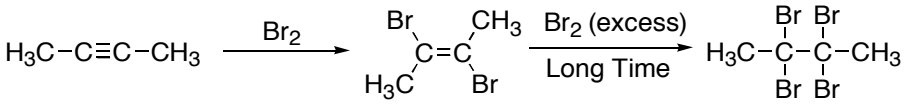
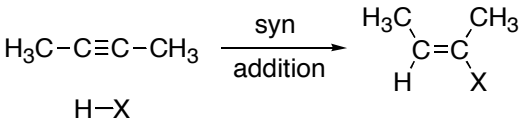
Halogenation of Alkynes

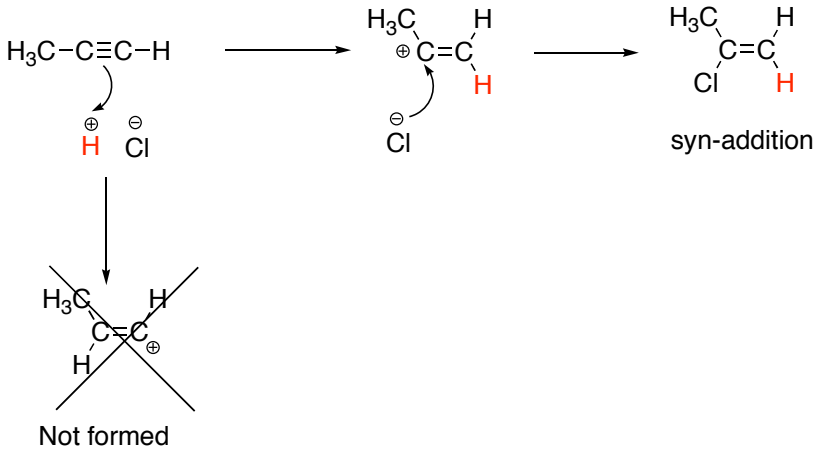
Eg.



HX Addition (syn)



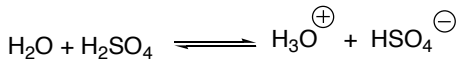
Eg. Propyne (follows markovnikov's rule)



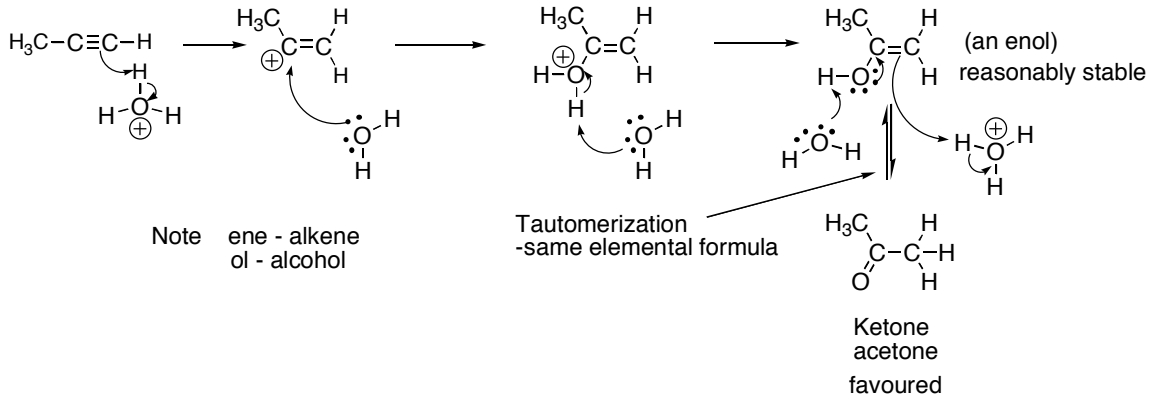
Addition Reactions of Alkynes – Addition of water (requires acid)

1.

