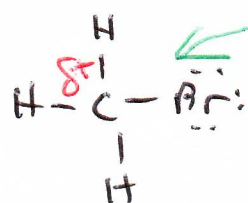


bromomethane
methyl bromide

haloalkane
alkyl halide

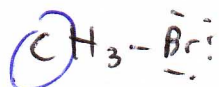
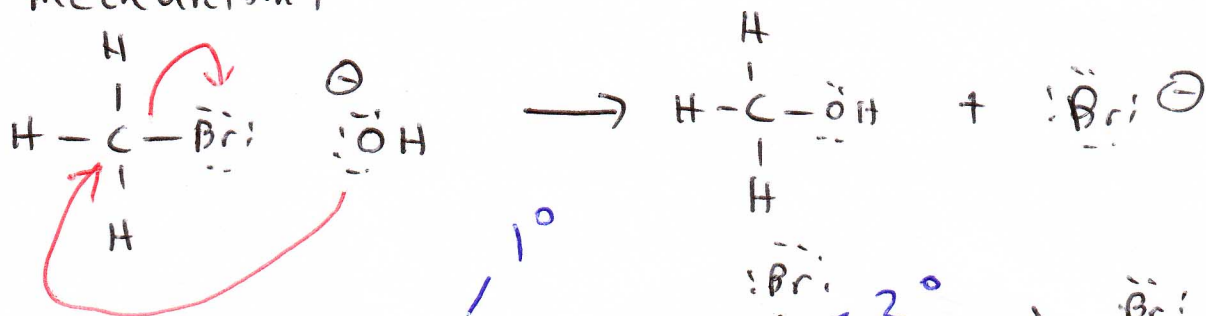
systematic
common



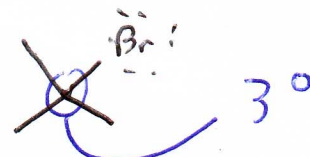
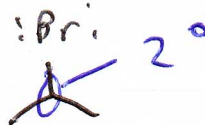
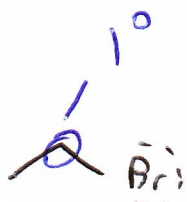
electrophile - seeks \ominus charge

nucleophile - seeks \oplus charge

mechanism:



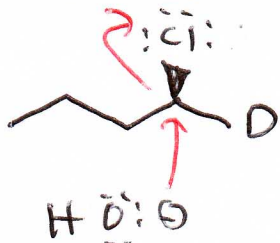
1° - methyl



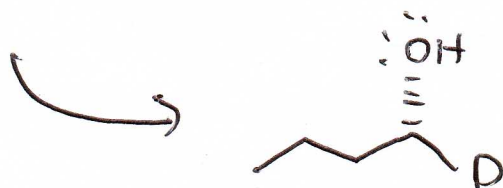
(not reactive)

← increasing rxn rate

Methyl and 1° alkyl halides react much more quickly by this mechanism than 2° or 3° alkyl halides since there is much less steric hindrance around the reaction site.



(S) - 1-chloro-1-deuterobutane



Inversion of configuration - the geometry of a stereocenter inverts during a rxn

Bimolecular Nucleophilic Substitution

#2

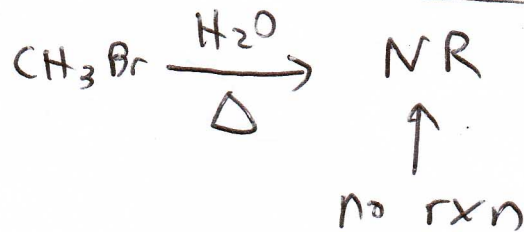
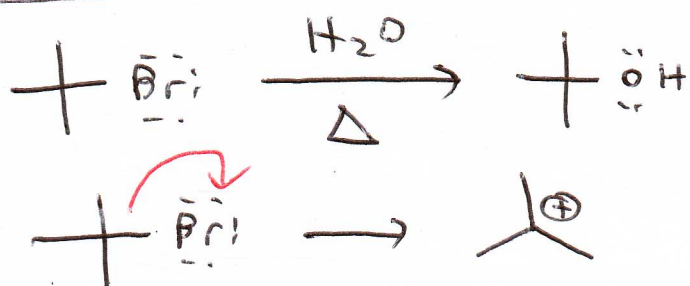
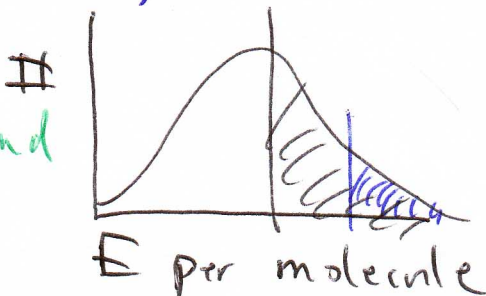
$$R = k [N] [S]$$

SN2

RLS - rate-limiting step - individual rxn step with the largest activation energy

$$k = A e^{-E_a/RT}$$

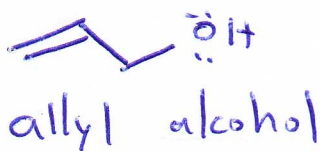
Both the nucleophile and the substrate react simultaneously in the only rxn step.



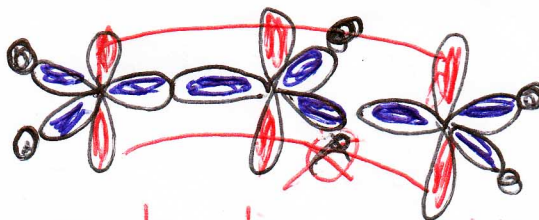
Conjugation



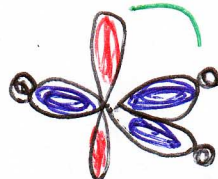
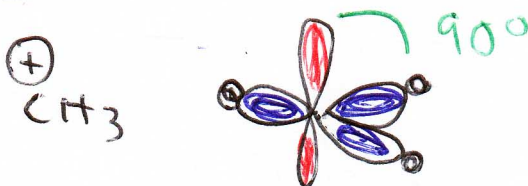
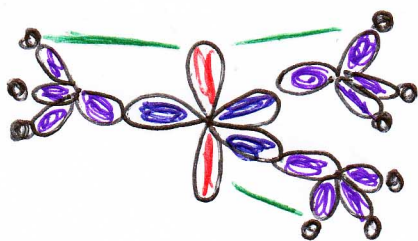
all sp²



allyl cation



conjugation - a bonding orbital interaction that involves more than two atoms.



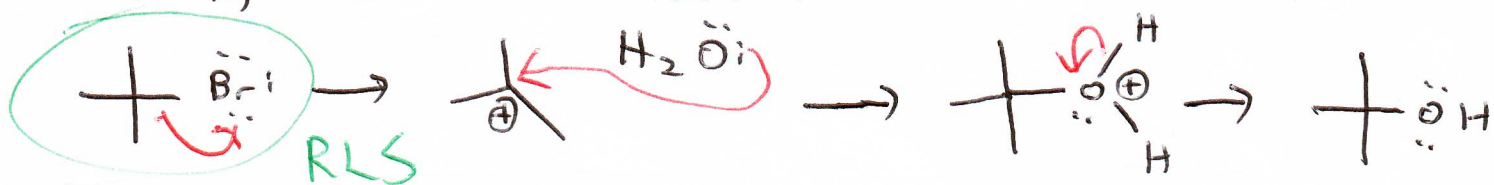
hyperconjugation - a non-bonding interaction involving more than two atoms.

#3



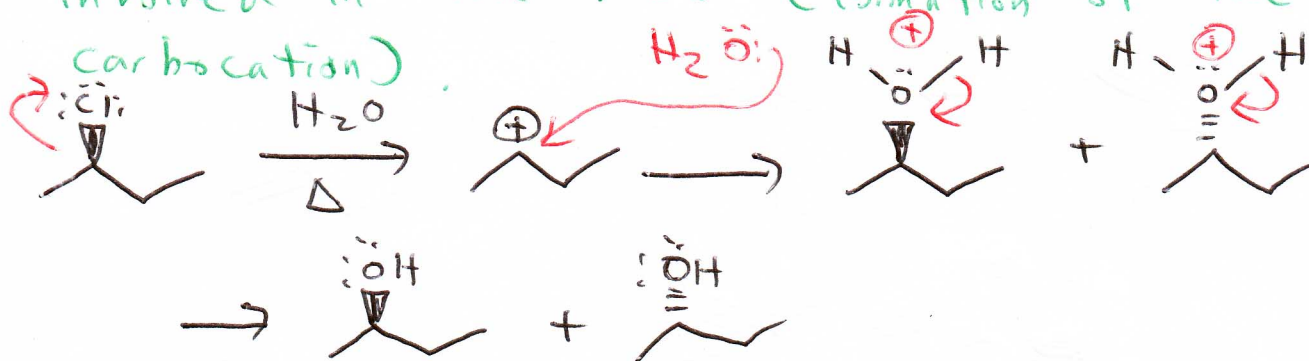
← increasing rxn rate

3° and 2° alkyl halides are much more reactive in this mechanism than 1° or methyl halides because the carbocation formed during the rxn is much more stable.



Unimolecular Nucleophilic Substitution $\text{S}_{\text{N}}1$

Only one molecule - the substrate - is involved in the RLS (formation of the carbocation).



When enantiomers are formed in equal proportions, the rxn mixture is racemic. Racemic mixtures are not optically active because half of the molecules cancel the optical rotation of the other half.

