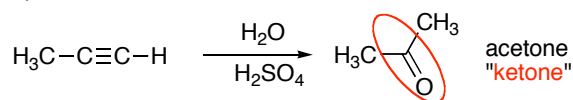
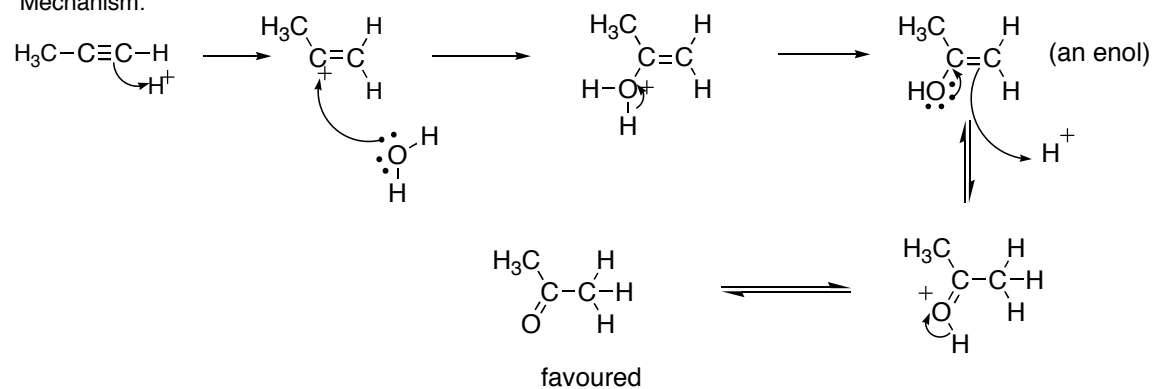


## Addition Reactions of Alkynes – Addition of water (requires acid)

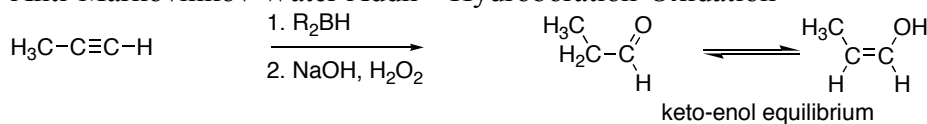
1.



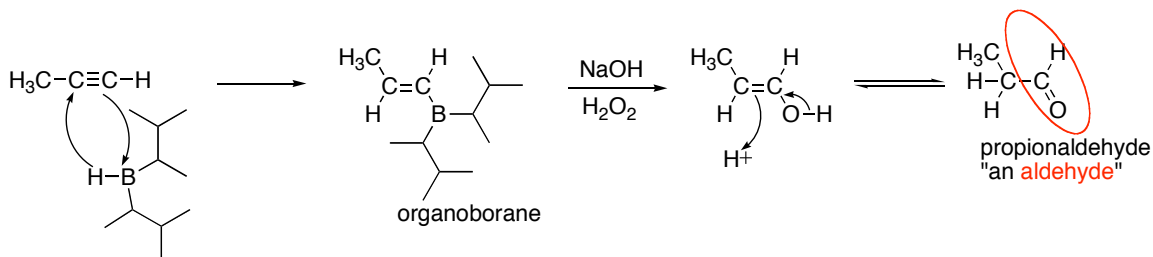
Mechanism:



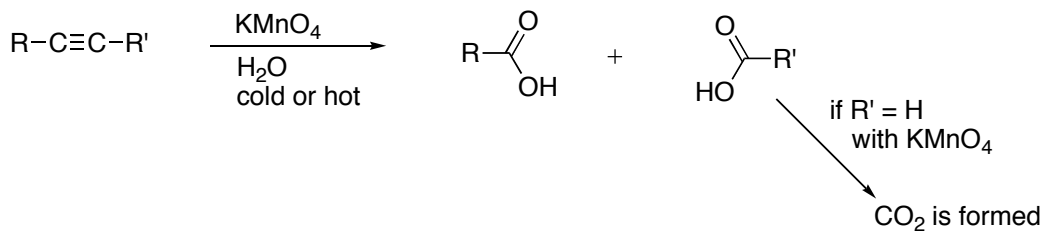
## 2. Anti-Markovnikov Water Addn – Hydroboration-Oxidation



