

(3) Today

Sections 11.1 - 11.6: Substitution Reactions

Sections 10.5, 17.6: Alcohols in Nucleophilic Substitution Reactions

Next Class (4)

Sections 10.5, 17.6: Alcohols in Nucleophilic Substitution Reactions

(5) Second Class from Today

Sections 11.7 - 11.11: Elimination Reactions

Third Class from Today (6)

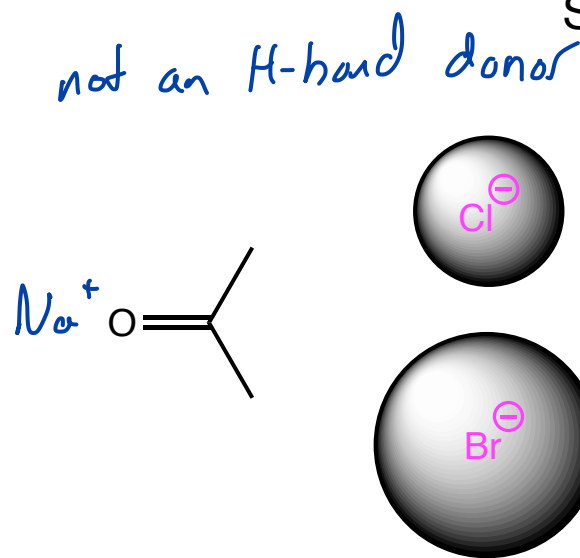
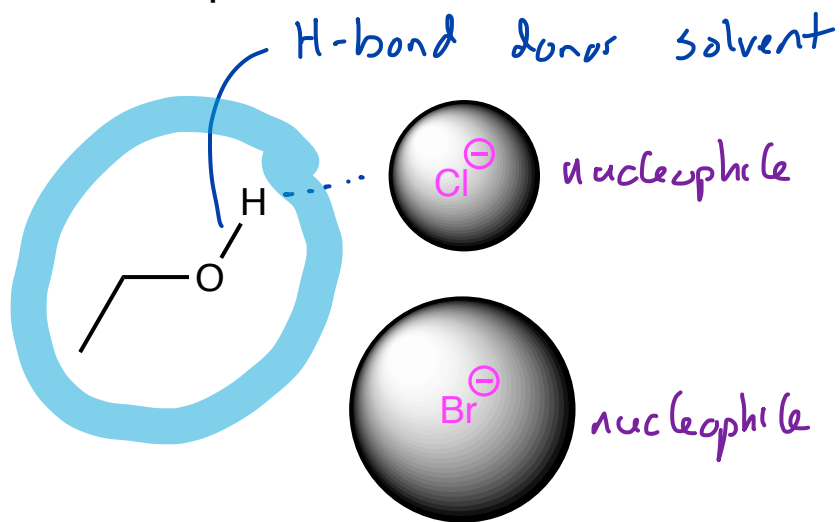
Sections 11.7 - 11.11: Elimination Reactions

Section 17.6: Alcohols and Elimination Reactions

*I have a meeting in Fitchburg today, so
I have to cancel office hours*

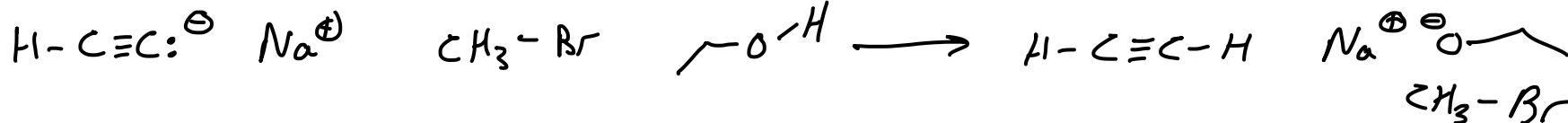
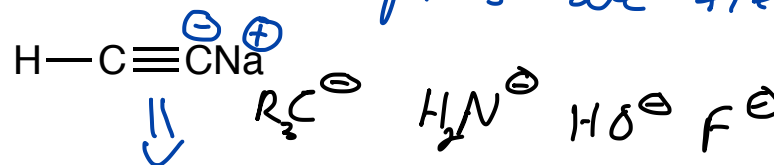
Nucleophiles and interactions with solvents

Section 11.3



protic solvents interact with nucleophiles... Form an H-bond-like interaction with the nucleophile especially as the nucleophile gets smaller... nucleophiles are "caged"

