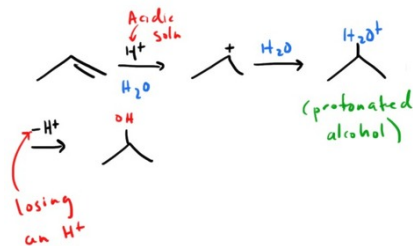
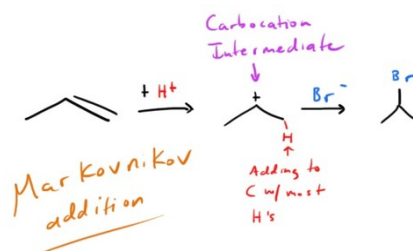


Acid Catalyzed hydration of an alkene (acid and water or H<sub>3</sub>O<sup>+</sup>)



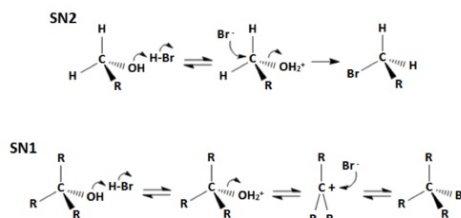
markovnikov with possible carbocation rearrangement

Addition of HX to an alkene



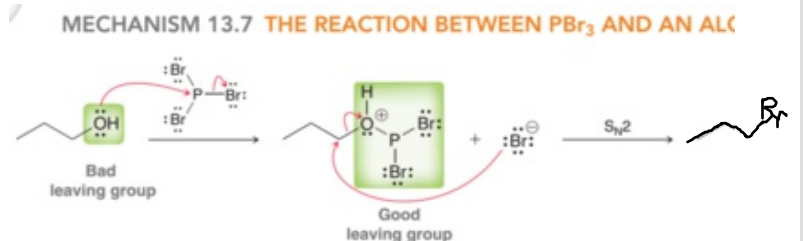
Markovnikov, possible carbocation rearrangement

Alcohols to alkyl halides (ROH with HX)



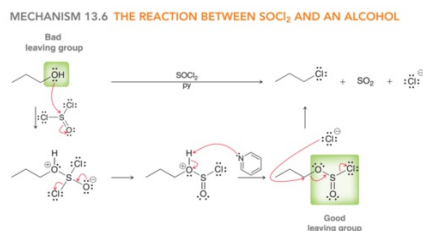
SN2 if primary or methyl, SN1 if secondary or tertiary

Alcohols with PBr<sub>3</sub>



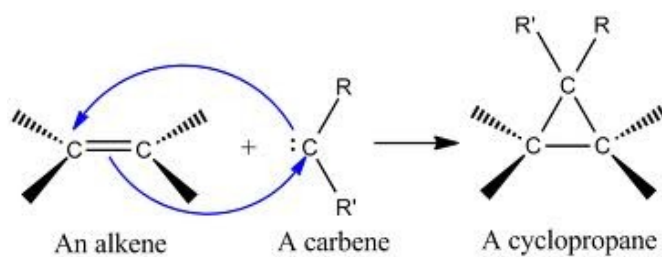
Inversion of stereochemistry if the carbon with OH was chiral because Br<sup>-</sup> does an S<sub>N</sub>2

Alcohols with SOCl<sub>2</sub>

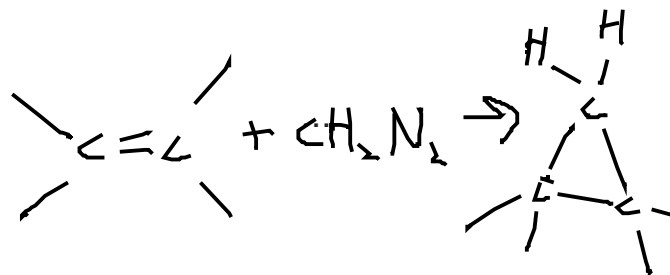


Inversion of stereochemistry if the carbon with OH was chiral because Cl<sup>-</sup> does an S<sub>N</sub>2