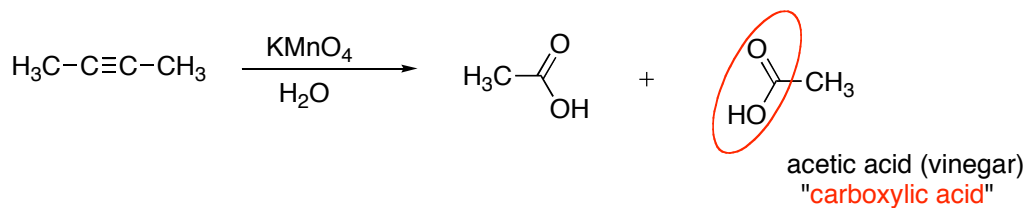
Mechanism:



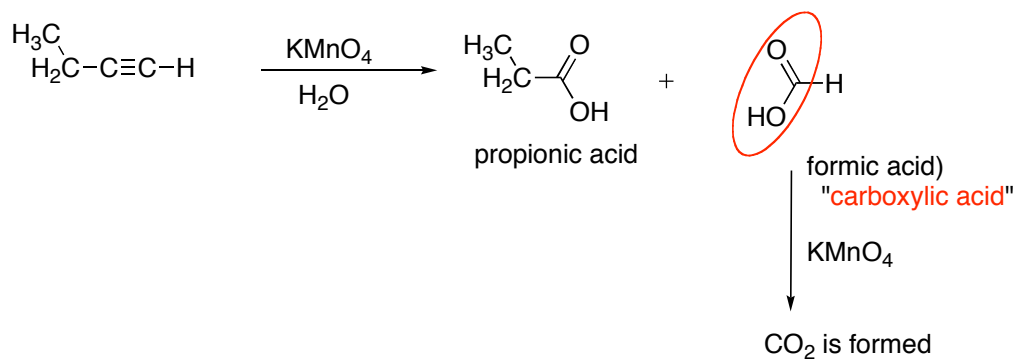
## 3. Oxidation of alkynes:



eg.  
i.

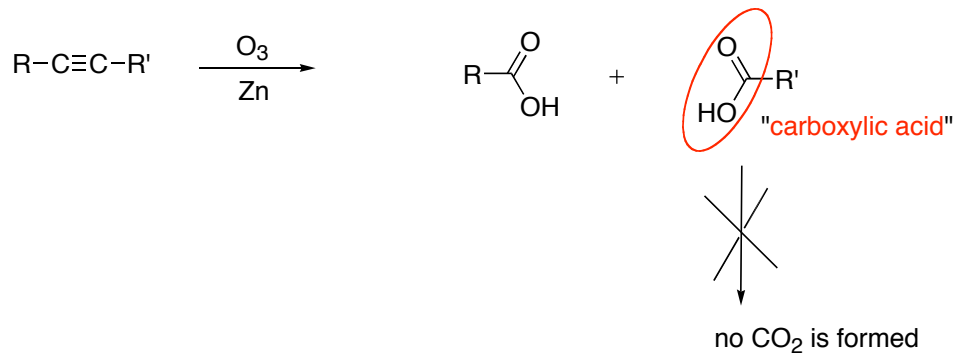


ii.

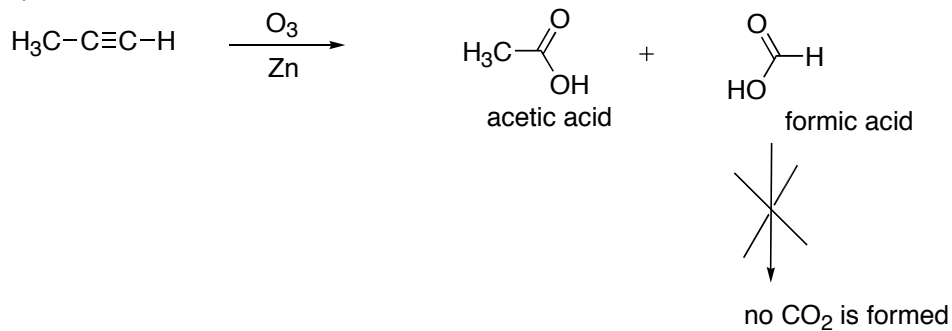


**NOTE:** do not need to worry about the mechanism of this reaction

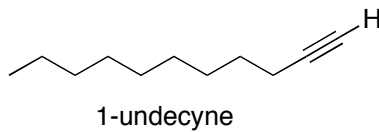
#### 4. Ozonolysis of alkynes:



i.