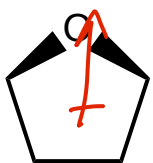
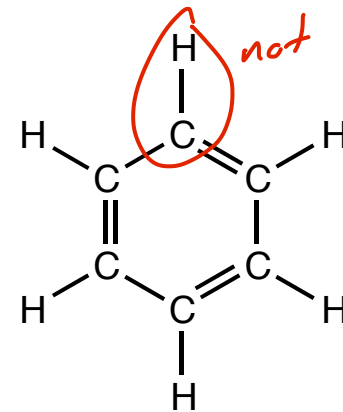
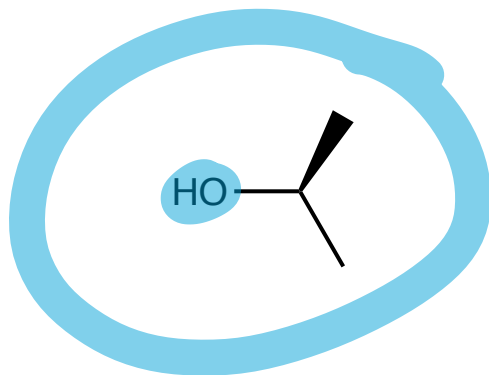
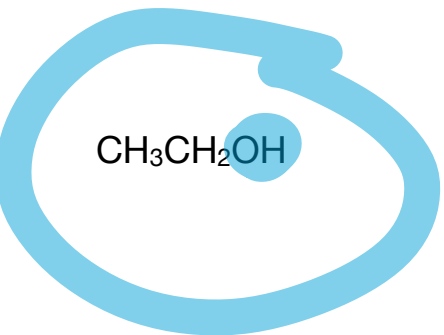
polar aprotic solvents don't interact strongly with nucleophiles but they are polar + interact with the counterion nucleophiles are free



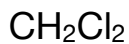
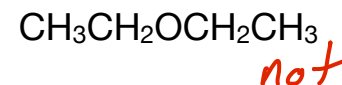
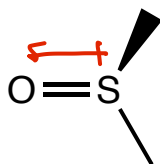
Protic or Aprotic Solvents

