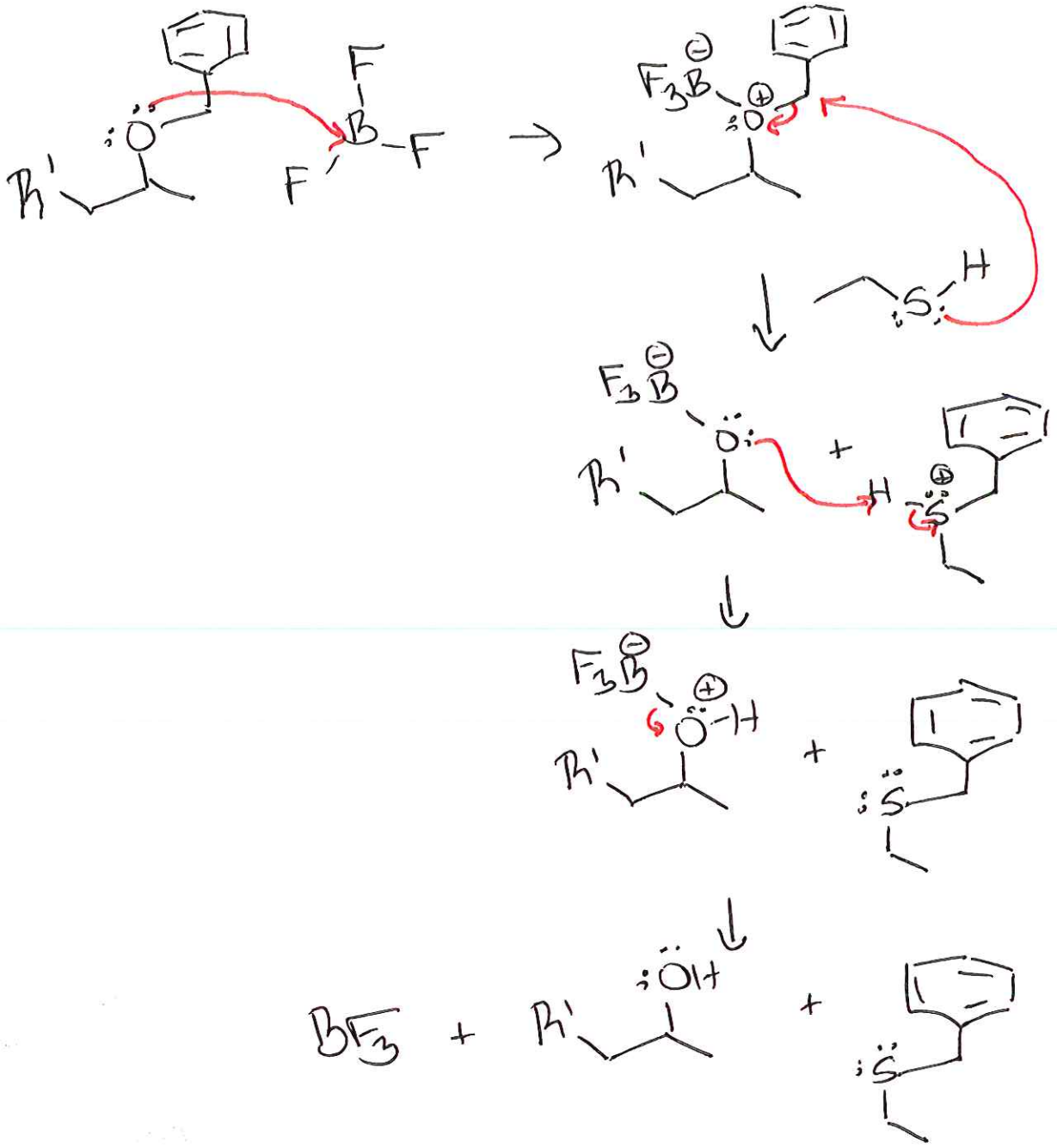


more substituted alkene ∴ more stable