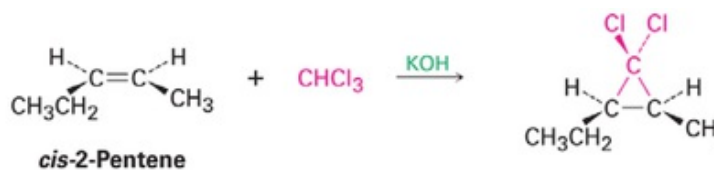
Alkene with  $\text{CH}_2\text{I}_2$  and  $\text{Zn}(\text{Cu})$



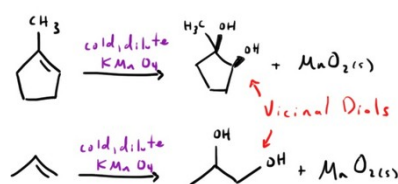
Alkene with  $\text{CH}_2\text{N}_2$



Alkene with  $\text{CHCl}_3$  and Strong Base

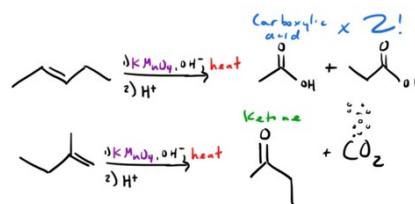


Alkene with  $\text{KMnO}_4$  (Cold), dilute  $\text{OH}^-$  or  
1)  $\text{OsO}_4$  2)  $\text{Me}_2\text{S}$



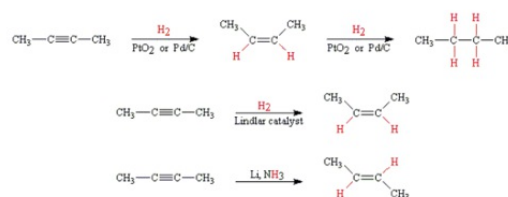
Dihydroxylation, syn addition

Alkene with  $\text{KMnO}_4$  (Hot),  $\text{OH}^-$



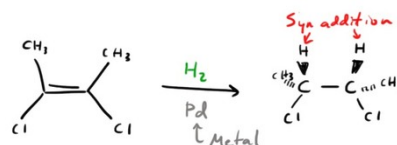
cuts like ozone but aldehydes become carboxylic acids, one carbon becomes  $\text{CO}_2$

Alkyne Hydrogenation (3 types)

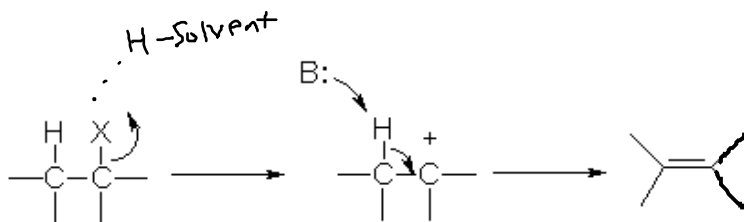


Ni2B (P-2) means Lindlar

Catalytic Hydrogenation (H<sub>2</sub>, metal)

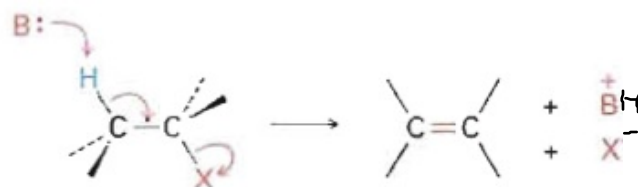


E1 Reaction

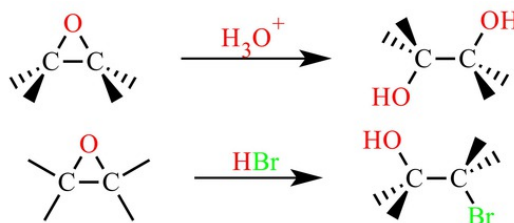


E2 Reaction

E2 Reaction: C-H and C-X bonds break simultaneously the alkene in a single step without intermediate  
 ★ anticoplanar

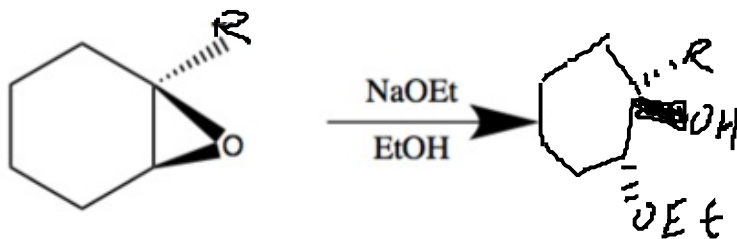


Epoxide Reacting with Acid



H<sup>+</sup> to O first then Nucl to most subst carbon

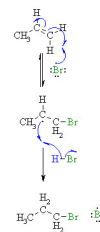
Epoxide reacting with base (good nucleophile)



OH will be anti to nucleophile. nucleophile goes to least substituted c

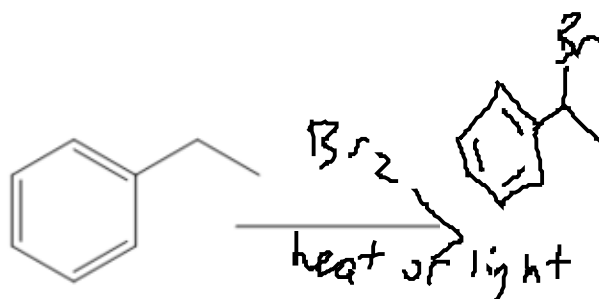
**S<sub>N</sub>2**

Free Radical Addition to alkene (HBr, ROOR) Propagation



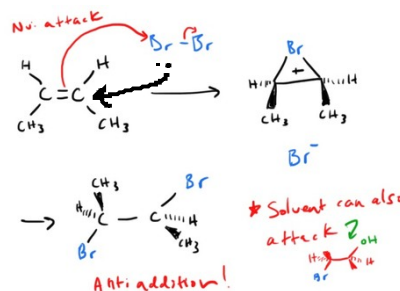
radical on the most stable carbon

Free Radical Halogenation (Cl<sub>2</sub> or Br<sub>2</sub> with heat or light)



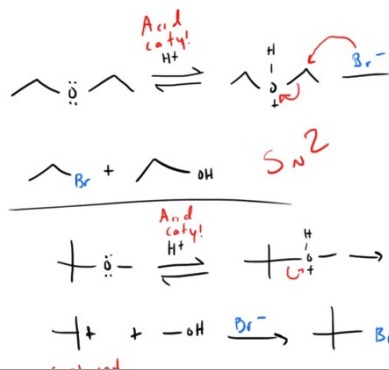
Cl<sub>2</sub> is not selective = switches a Cl with any alkane H. Br<sub>2</sub> is selective = switches Br with H on carbon on mos

Halogenation of an alkene (X<sub>2</sub>)

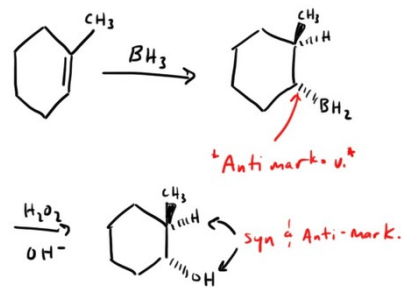


anti addition, nucl attacks most subst carbon

How to Cleave an Ether!

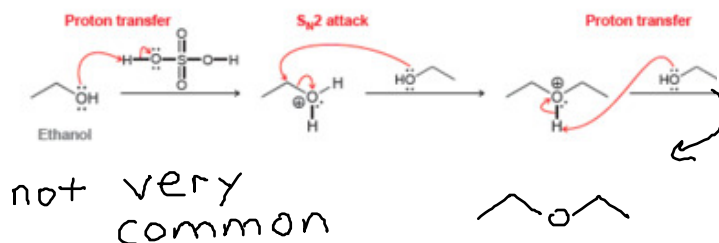


Hydroboration 1) BH<sub>3</sub>, THF 2) H<sub>2</sub>O<sub>2</sub>, OH<sup>-</sup>