3 polar protic

Practice

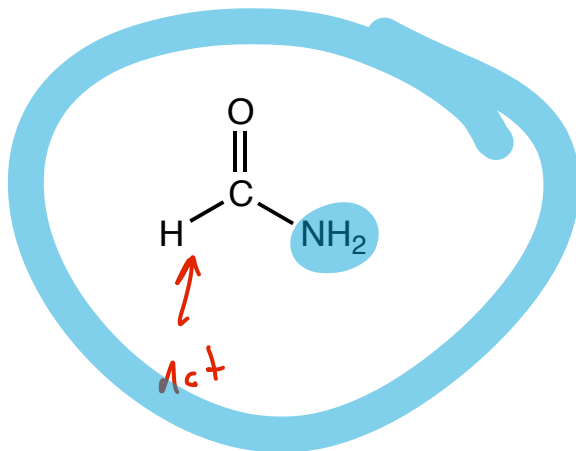


aprotic



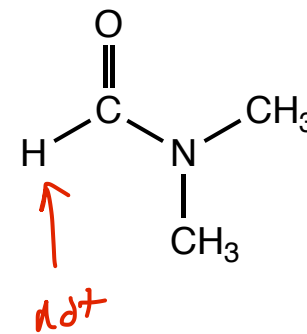
↑
not

4



↑
not

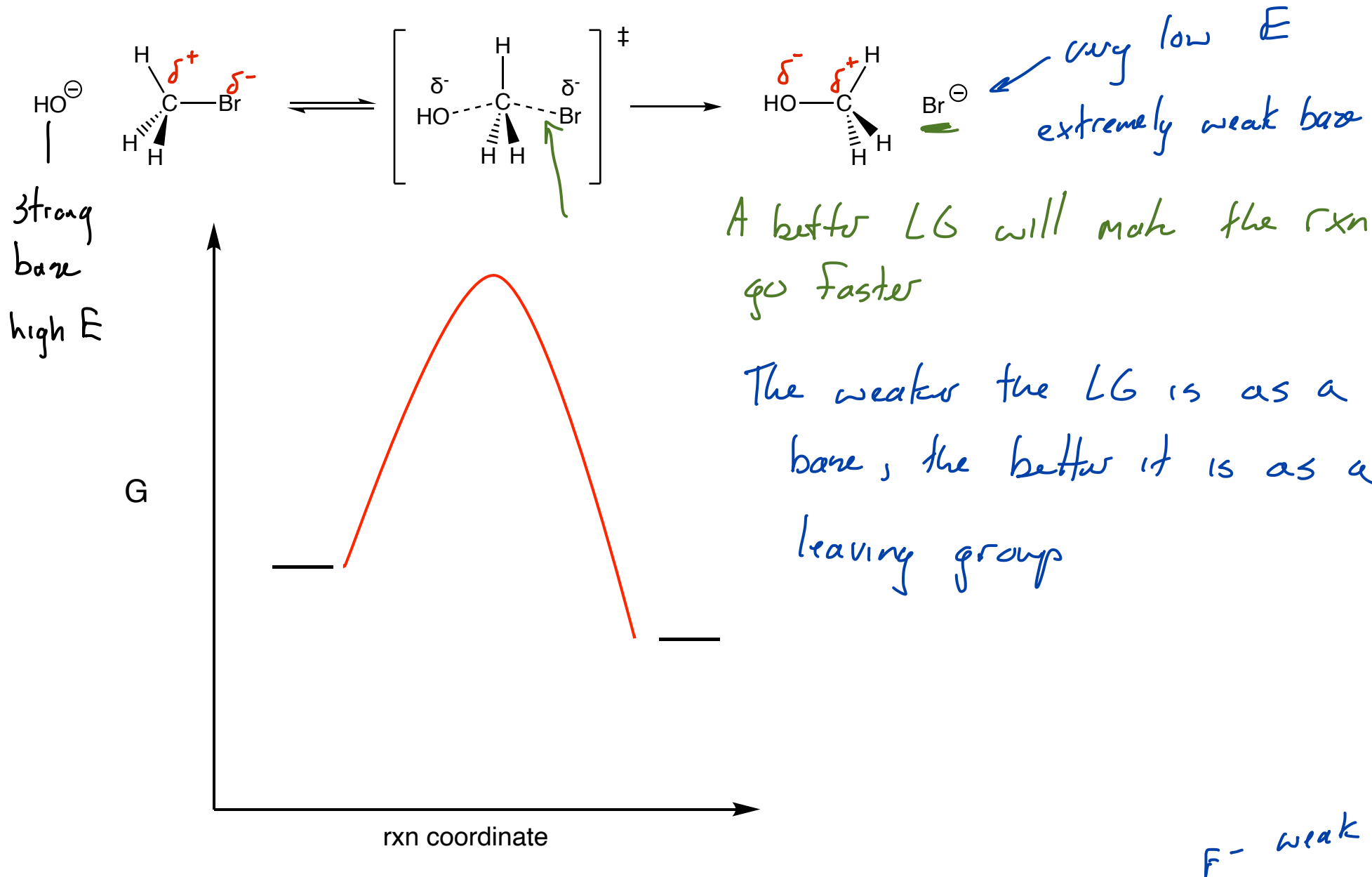
5



↑
not

Factors Affecting S_N2 Reactions: The Leaving Group

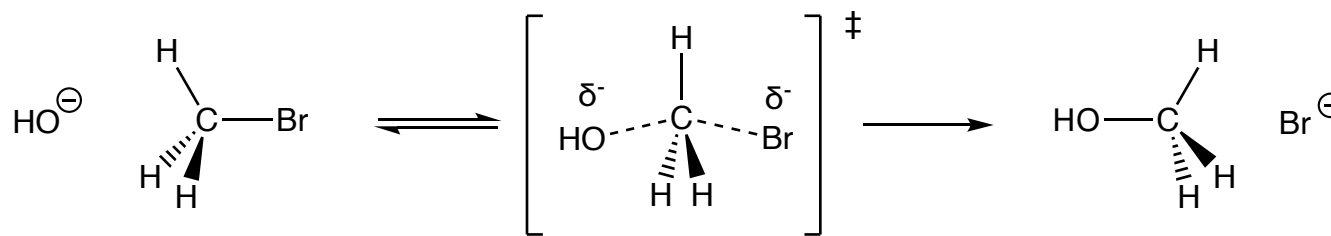
Section 11.3



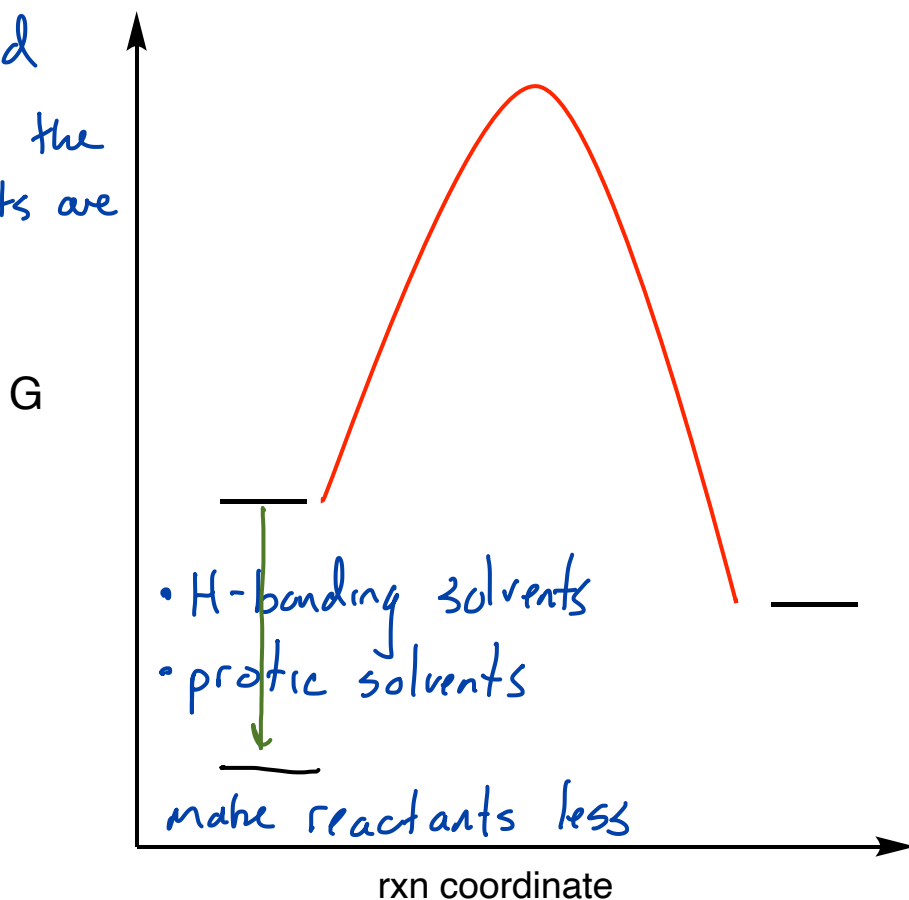
Relative reaction rates from Bruice, McMurry