2(a) Hydrogenation of the alkene

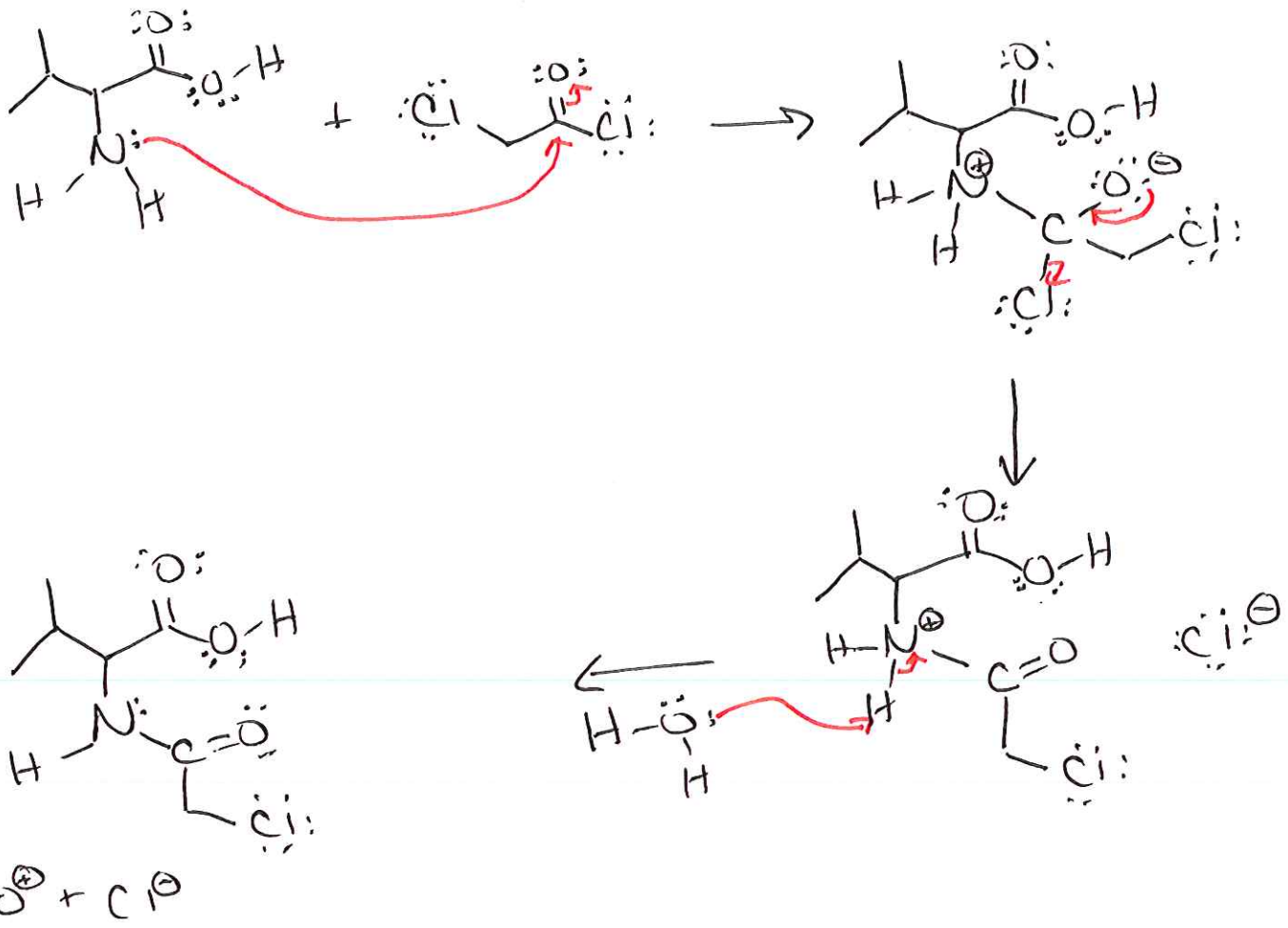
eg 

2(b)