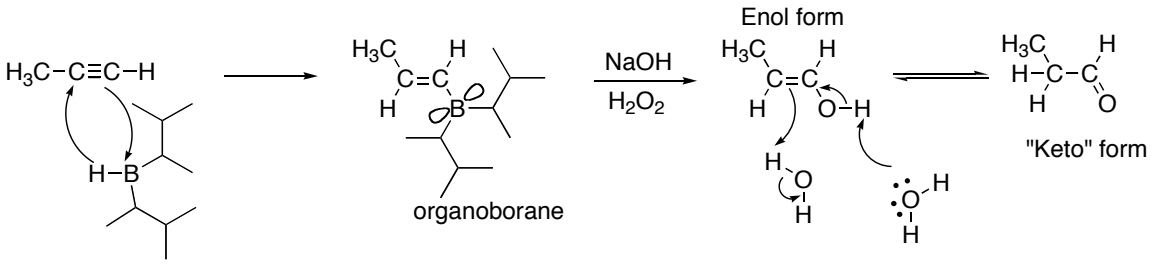
Remember



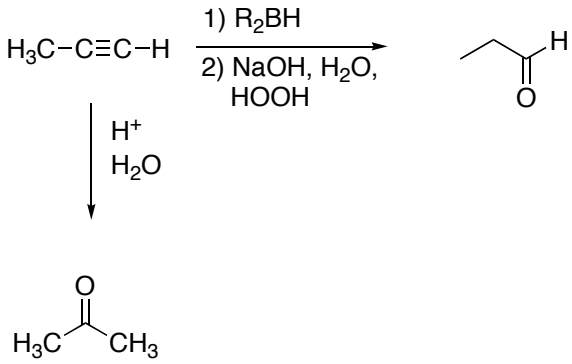
Mechanism:



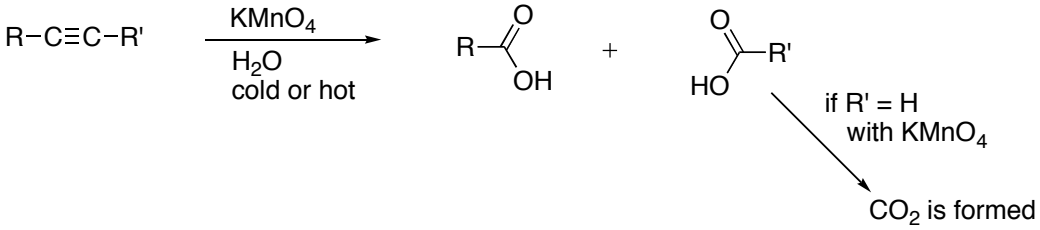
2. Anti-Markovnikov Water Addn – Hydroboration-Oxidation



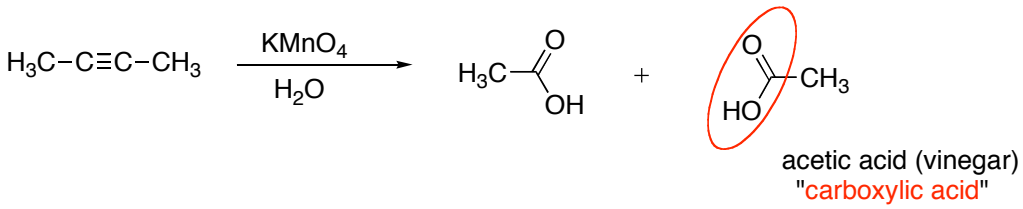
Two possibilities for addition of water



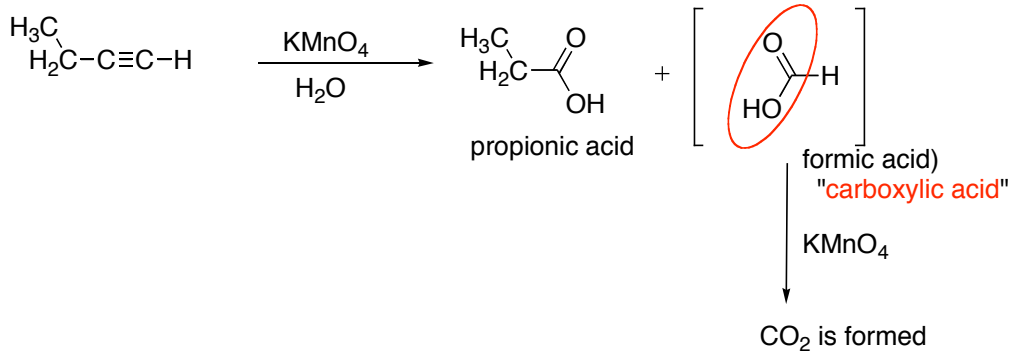
3. **Oxidation of alkynes:**



eg.
i.

