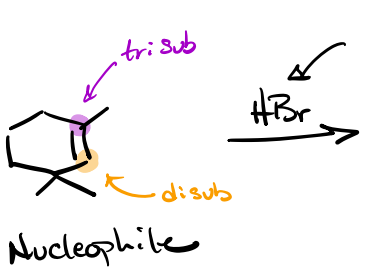
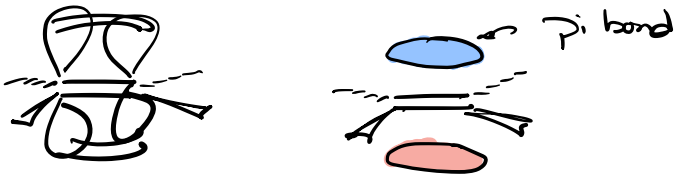
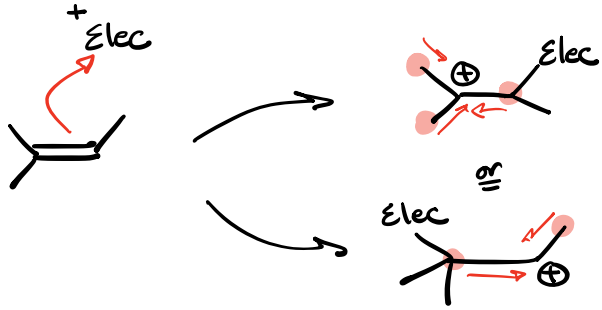
Alkene Review — Electrophilic Addition