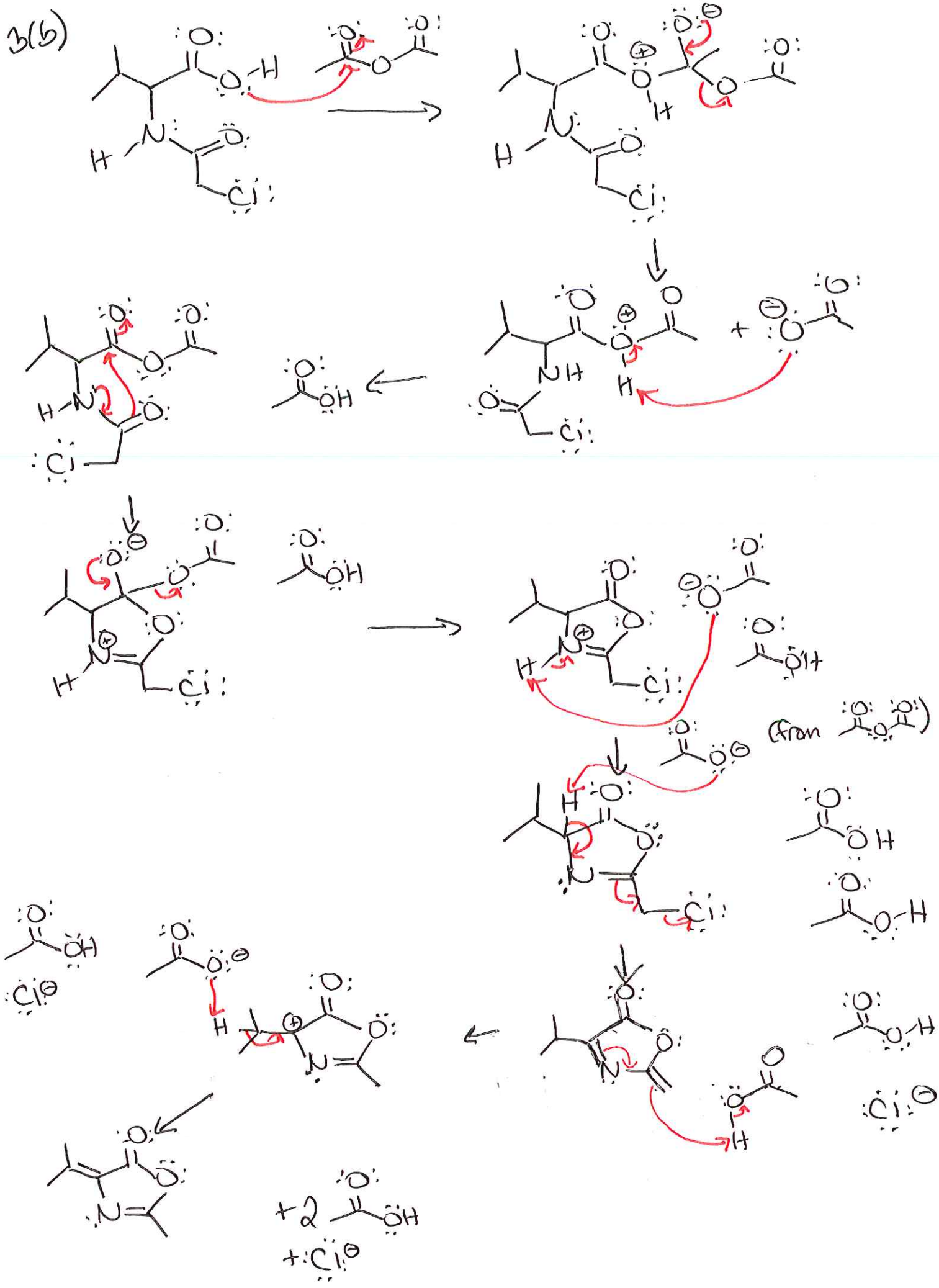
2(c) CH_3CH_2SH is a softer Lewis base than the ether (because the S is larger and less electronegative than the O). Therefore, the BF_3 – a relatively hard Lewis acid due to the small size and significant $\delta+$ of the B atom – will preferentially react with the harder Lewis base (the ether).

3(a)