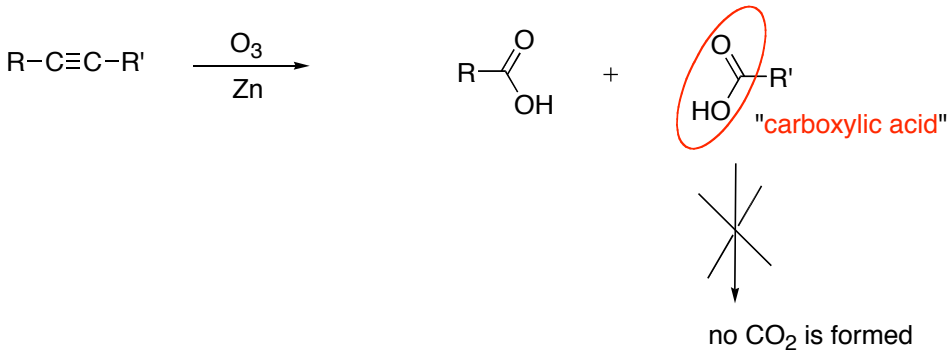


ii.

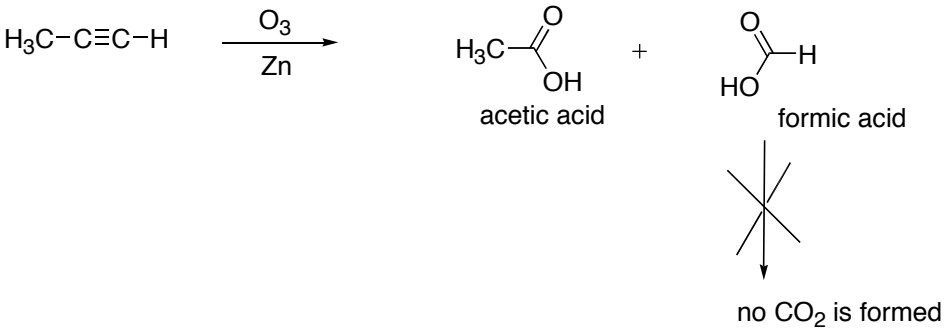


NOTE: do not need to worry about the mechanism of this reaction

4. **Ozonolysis of alkynes:**

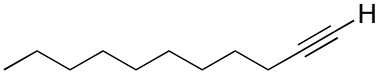


i.



5. **Reactions of terminal alkynes:** { R−C≡C−H }

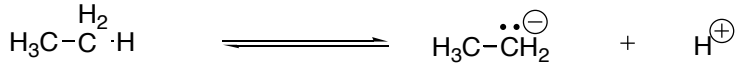
eg.



1-undecyne

- acidity of alkane / alkene / alkyne:

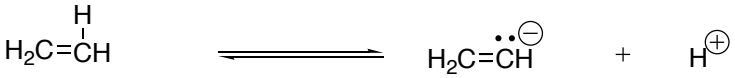
i.



$$Ka = \frac{[CH_3CH_2^-][H^+]}{[CH_3CH_3]} = 10^{-46}$$

pKa = 46

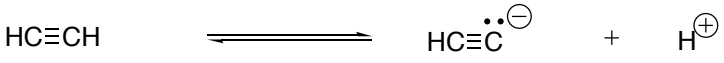
ii.



$$Ka = \frac{[CH_2CH^-][H^+]}{[CH_2CH_2]} = 10^{-36}$$

pKa = 36

iii.



$$Ka = \frac{[HC\equiv C^-][H^+]}{[HC\equiv CH]} = 10^{-26}$$

pKa = 26

- How strong a base needed?