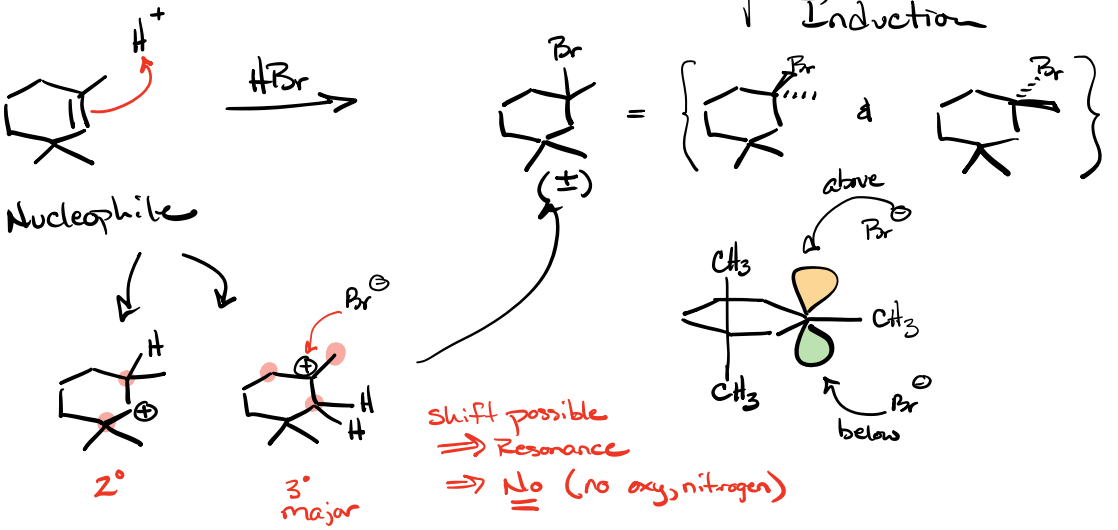




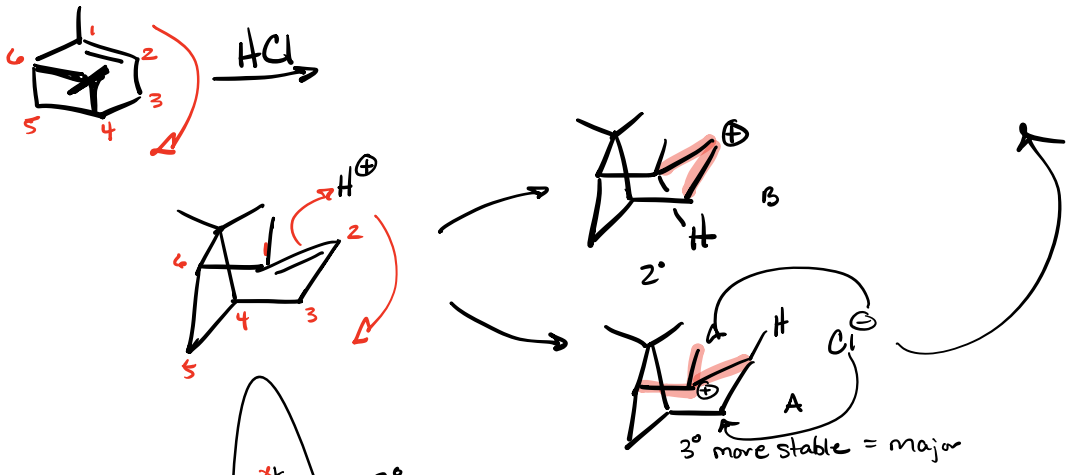
Carbocation Stability: $3^\circ > 2^\circ > 1^\circ$

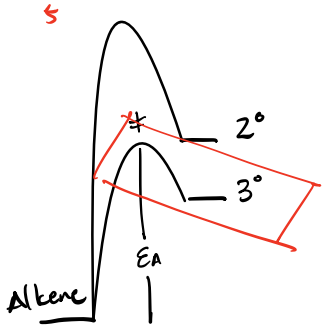
Inductive factors

- Hybridization/Element
- Resonance
- Size
- Induction



shift possible
⇒ Resonance
⇒ No (no oxy, nitrogen)

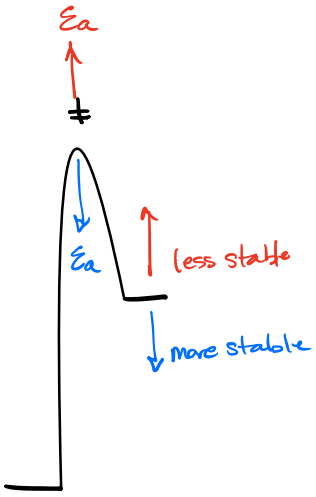




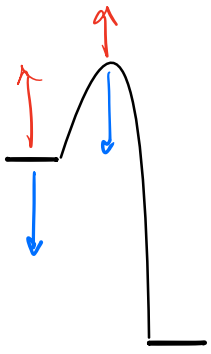
Hammond Postulate

Prediction of Relative transition state energy.

The structure of the transition state will resemble the side of the energy diagram that it is closest in energy to