I⁻ : Br⁻ : Cl⁻ : F⁻

30,000 : 10,000 : 200 : 1



polar solvents
required
because the
reactants are
polar



- H-bonding solvents
- protic solvents

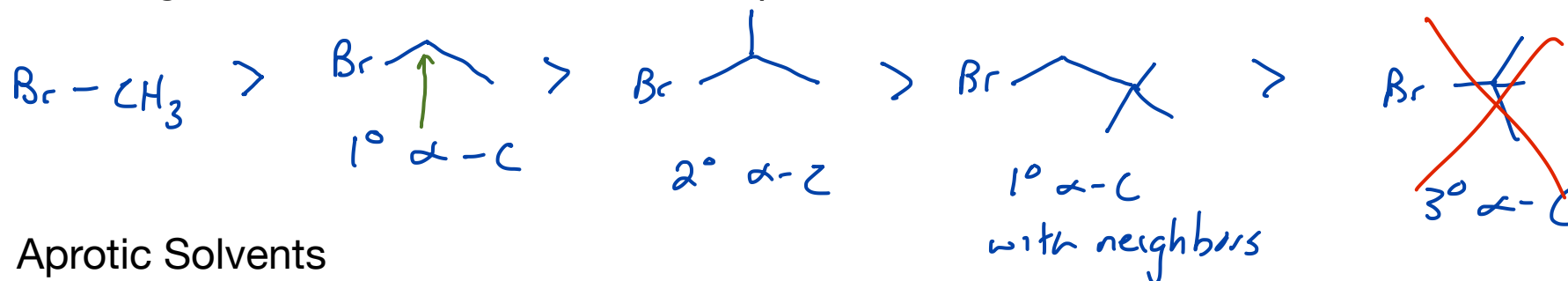
make reactants less
reactive

polar aprotic solvents
don't stabilize the
nucleophile so the
reactions go faster
in polar aprotic
solvents