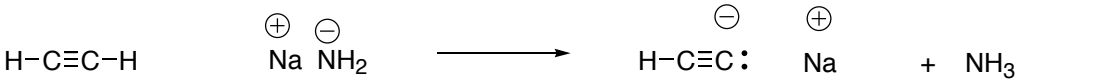
$HC\equiv C-H$

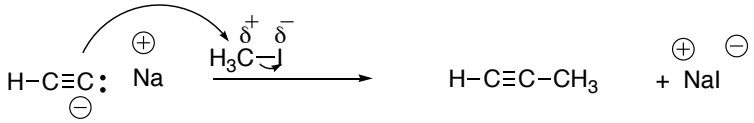
pKa = 26

acid		conjugate base
H_2N-H	pKa ~ 36	H_2N^-
H_3C-H	pKa ~ 45	H_3C^-
HO-H	pKa ~ 15.7	HO^-

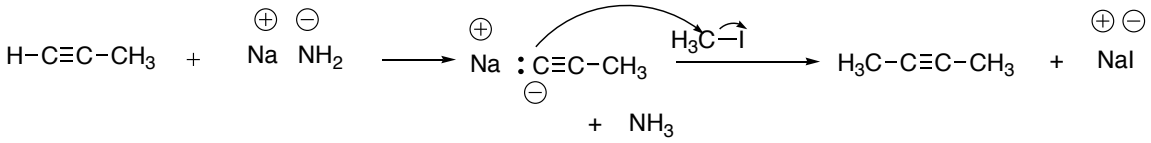
- only H_2N^- and H_3C^- are strong enough bases to deprotonate the proton of the alkyne.

Reactions of terminal acetylenes:



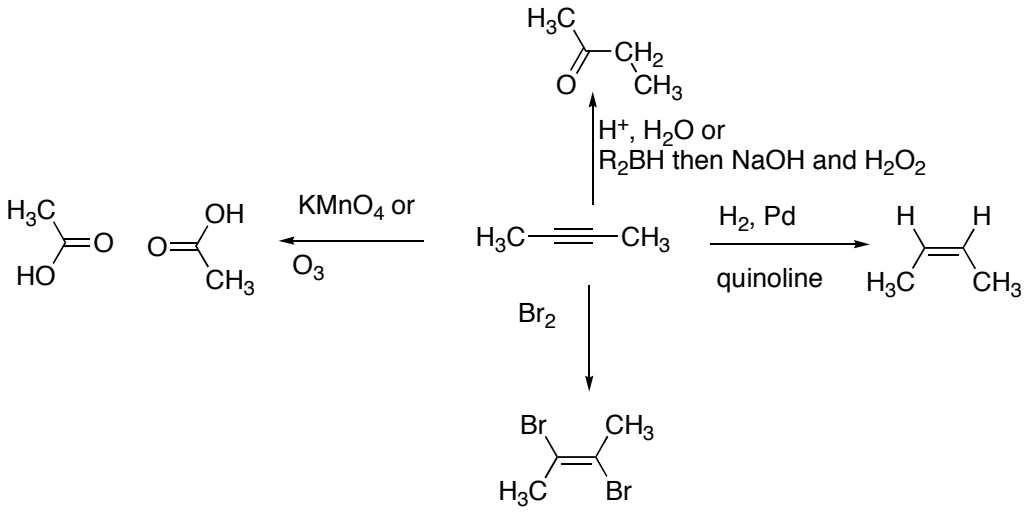


- nucleophilic substitution reaction (S_N2)

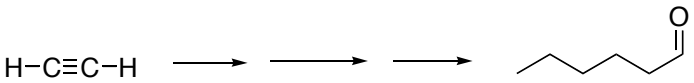


- reaction with primary halides (Cl, Br, I)

Acetylenes are key intermediates for making other types of compounds:



Problem: How to convert acetylene (ethyne) to hexanal (6 carbon aldehyde) using any other necessary reagents



Approach: