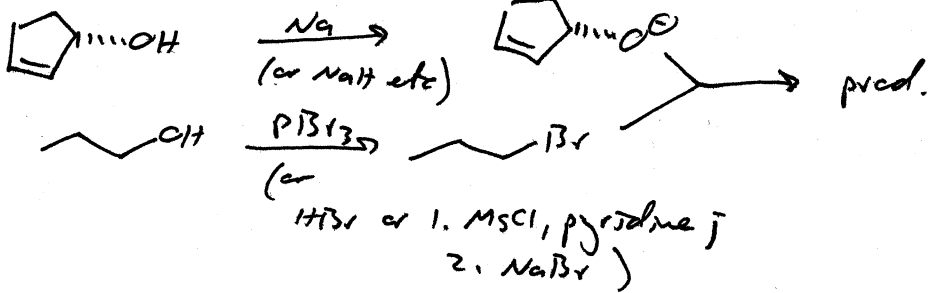


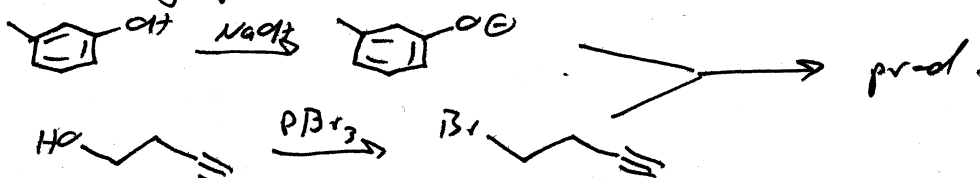
(a) Make the  $1^\circ\text{-O}$  bond via C1=CC=CC=C1[O-] + 1-bromopropane starting with 2 alcohols...



(b) same idea - you'll need to deprotonate (S)-2-butanol, then use this alkoxide to displace a halogen (or other l.g.) from the  $1^\circ$  of the other component - made, e.g., by (R)-3-methyl-1-pentanol +  $\text{PBr}_3$

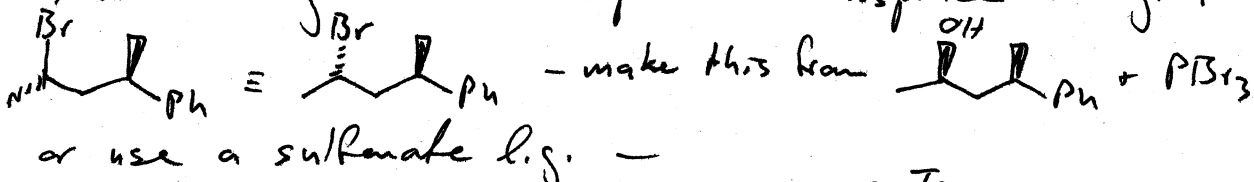
(c) deprotonate CC(O)C=C, then alkoxide +  $\text{CO}_2\text{-I}$  (from  $\text{CO}_2\text{OH}$  +  $\text{PI}_3$ )

(d) The only option here is to make the  $1^\circ\text{-O}$  bond, so

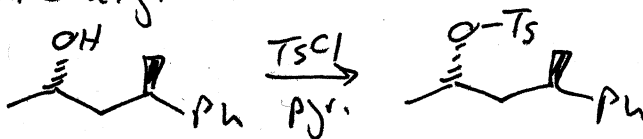


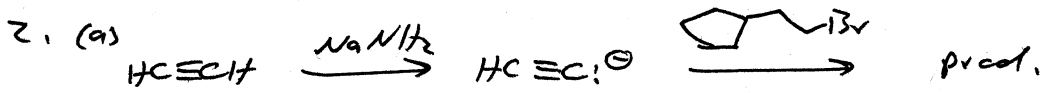
(e) deprotonate acrylic acid with  $\text{NaHCO}_3 \rightarrow \text{CH}_2=\text{CHCOO}^-$ , then use this nucleophile to displace the l.g. from the benzylic position of C1=CC=CC=C1Br (from alcohol +  $\text{PBr}_3$  or  $\text{HBr}$ )

(f) 1-methylcyclobutane carboxylic acid +  $\text{NaHCO}_3$ , then this weakly basic nucleophile can displace a l.g. from:



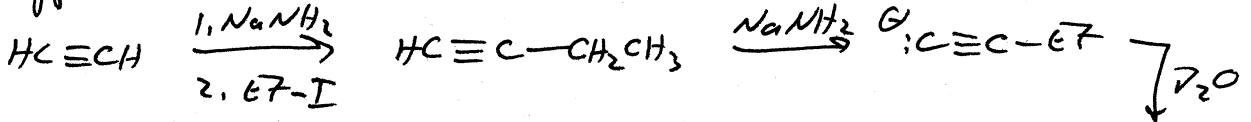
or use a sulfonate l.g. -



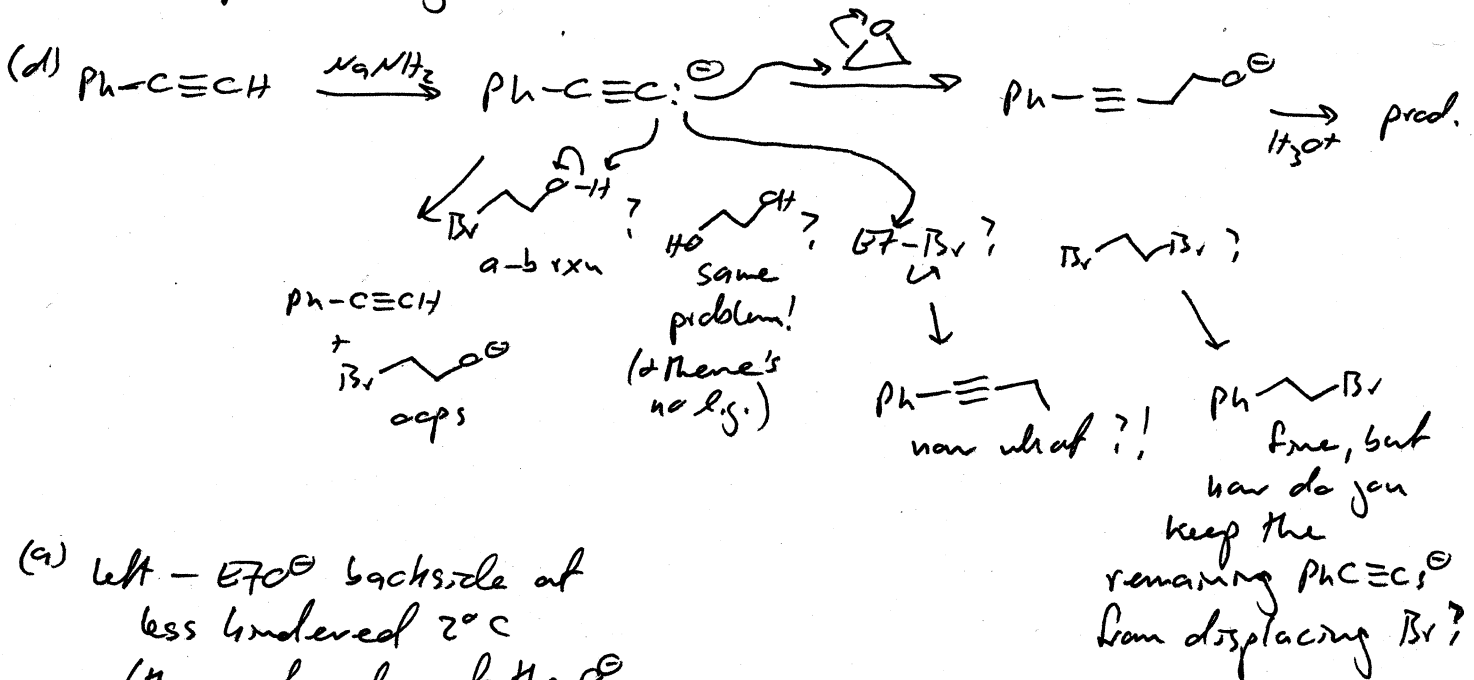


(b) as above - deprotonate first, then  $\text{S}_{\text{N}}2$  to make  $\text{C}\equiv\text{C}-\text{Ph}$  or  $\text{C}\equiv\text{C}-\text{Ph}$  as an intermediate, then deprotonate again +  $\text{S}_{\text{N}}2$  on the other side

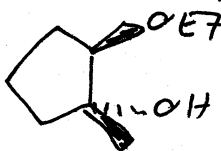
(c) best approach here is to add the ethyl first, then the D...