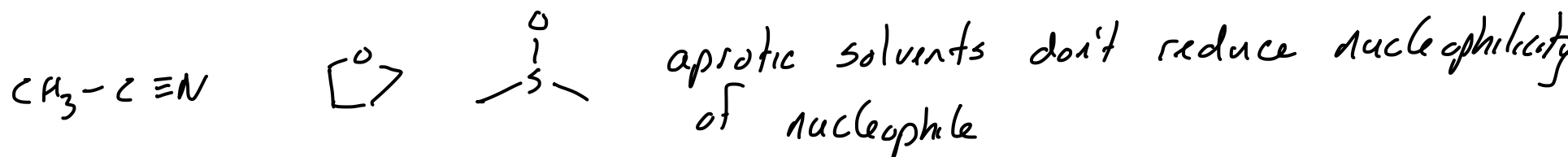
Factors Affecting S_N2 Reactions

Section 11.3

Low degree of substitution on α-C and β-C atoms



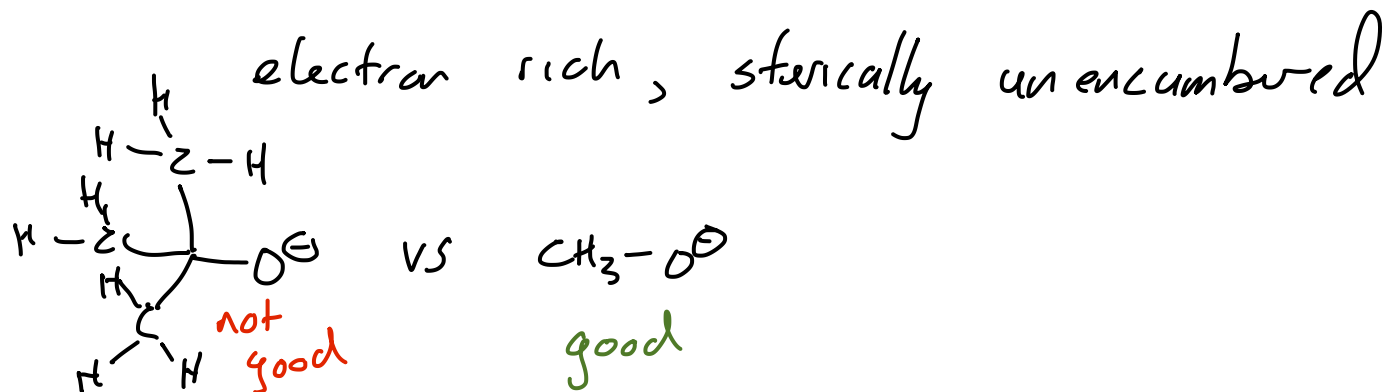
Aprotic Solvents



Good Leaving Group

leaving group should be an extremely weak base
conjugate of a strong acid

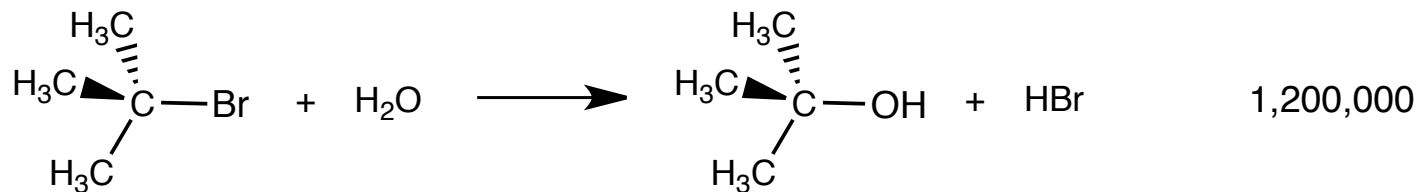
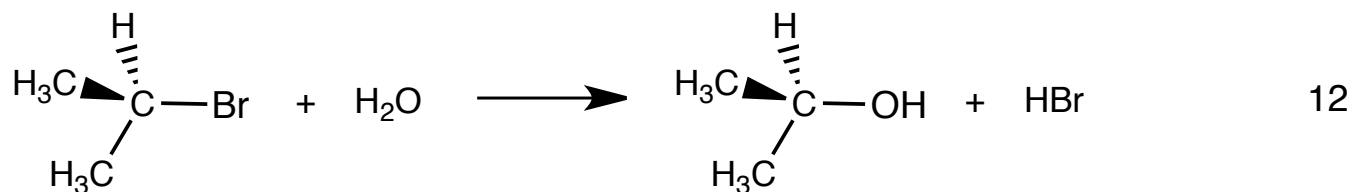
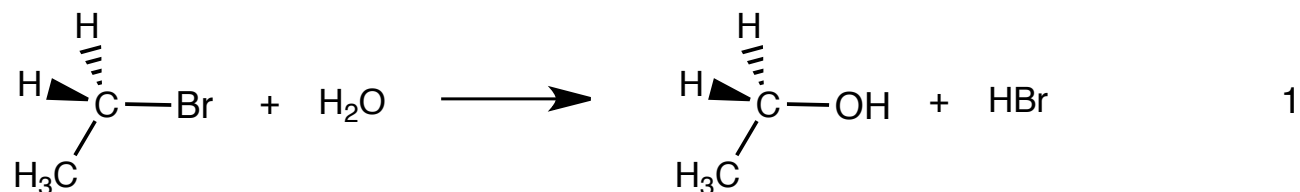
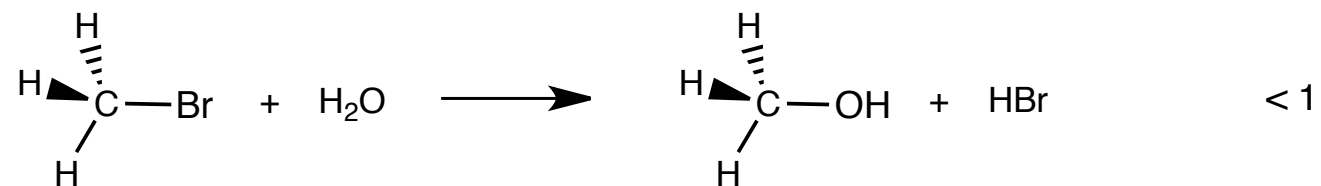
Good Nucleophiles