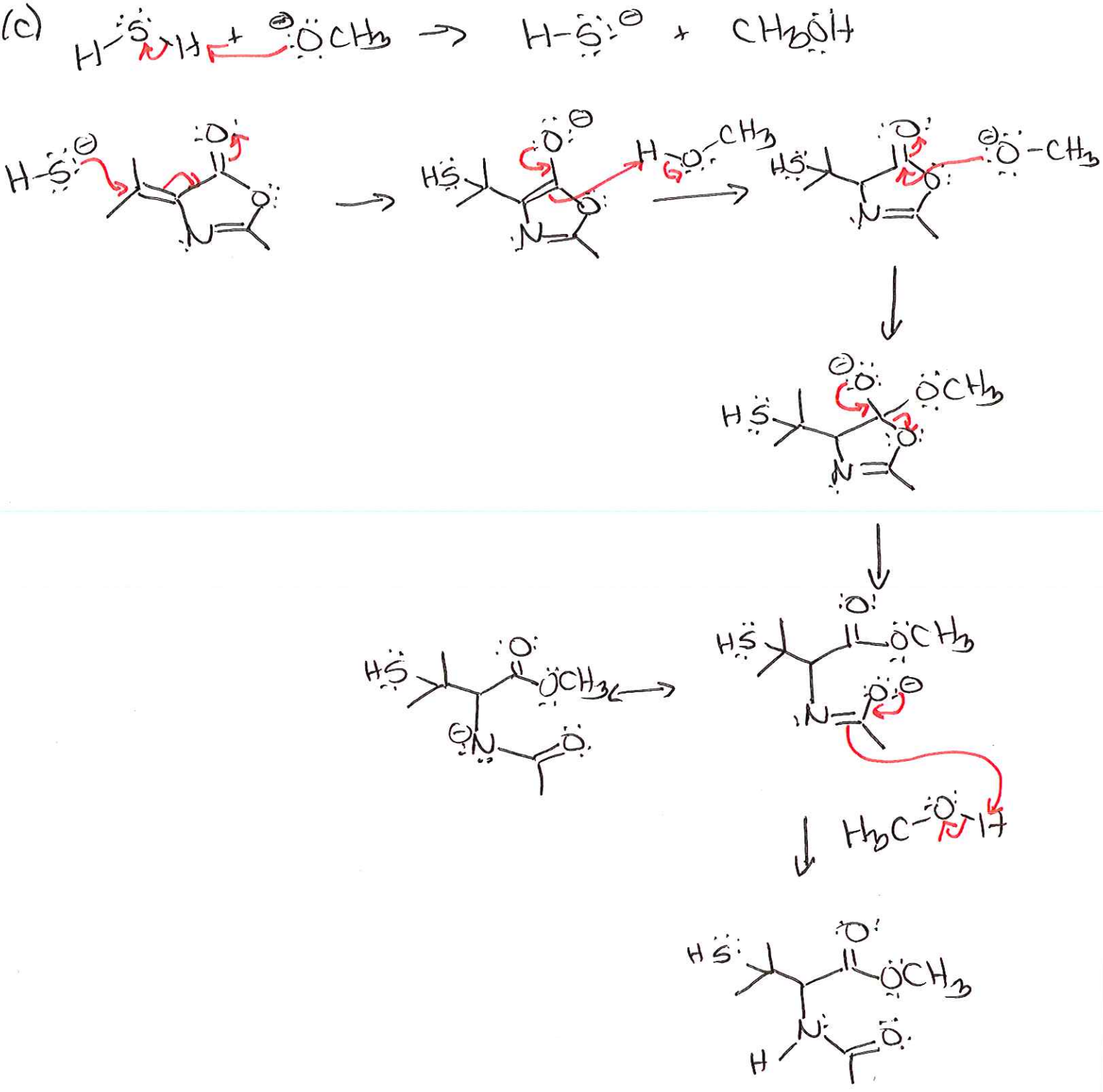


+ $H_3O^{\oplus}$ + $Cl^{\ominus}$

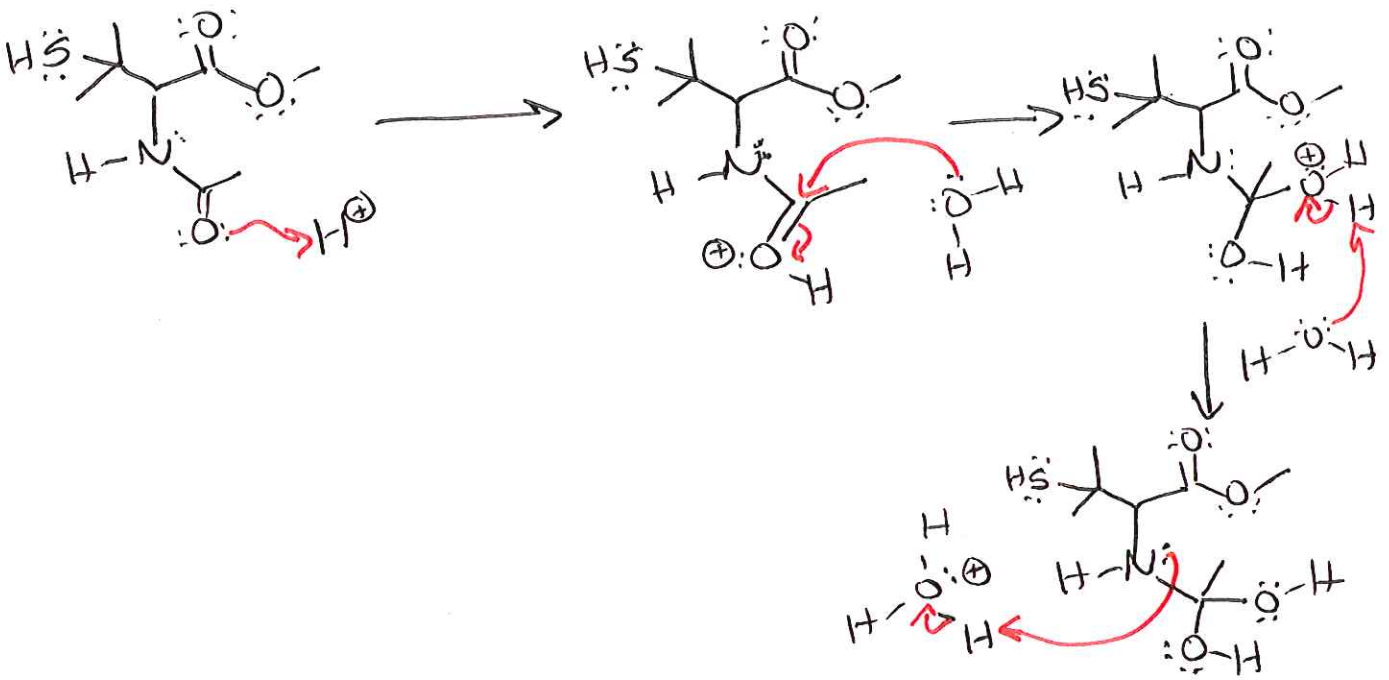
3(b)