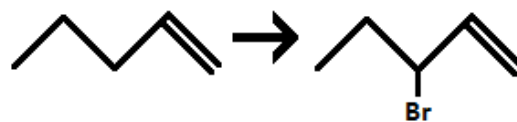


Antimarkovnikov hydration, syn addition

Intermolecular Dehydration of Alcohols  
(ROH with H<sub>2</sub>SO<sub>4</sub>)

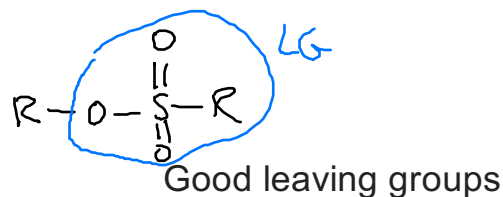


NBS with heat or ROOR

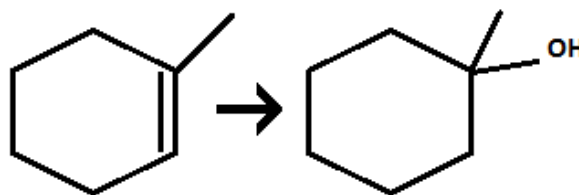


switches Br for H on an allylic or benzylic carbon

OTs, OTf, OMs

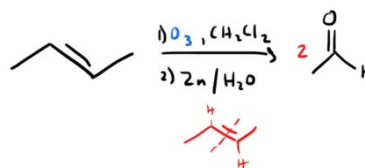


Oxymercuration/Demercuration 1)  
Hg(OAc)<sub>2</sub>, H<sub>2</sub>O 2) NaBH<sub>4</sub>, OH<sup>-</sup>



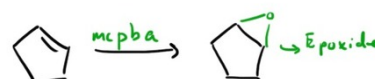
Markov hydration, no C<sup>+</sup> rearrangement, Could use ROH instead of H<sub>2</sub>O

Ozonolysis 1) O<sub>3</sub> 2) Me<sub>2</sub>S or Zn

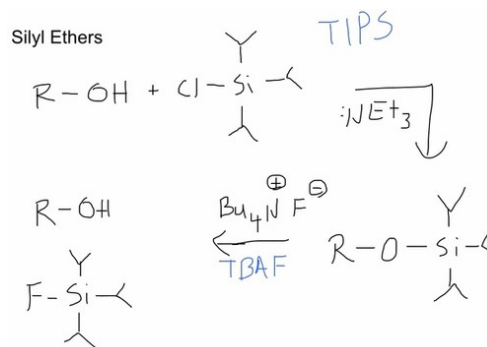


cuts the double bond and puts O on carbons

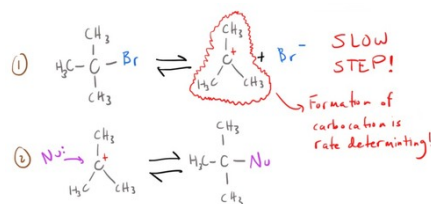
Peroxydicarboxylic acids (mCPBA) or COOOH



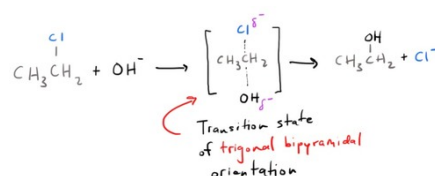
Protecting Groups (ROH with TBSCl)



Sn1 Reaction



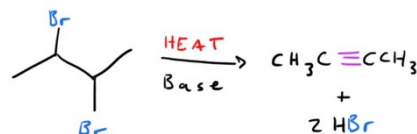
Sn2 Reaction



Strong Bases

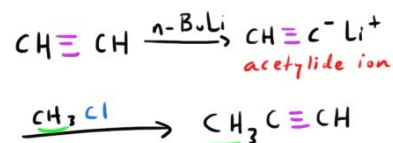
N-, O-, C-, H- except: CN-, COO-, N3-,  
 $R-C\equiv C:^{\ominus}$

Synthesis of Alkyne starting from dihalide



Use 2 equivalents of strong base like NaNH<sub>2</sub>

Synthesis of Alkyne using acetylide ion



William Ether Synthesis RO- with R-LG