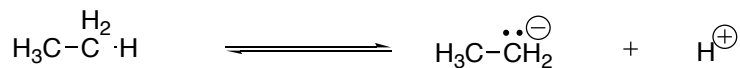


5. Reactions of terminal alkynes: { R-C≡C-H }  
eg.



- acidity of alkane / alkene / alkyne:

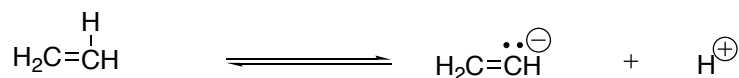
i.



$$K_a = \frac{[\text{CH}_3\text{CH}_2^-][\text{H}^+]}{[\text{CH}_3\text{CH}_3]} = 10^{-46}$$

$$\text{p}K_a = 46$$

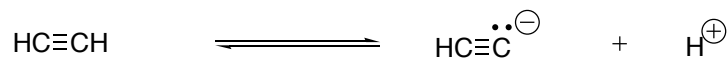
ii.



$$K_a = \frac{[\text{CH}_2\text{CH}^-][\text{H}^+]}{[\text{CH}_2\text{CH}_2]} = 10^{-36}$$

$$\text{p}K_a = 36$$

iii.

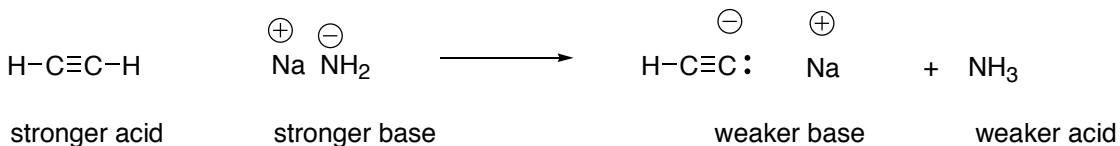


$$K_a = \frac{[\text{HC}\equiv\text{C}^-][\text{H}^+]}{[\text{HC}\equiv\text{CH}]} = 10^{-26}$$

$$\text{p}K_a = 26$$

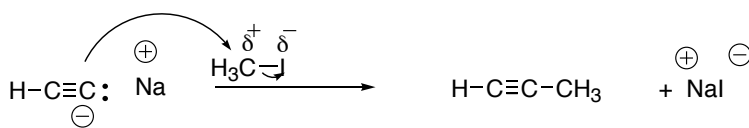
- How strong a base needed?

**Reactions of terminal acetylenes:**

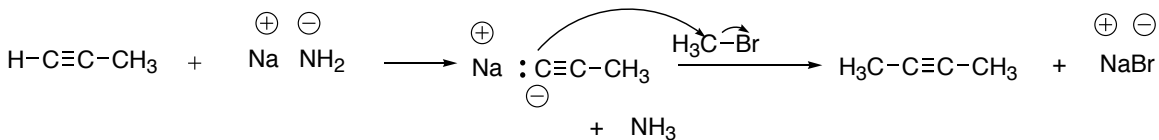


Nucleophile – a substance that seeks positive centre (often on carbon)

Base – a substance that seeks a proton ( $\text{H}^+$ )