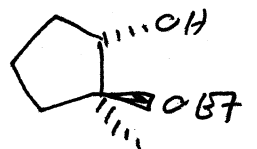
why not D first, then Et?? You can make  $\text{HC}\equiv\text{CD}$ , but then how do you pull off just the H + not the D in the next step? If you could make  $\text{DC}\equiv\text{CD}$ , that would work, but how do you make that?  $\text{NaNH}_2$  can't deprotonate both ends at the same time, so you'd make  $\text{HC}\equiv\text{CD}$  first + have the same problem again!



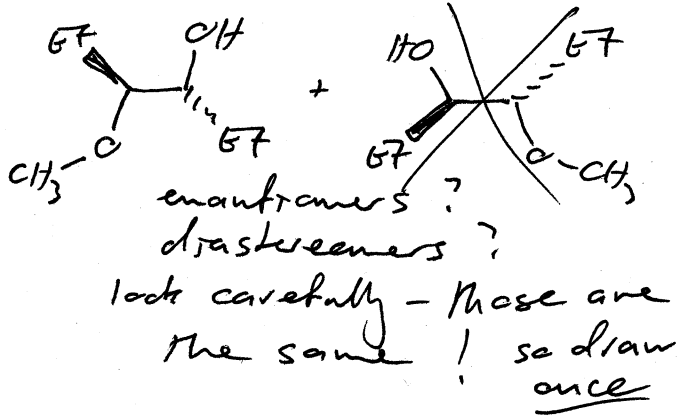
3. (a) left -  $\text{EtO}^\ominus$  backside at less hindered  $2^\circ\text{C}$  (then protonation of the  $\text{O}^\ominus$  by solvent)



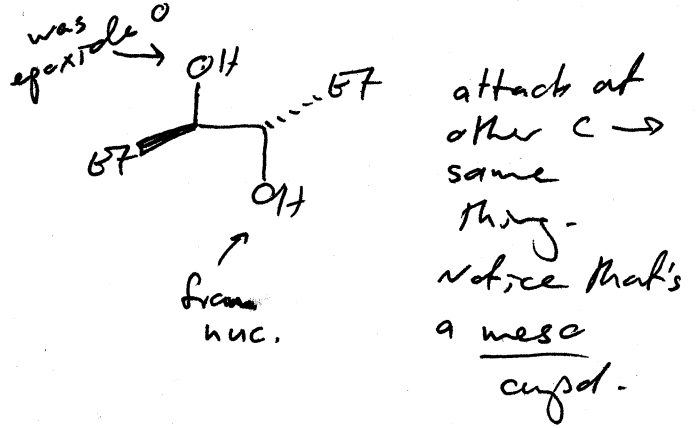
right - pref. of epoxide O, then attack by  $\text{EtOH}$  backside on C with more pos charge ( $3^\circ$ ) (then loss of H+ to solvent)



(b) left prot, then med either side

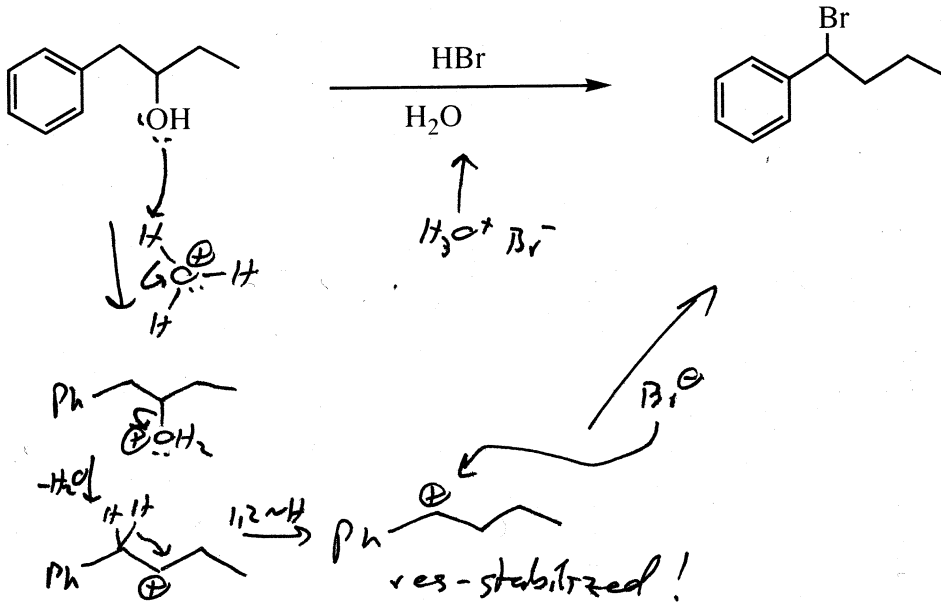


right - HO<sup>⊖</sup> ss nuc.

