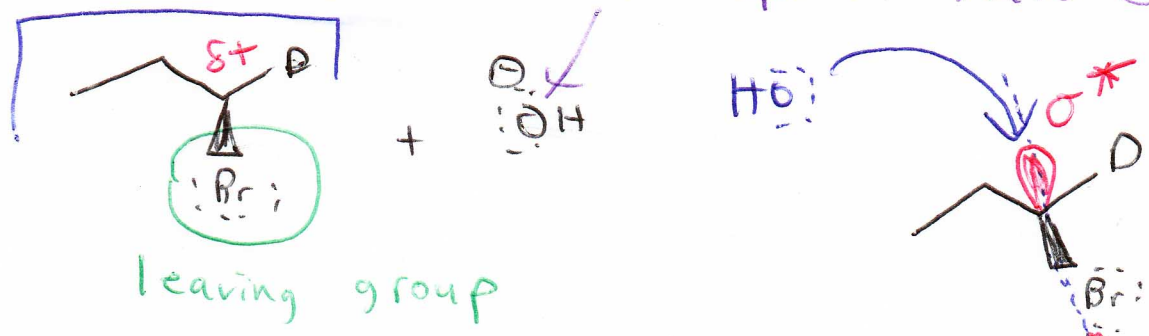
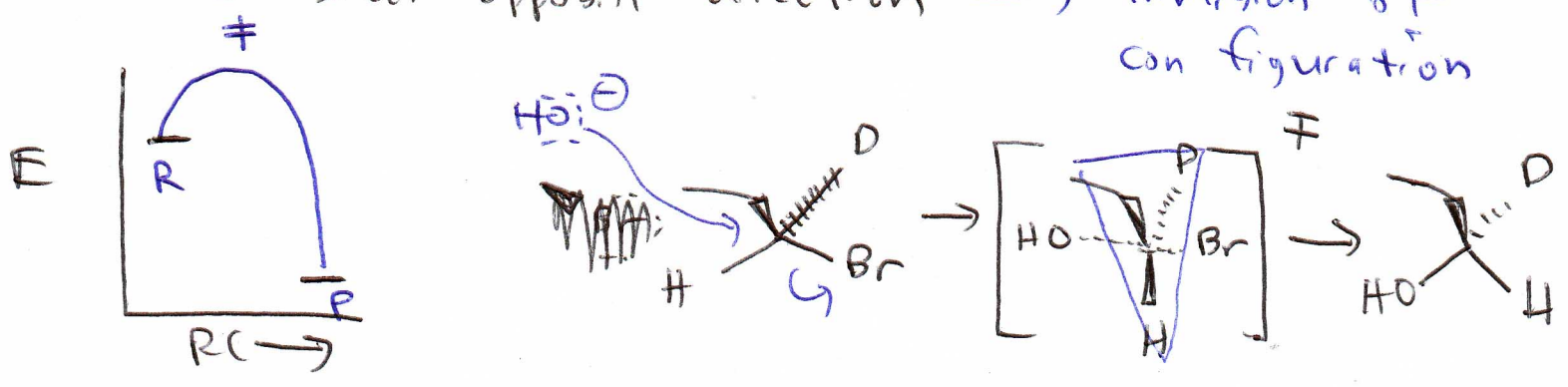


- 1) synthetic utility: alkyl halide \rightarrow alcohol *
ether *
thiol *
 - 2) reagents: basic nucleophile
ex: NaOH, NaOCH₃, NaCN
 - 3) conditions: polar aprotic solvent
 - 4) mechanism (above): anion, concerted
 - 5) stereochemistry: inversion of configuration
 - 6) regiochemistry: specific (@ leaving group)
- substrate - target nucleophile - seeks \oplus charge

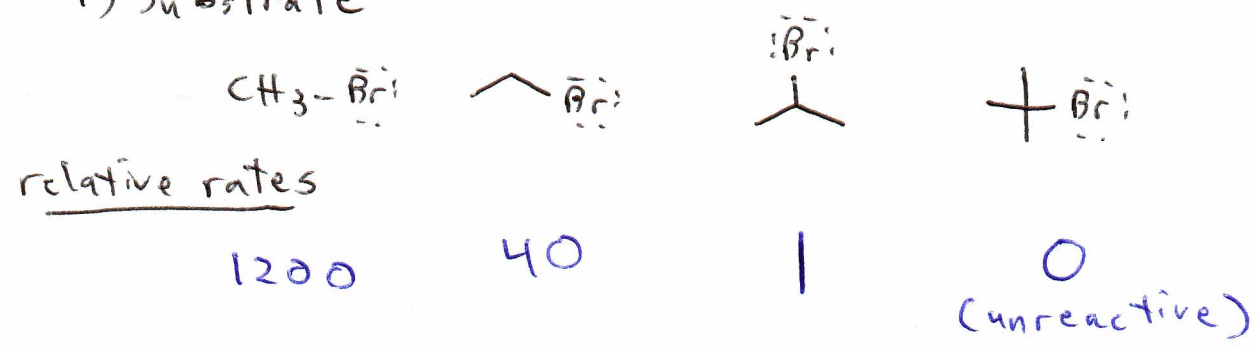


In S_N2 rxn, the nucleophile attacks by adding into the σ^* bond to the leaving group. Since electrons are added into the anti bonding orbital, the bond with the leaving group breaks. This allows a new bond with the nucleophile to form, but in the exact opposite direction \rightarrow inversion of configuration

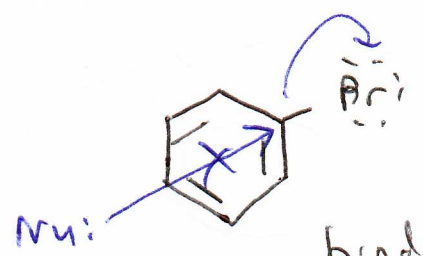
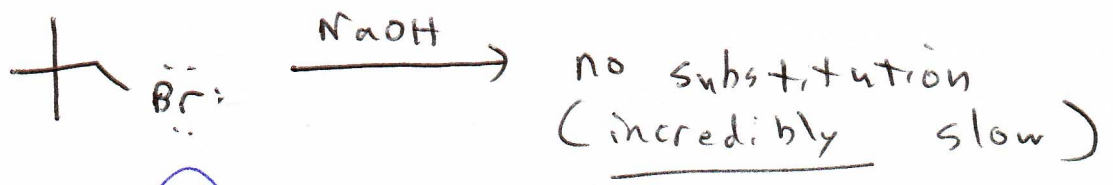


Factors that affect an S_N2 rxn

1) Substrate



Since the S_N2 rxn depends on the nucleophile attacking direct the carbon bearing the leaving group, steric hindrance around that position will slow the rate of reaction.



phenyl halides do not undergo S_N2 because of too much steric hindrance (attack would have to occur through the ring).

2) Nucleophile

Nucleophilicity - how strongly does a compound seek \oplus charge

Ex: H_2O vs OH^-
hydroxide is much more nucleophilic because it has a \ominus charge on it

Basicity - how able is a compound to remove H^+ ,



OH^-
Stronger
base

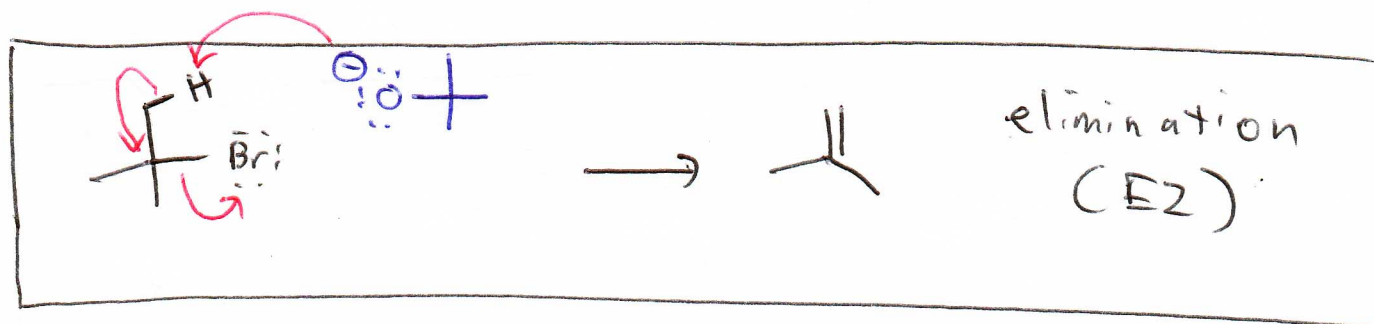
vs

SH^-
Stronger
nucleophile

H_2O $\text{pK}_a = 15.74$
 H_2S $\text{pK}_a = 7$

polarizability - ~~able~~ able to become polarized -
larger ions are "squishier", meaning that
electron density can more easily be displaced.

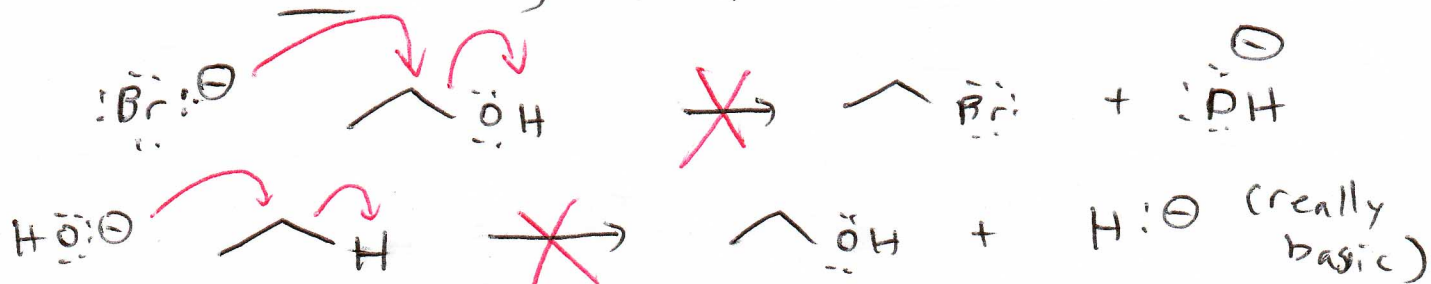
Since sulfur is more polarizable than oxygen, the
process of forming a bond occurs more easily -
and therefore more quickly - for sulfur versus
oxygen \rightarrow sulfur is a better nucleophile than
oxygen (in similar molecules)



$\text{S}_\text{N}2$ rxns require strong nucleophiles (needs something
able to attack), which are often, but not always,
basic. ~~Extremely~~ Extremely basic or hindered nucleophiles can
undergo elimination instead of substitution.

3) leaving group

good leaving groups are the conjugate bases
of very strong acids.

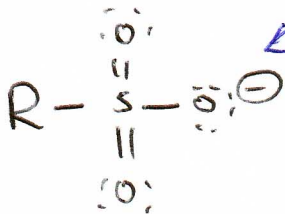


Examples:



usually better than Cl^- since HI is a stronger acid than HCl

sulfonates



Strongly resembles sulfuric acid