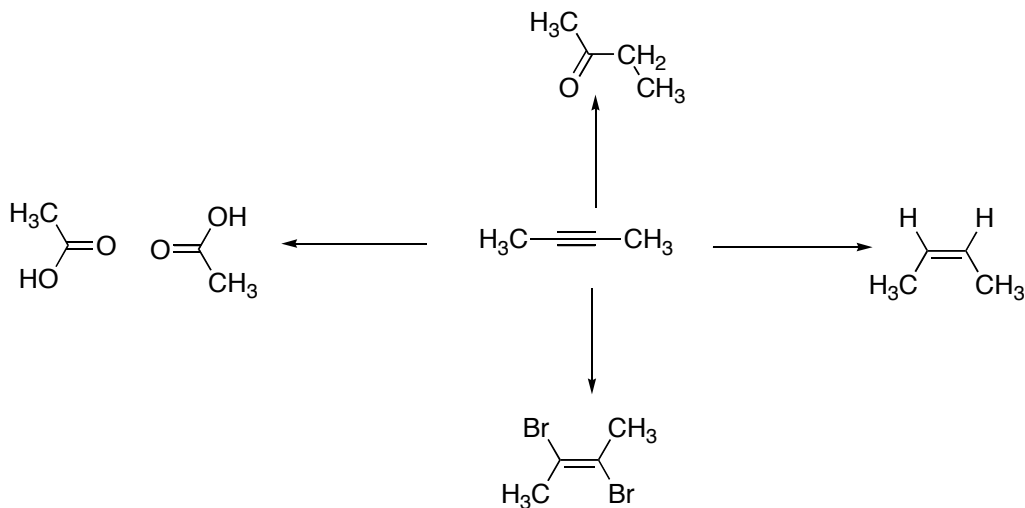


- nucleophilic substitution reaction ( $\text{S}_{\text{N}}2$ )

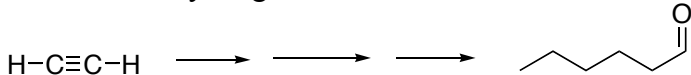


- reaction with primary halides (Cl, Br, I)

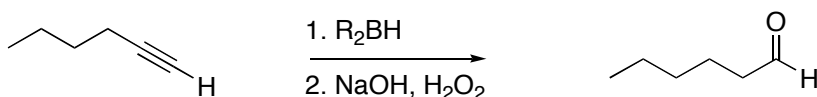
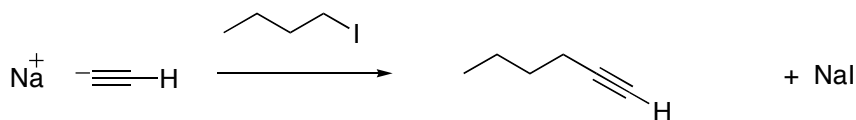
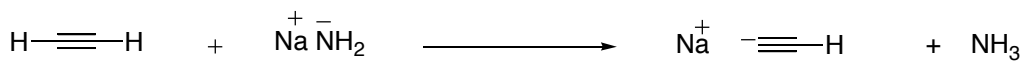
Acetylenes are key intermediates for making other types of compounds:



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

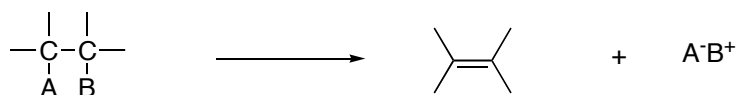


Approach:



### Synthesis of alkenes and alkynes:

- elimination reaction

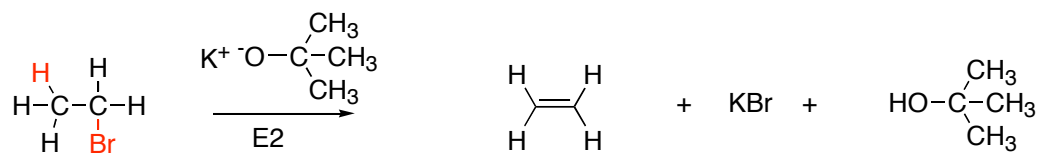


- There are 2 types of elimination reactions:

- E2 type elimination
- E1 type elimination

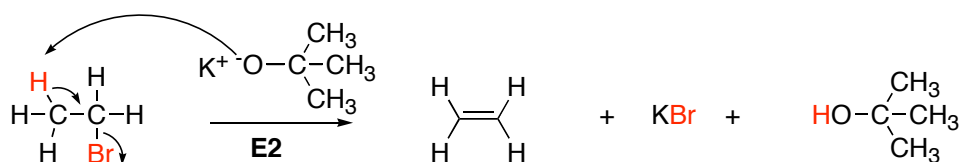
i) E2 - **concerted**: all bonds break and form at the same time

- **rate** depends on **two** reagents
- **stereospecific** – stereochemistry of starting material determines the stereochemistry of product



the two units eliminated are  $\text{H}^+$  and  $\text{Br}^-$

Mechanism is **E2**:



- ii) E1 - **stepwise** reaction – not concerted – **carbocation intermediate**  
 - **rate** depends on **one** reagent  
 - not stereospecific



Mechanism:

