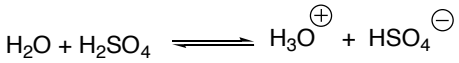
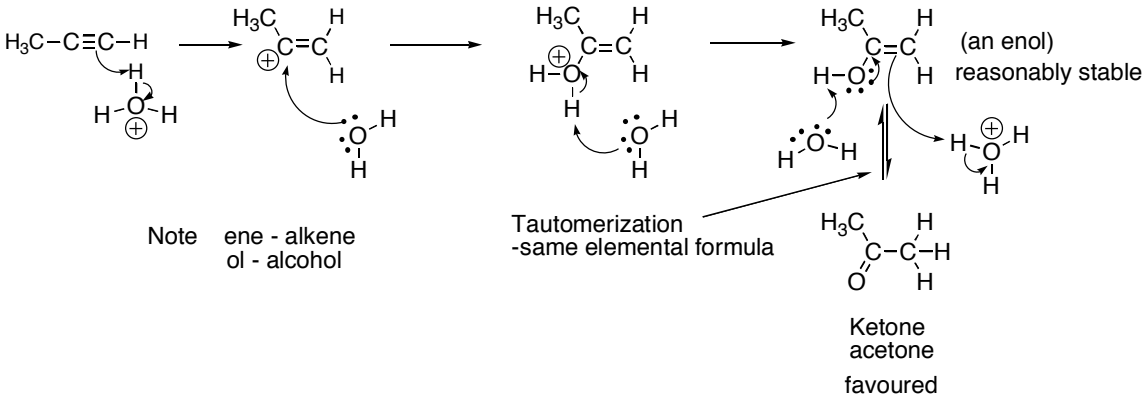
## Addition Reactions of Alkynes – Addition of water (requires acid)

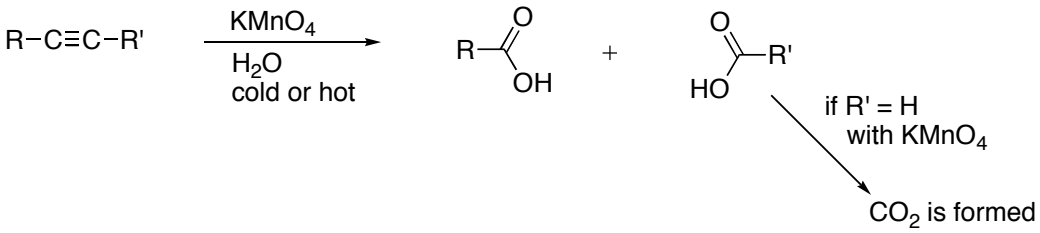
Remember




Mechanism:

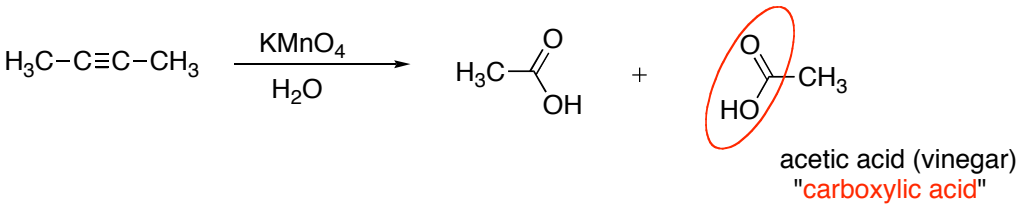



## Oxidation of alkynes:

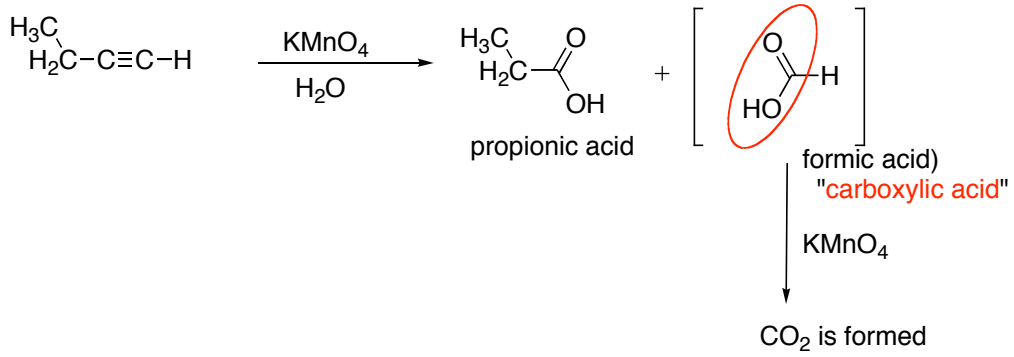



eg.

i.

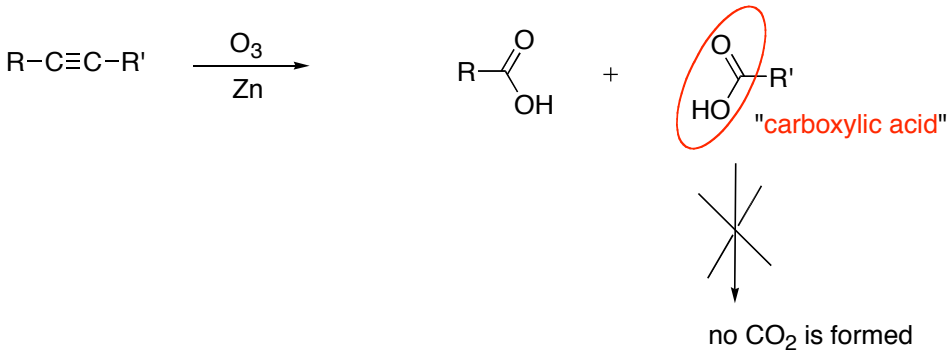


ii.

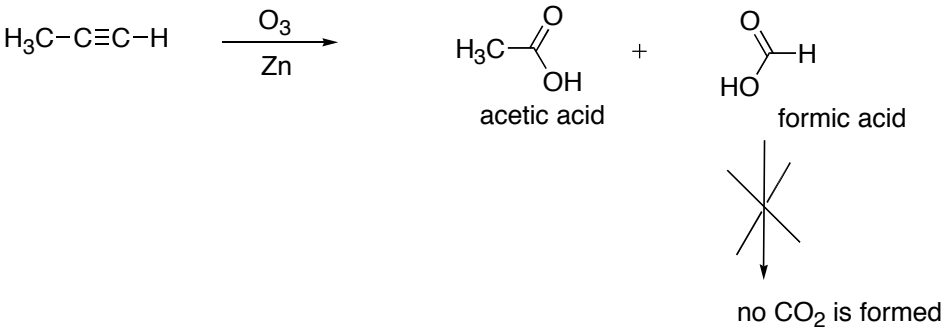



**NOTE:** do not need to worry about the mechanism of this reaction

**Ozonolysis of alkynes:**

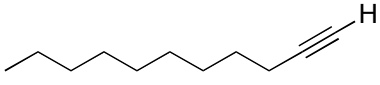



i.




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

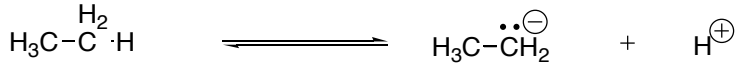
**eg.**



1-undecyne

**- acidity of alkane / alkene / alkyne:**

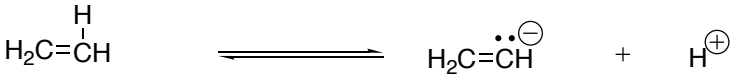
i.



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

pKa = 46

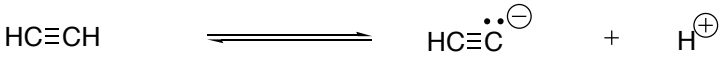
ii.



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

pKa = 36

iii.



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

pKa = 26

- How strong a base needed?

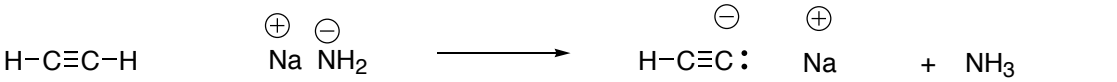
$HC\equiv C-H$

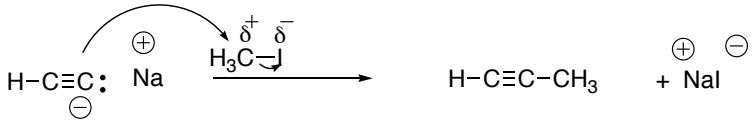
pKa = 26

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

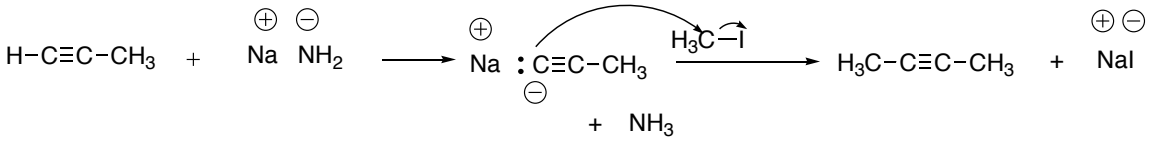
- only $H_2N^-$ and $H_3C^-$ are strong enough bases to deprotonate the proton of the alkyne.

**Reactions of terminal acetylenes:**



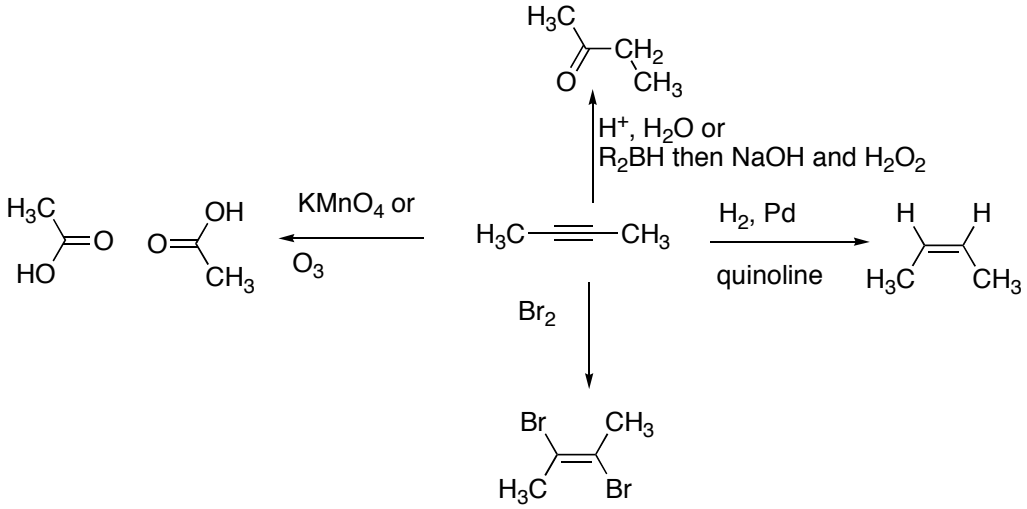

- nucleophilic substitution reaction ( $S_N2$)




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

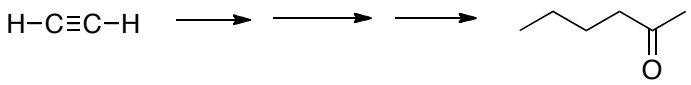
Nucleophile – seeks positive charge
Electrophile – seeks negative charge (eg. H+)

Acetylenes are key intermediates for making other types of compounds:

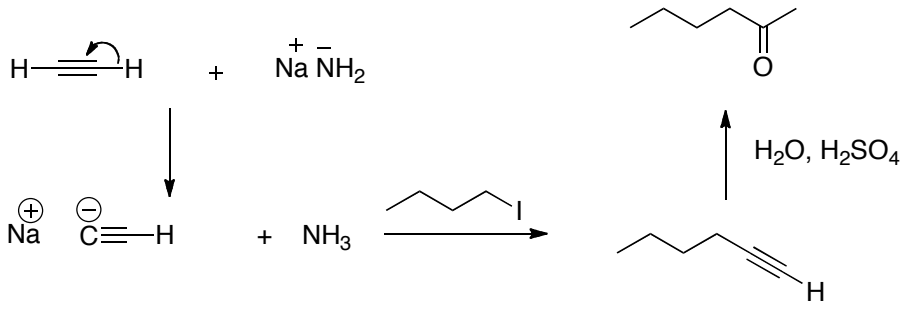



**Synthetic Problems:**

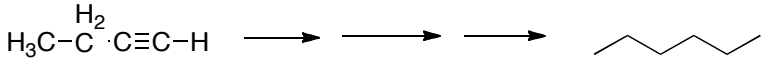
**Example 1:**



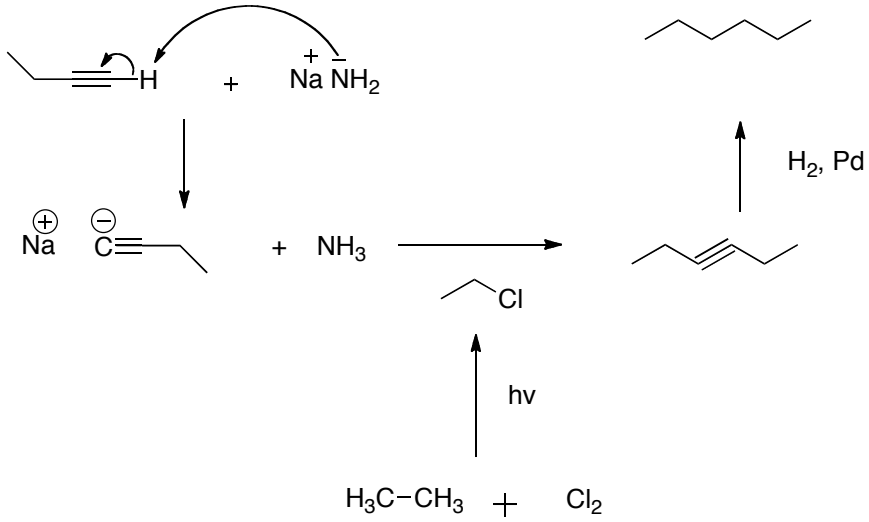

Approach:




**Example 2:**



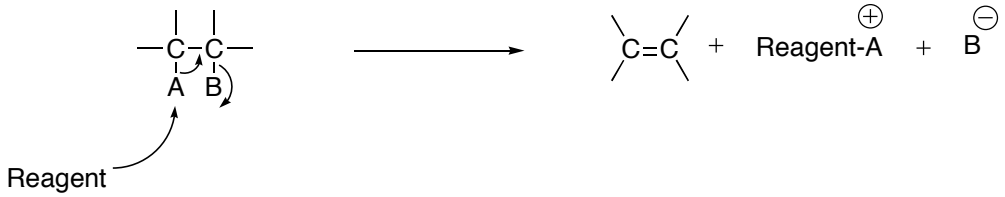

Approach:




**Elimination Reactions**

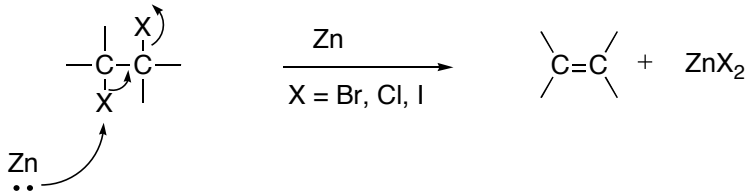
**Synthesis of Alkenes and Alkynes**

General




**Examples:**

Dehalogenation




Dehydrohalogenation : Generally requires base e.g. $R\text{-}O^{-}\ Na^{+}$