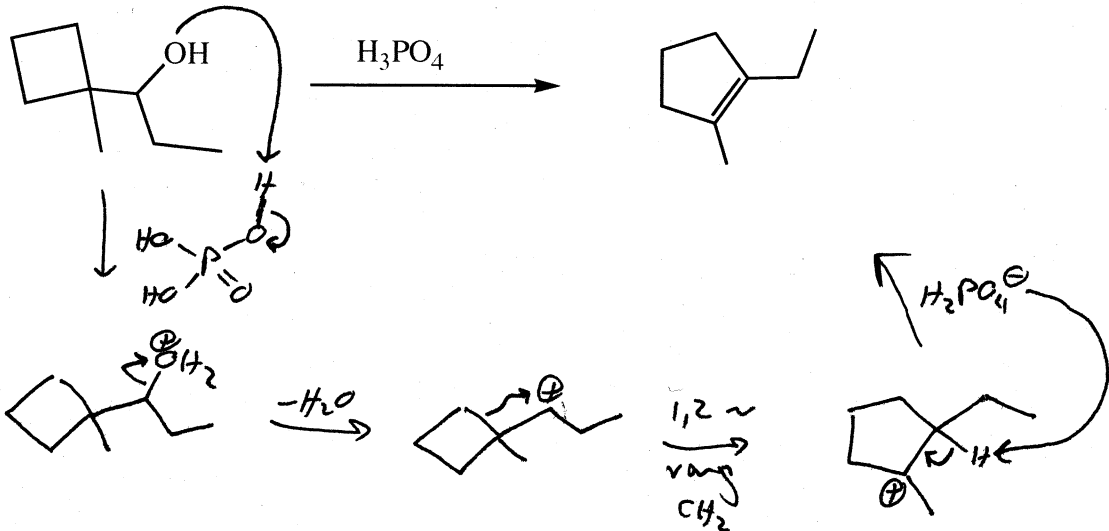


4. Write a mechanism that explains each of the following reactions. Assume that chiral compounds are racemic unless stated otherwise.

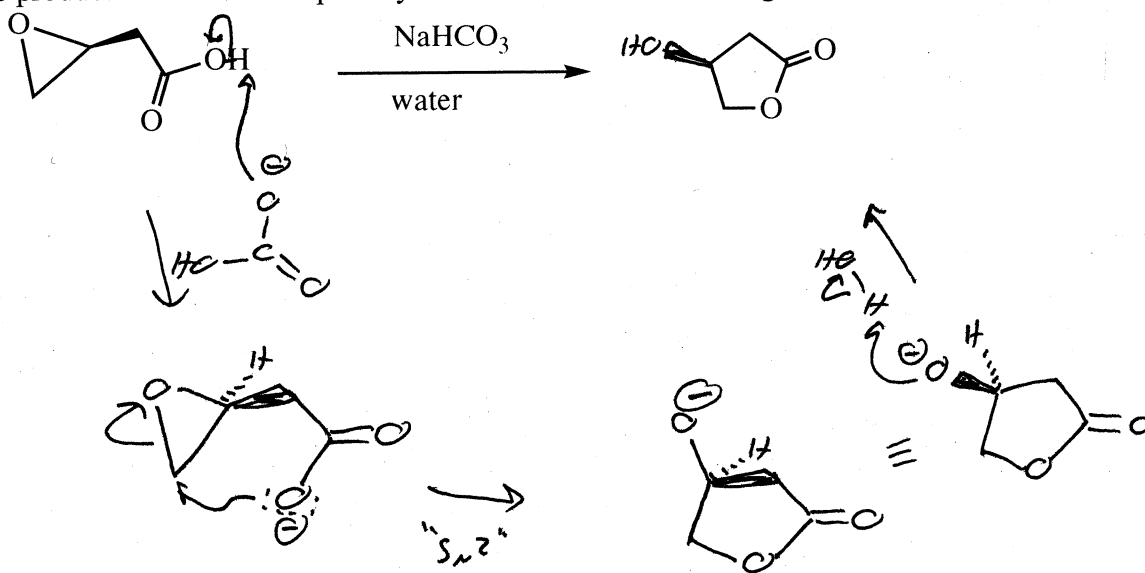
(a)



(b)



(c) The product in this case is optically active. Add a dash or wedge to show the stereochem.



(d) Same here.