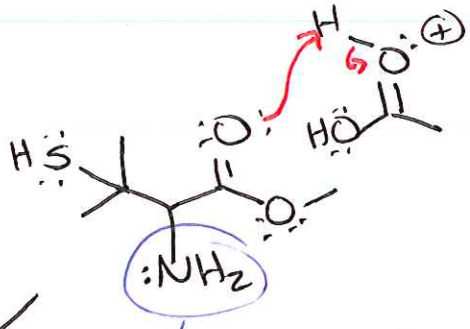


3(c)

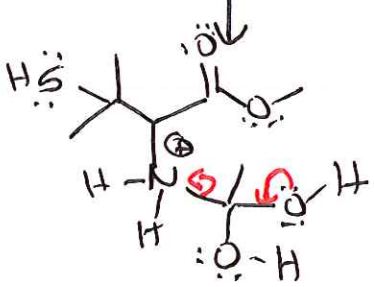


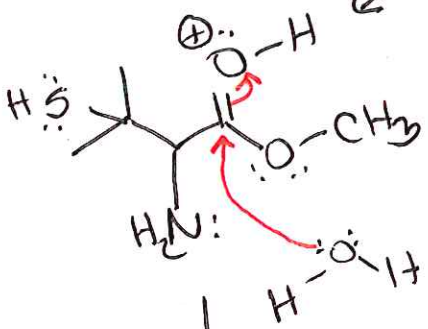
3(d)

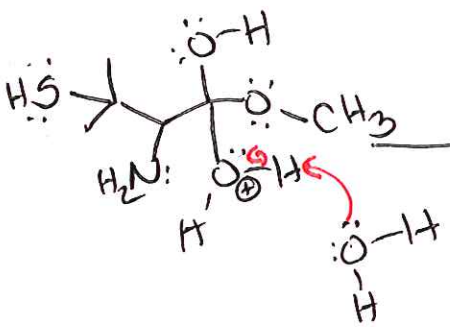


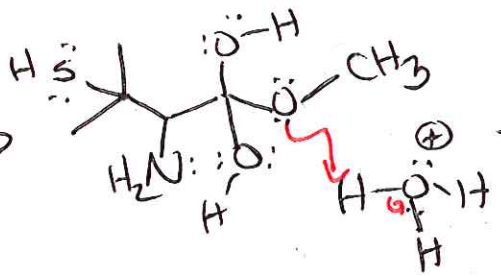


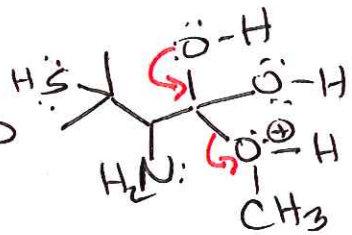
this amino group is basic and will be protonated by HCl (then deprotonated upon work-up)

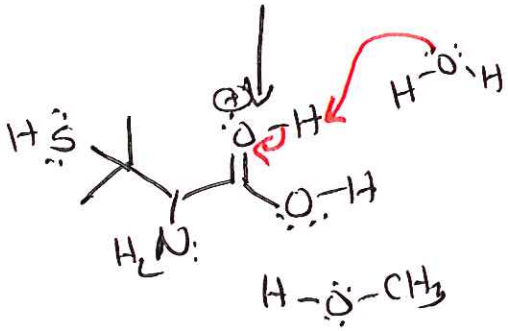












See next Page

3(d) continued...