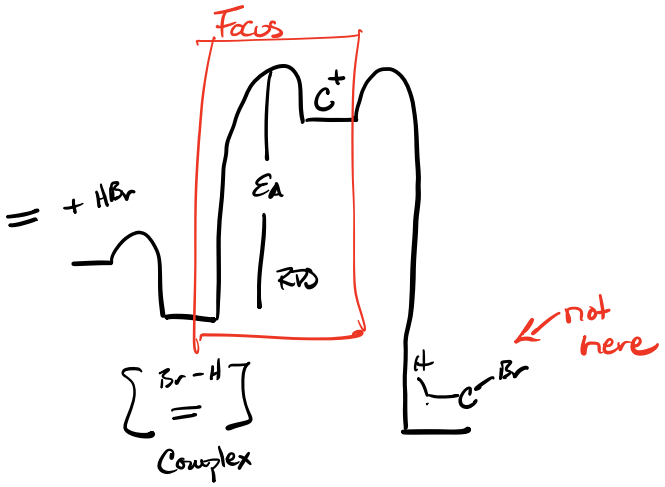


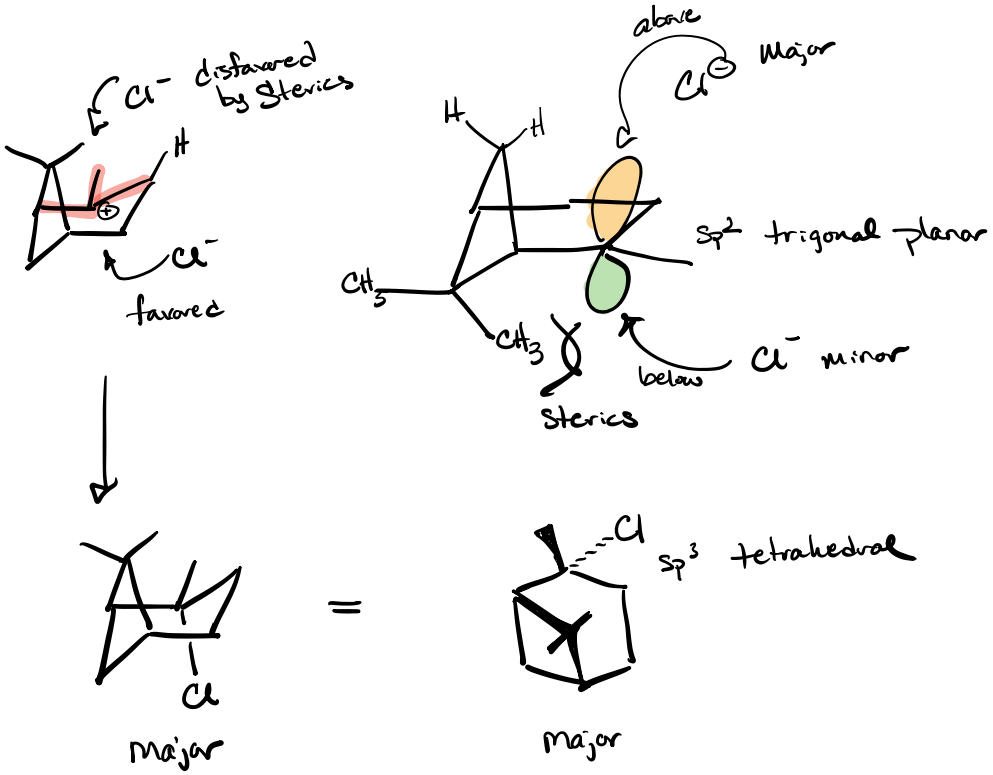
Endothermic Step
Governed by stability of product

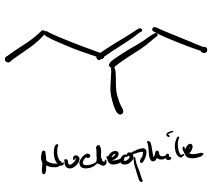


Exothermic Step
Governed by stability of reactant

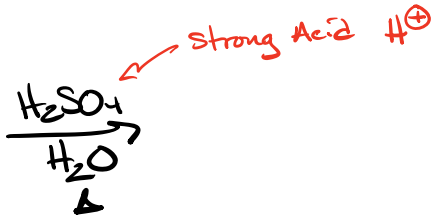
Electrophylic Addition

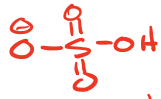




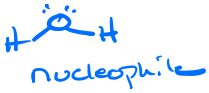


Nucleophile



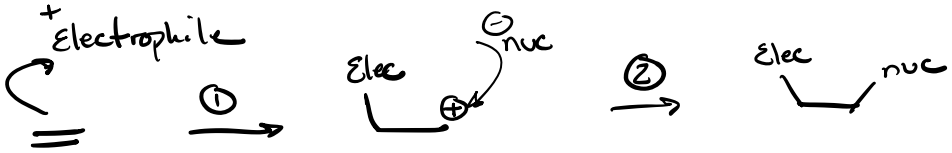


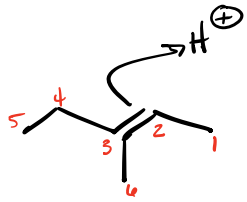
Very weak nucleophile

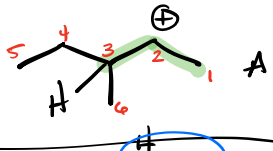


Nucleophile

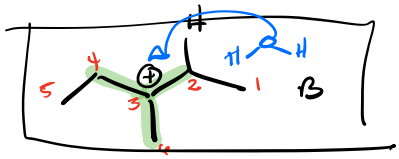
① Electrophile
② Nucleophile





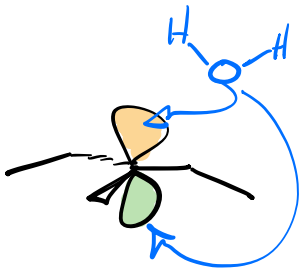


A



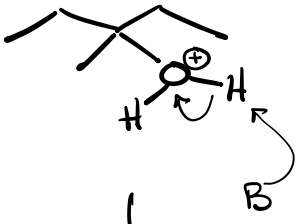
B

Induction

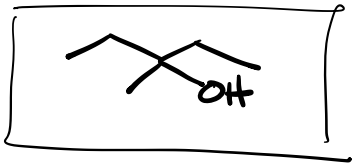


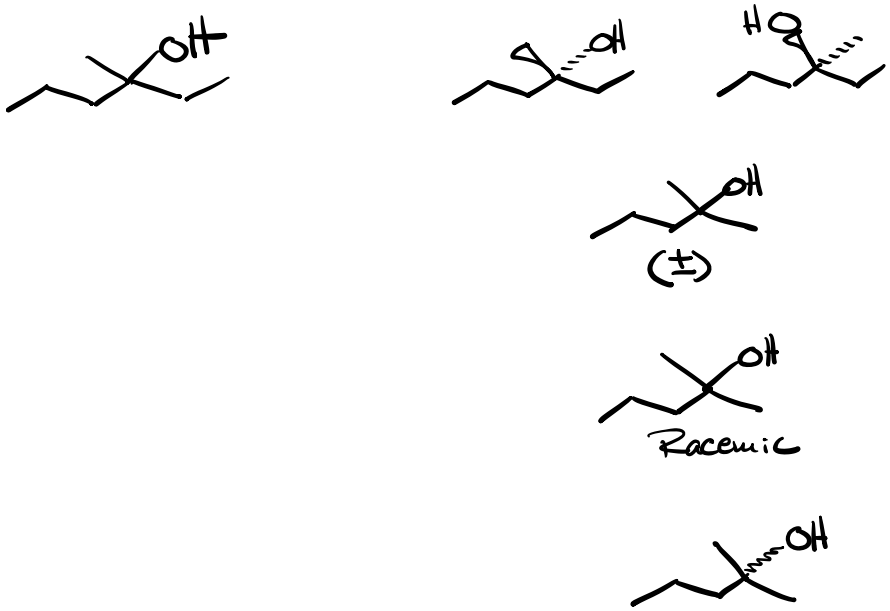
① Add electrophile
② Consider options
③ Find more stable option
- Hybridization
- Resonance
- Size
- Induction

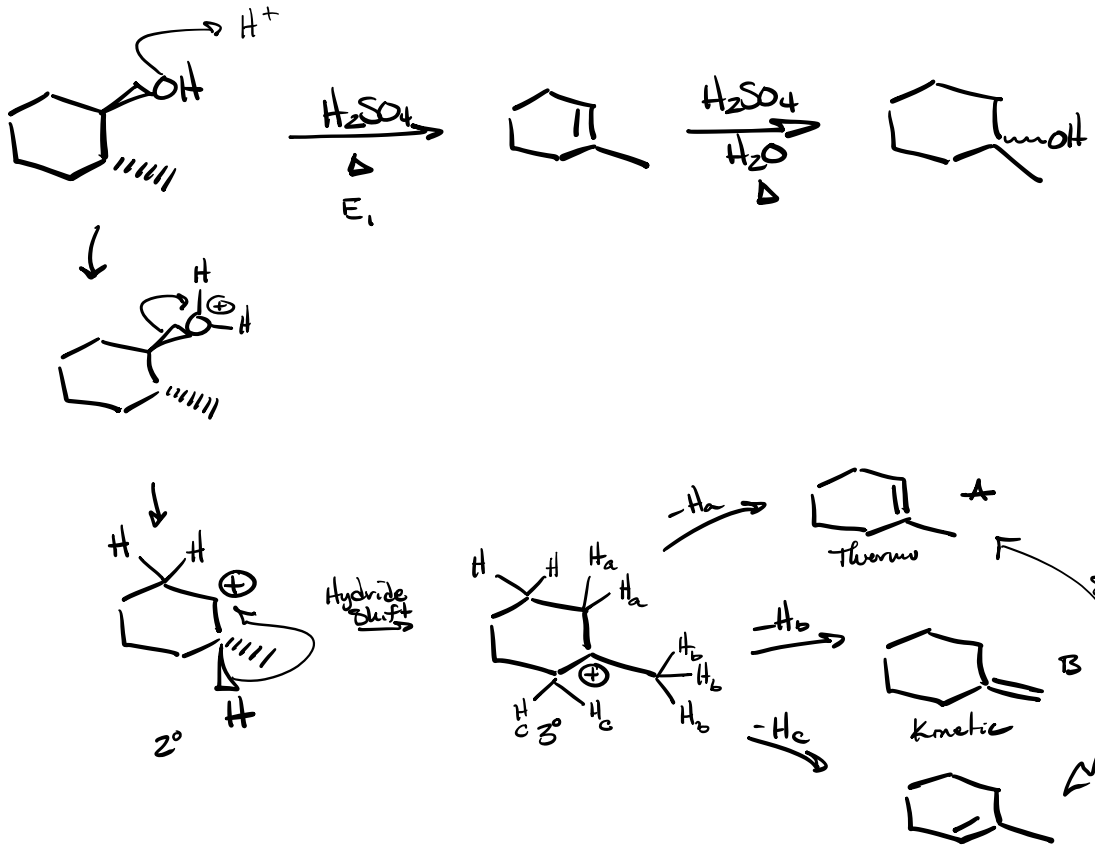
④ Consider hydride or alkyl shifts
⑤ Electrophile
⑥ Consider Stereochem
- ± = Racemic
- or
- Stereoselective

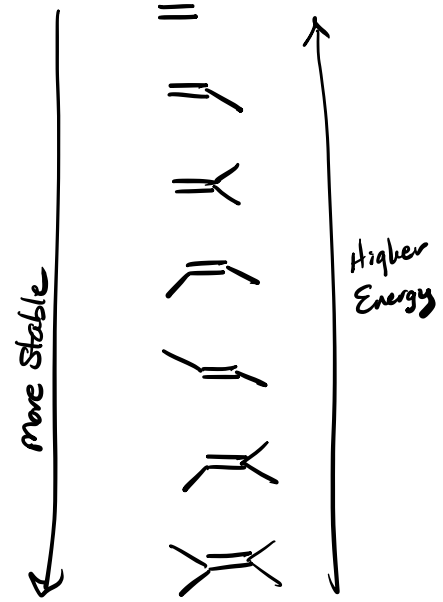


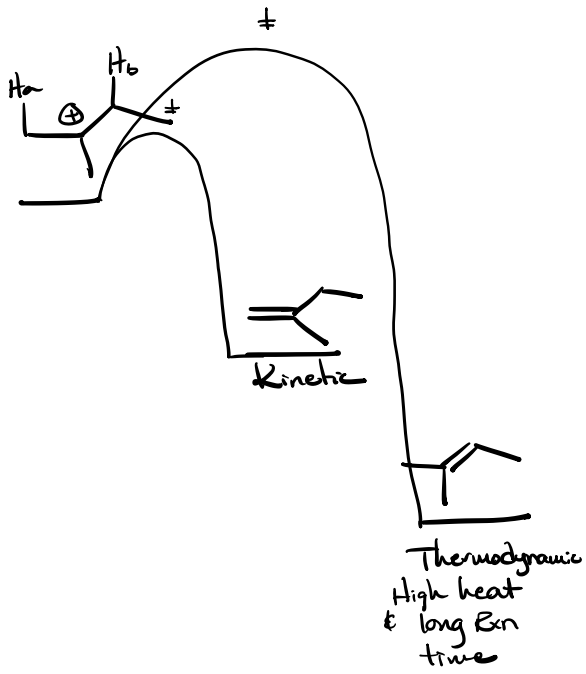
B

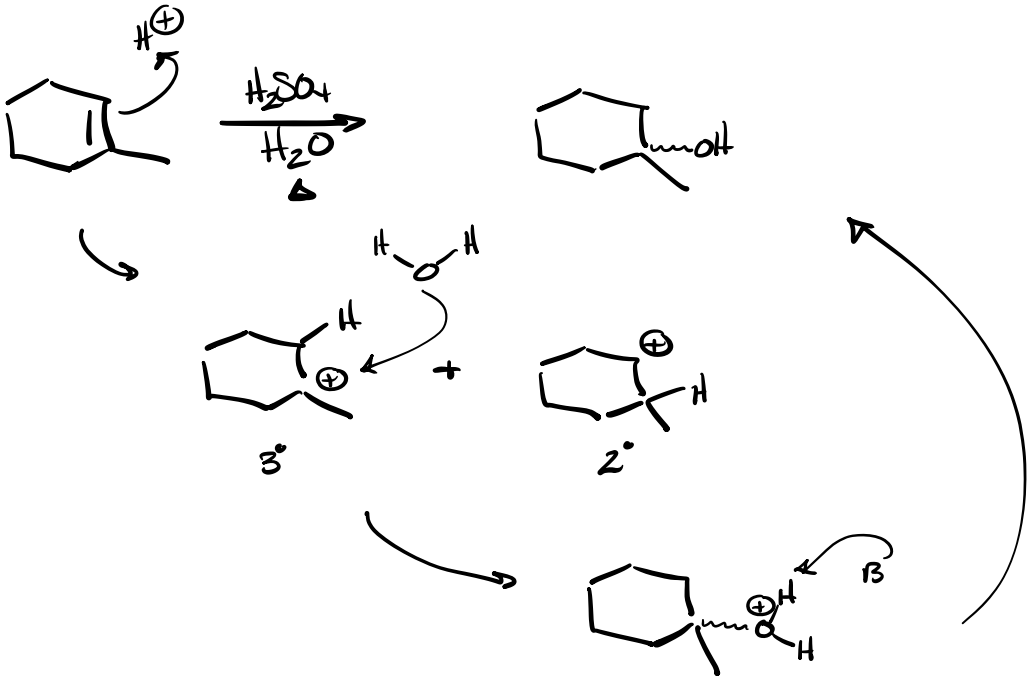


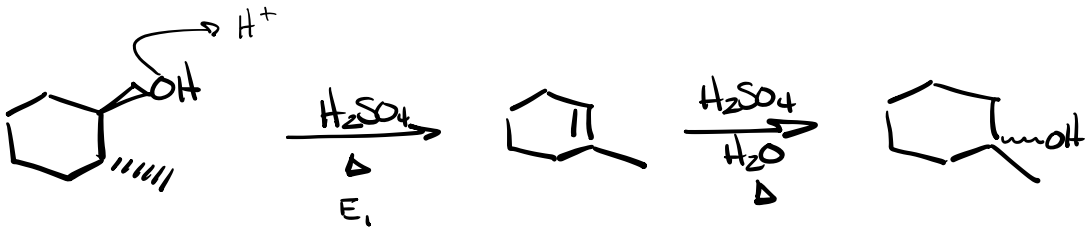

OH
OH
HO
OH
(±)
OH
Racemic
OH

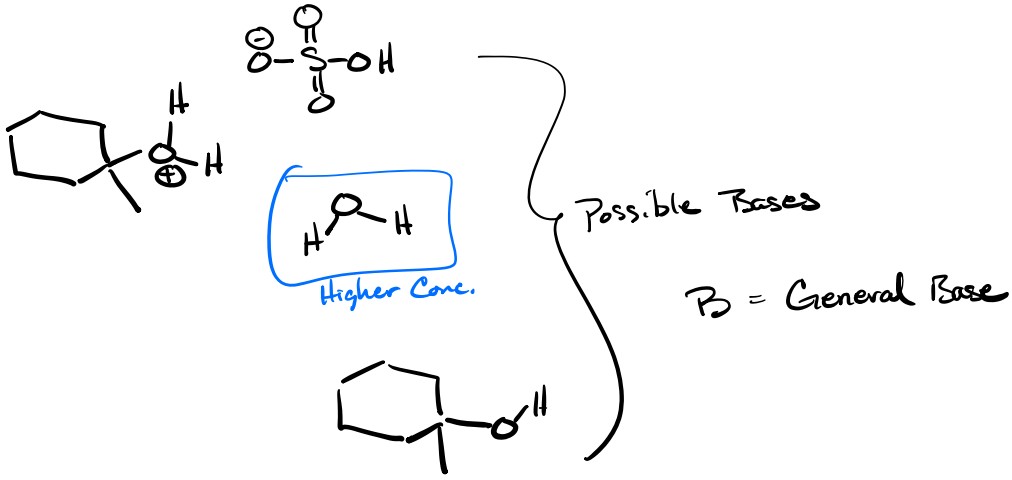

H+
OH
H2SO4
Δ
E1
H2SO4
H2O
Δ
OH
H
H
H
H
H
Hydride Shift
2°
-Ha
A
Thermo
Ha
Ha
Hb
Hb
Hb
H
C
3°
Hc
Hc
-Hb
B
Kinetic
-Hc
Same

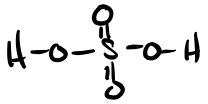

More Stable
Higher Energy

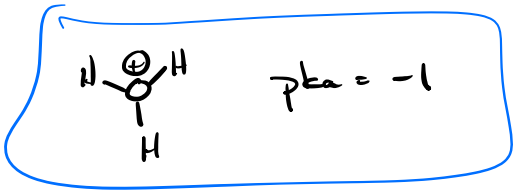

Ha
Hb
Kinetic
Thermodynamic
High heat
& long Rxn
time

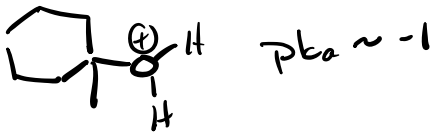

H⊕
H2SO4
H2O
Δ
3°
2°
B

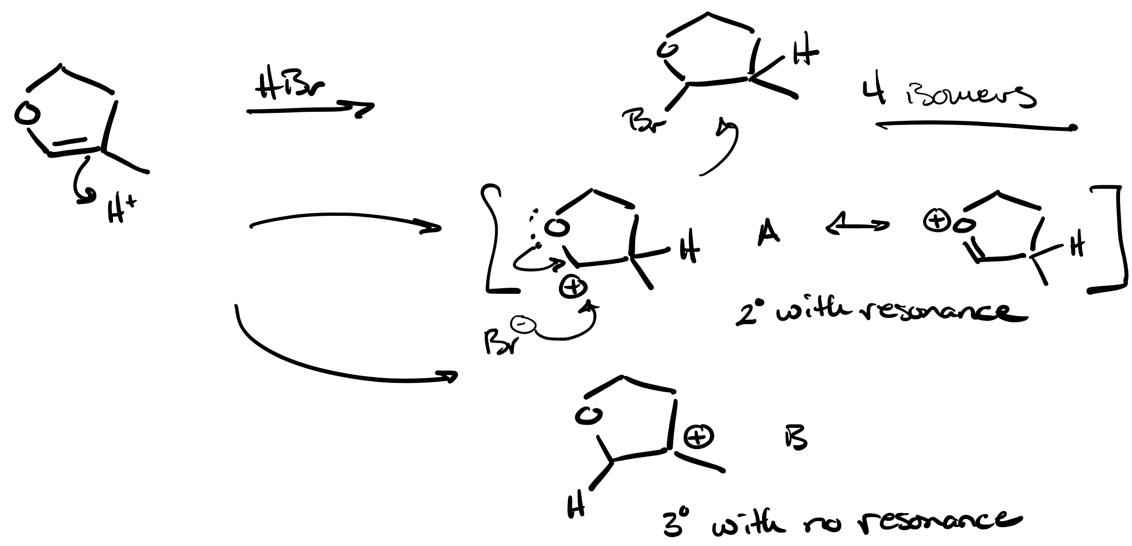

H+
OH
H2SO4
Δ
E1
H2SO4
H2O
Δ
OH


Higher Conc.
Possible Bases
B = General Base


pka = -7


pka = -1


pka ~ -1



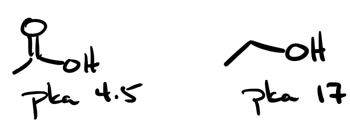
	Same element	Different Elements
①	Hybridization/EN (Element)	

20 unit

C–H	N–H	O–H	F–H
60	40	16	3

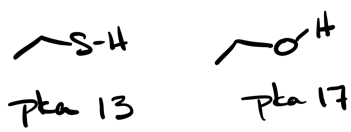
sp3 C–H	sp2 C–H	sp C–H
60	45	26

② Resonance



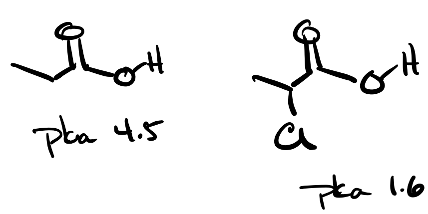
10-15 units

③ Size

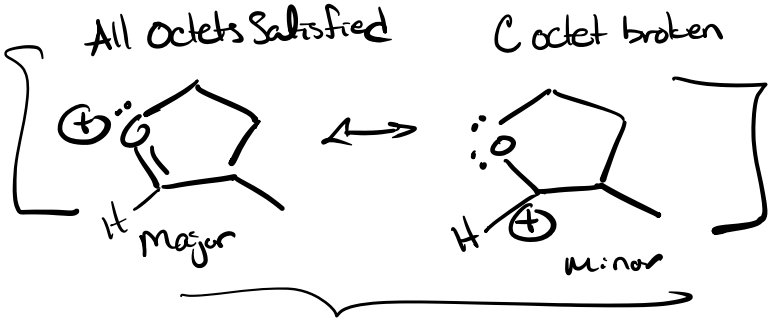


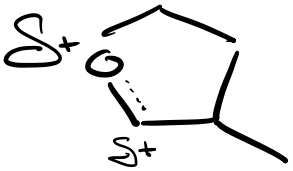
~ 8 units

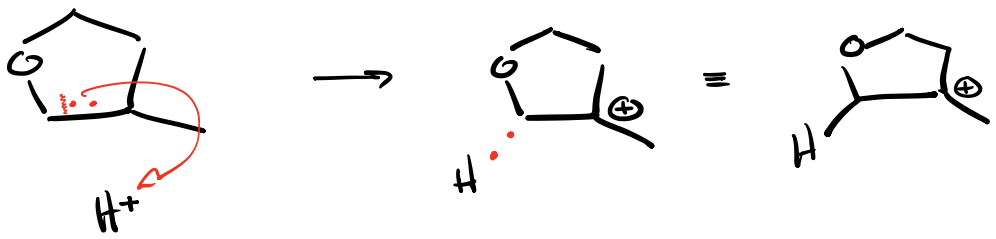
④ Induction



~ 1-3 units


All octets Satisfied
C octet broken
H
Major
H
Minor


S+
S+


H+
H
H