Rates of Hydrolysis of Alkyl Bromides

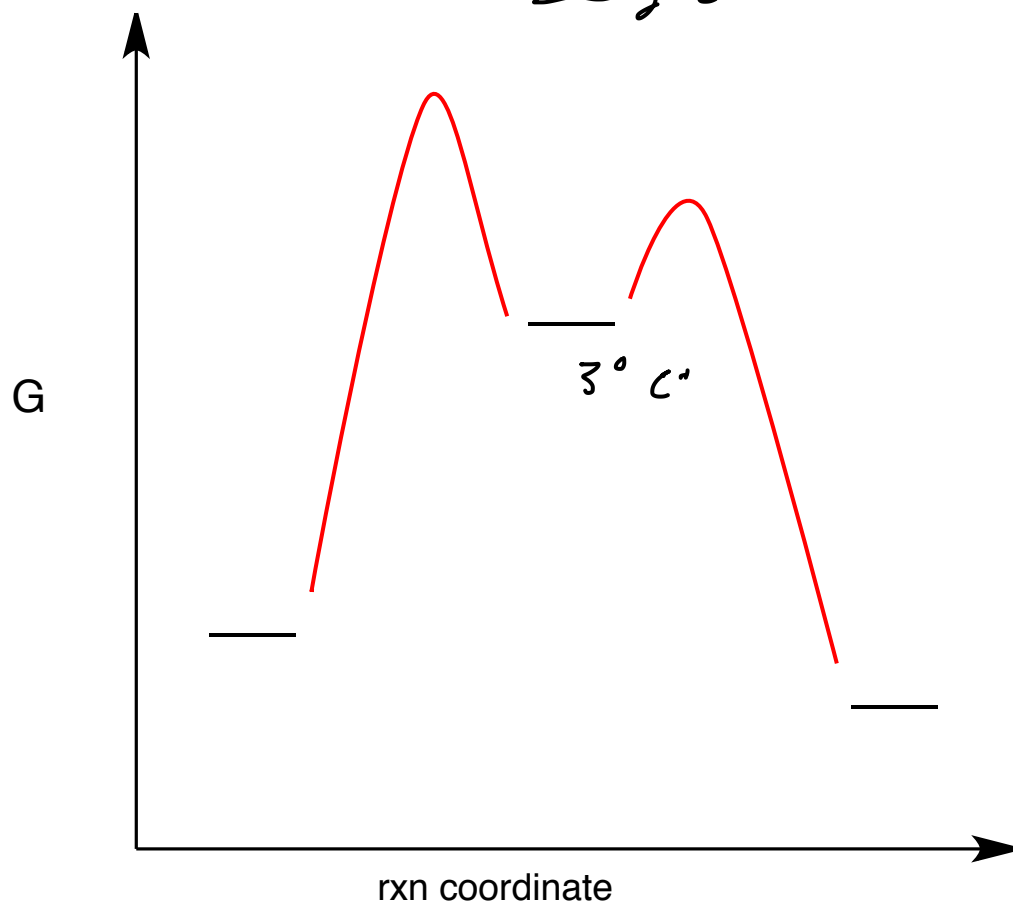
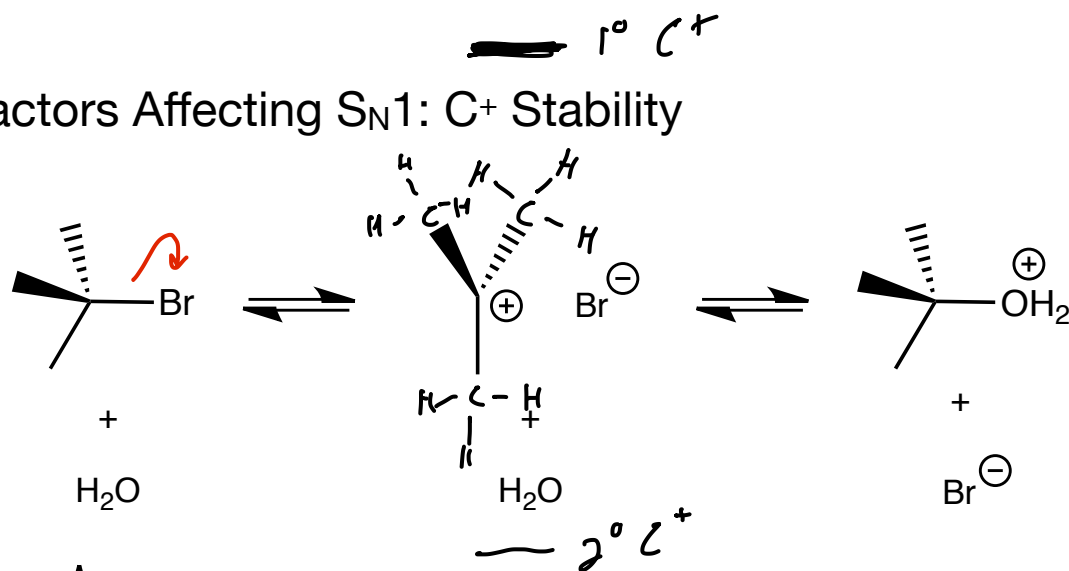
Section 11.4

Relative Reaction Rate¹



¹Organic Chemistry, a 10th edition. McMurray, OpenStax

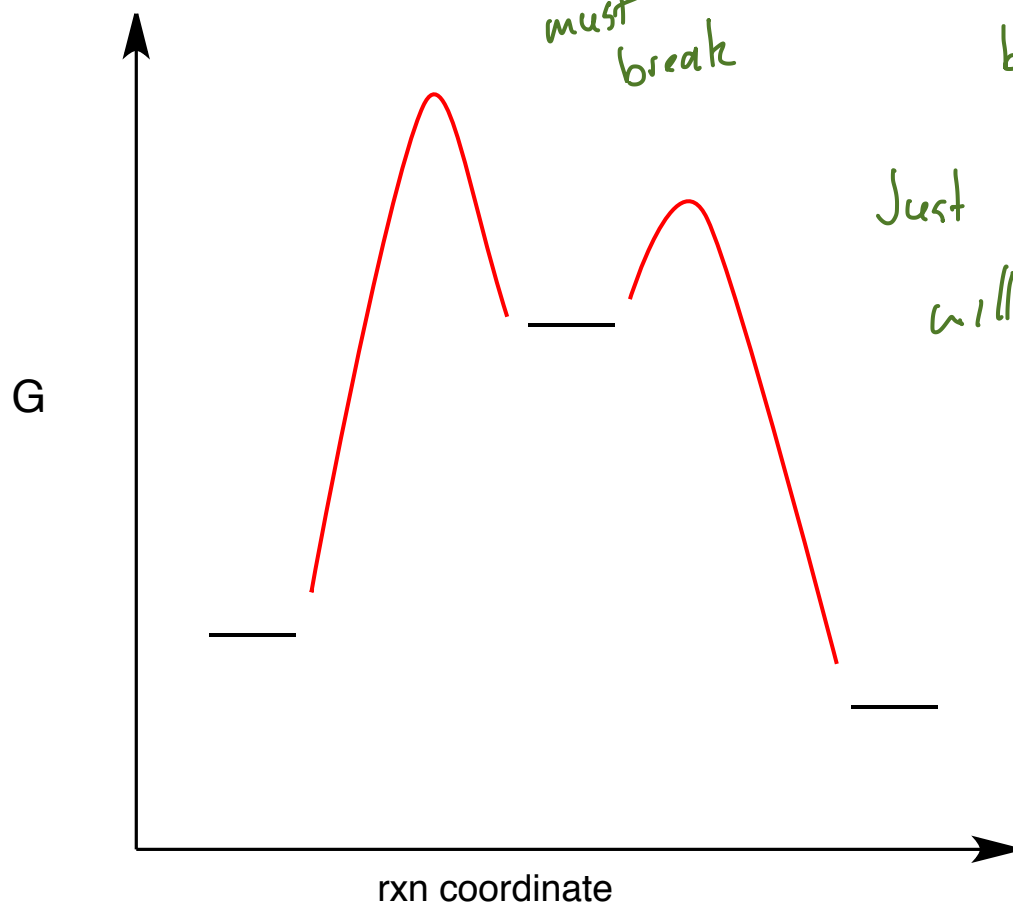
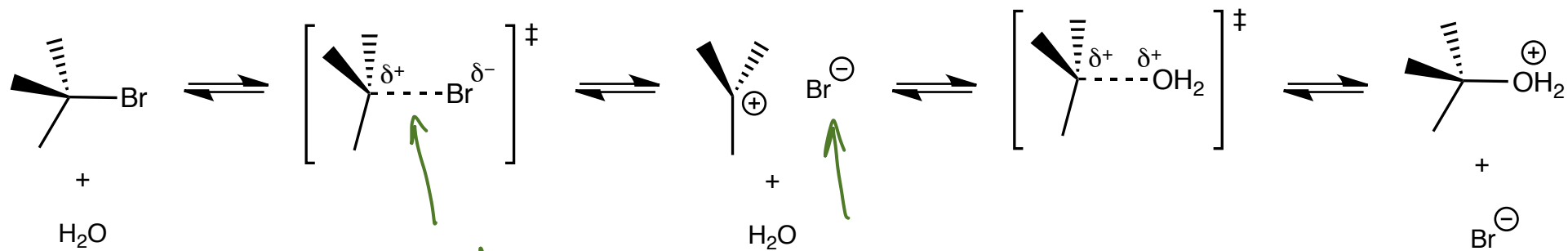
Factors Affecting S_N1: C⁺ Stability



1° C^+ too unstable to form under normal lab conditions
 2° C^+ are possible
 3° C^+ form relatively easily

Factors Affecting S_N1: The Leaving Group

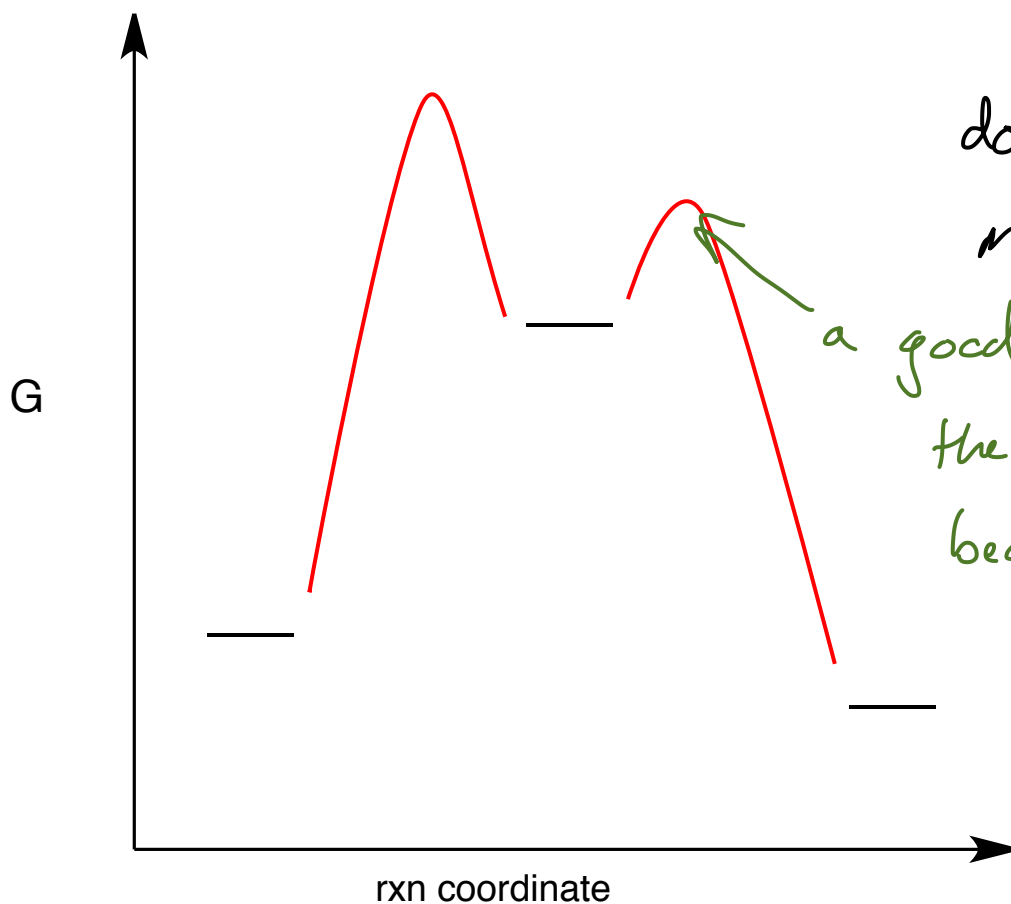
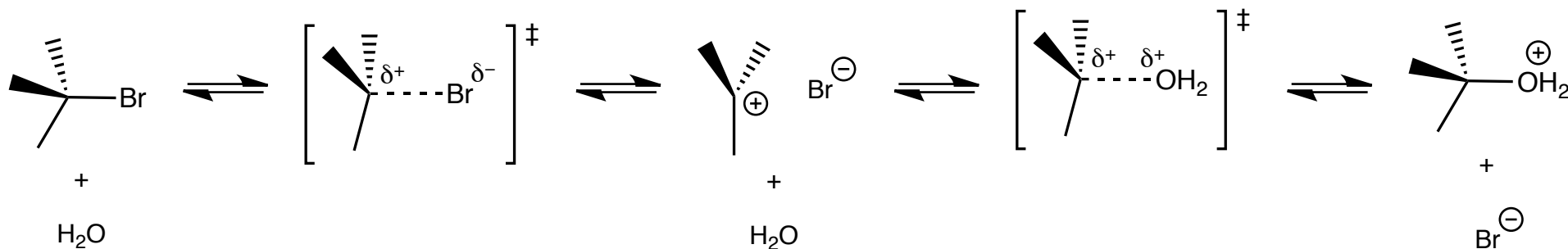
Section 11.5



Just like with S_N2 having a good LG will make the rxn go faster

Factors Affecting S_N1: The Nucleophile

Section 11.5



does adding a good nucleophile make the rxn faster? No
 a good Nu lowers this barrier but the reaction rate won't increase because we have to wait to overcome the first barrier.

Factors Affecting S_N1: The Solvent

Section 11.5

