Session 11 Worksheet

Alkenes and E1 Reactions

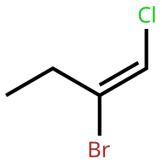
E and Z Designation:

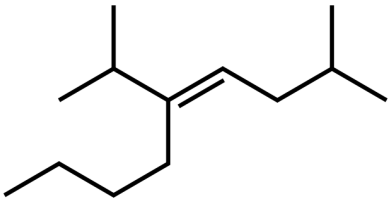
Priority goes to the atom with highest_____

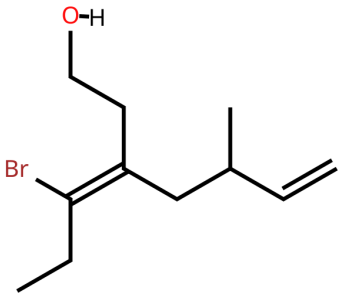
(E) configuration:

(Z) configuration:

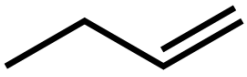
Assign Designation:

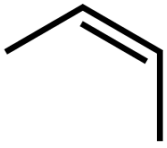




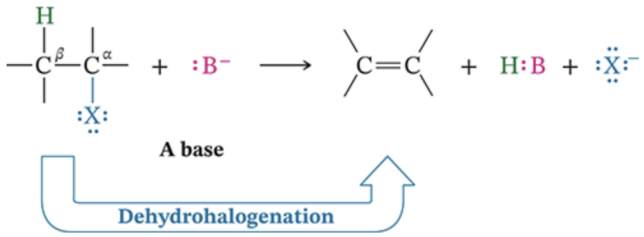


Stability of Alkenes:





Dehydrohalogenation:



E2 Reactions

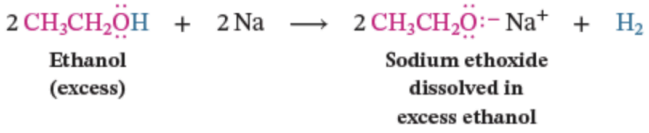
E2

Uses a _____ mechanism

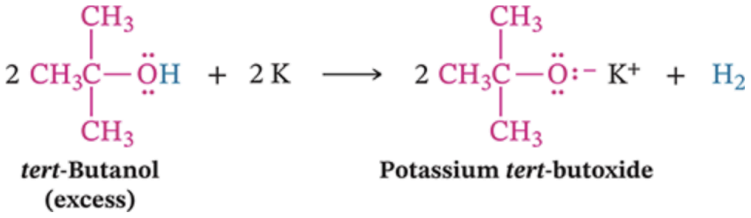
Instead of a nucleophile, elimination uses a _____, specifically a _____ for E2

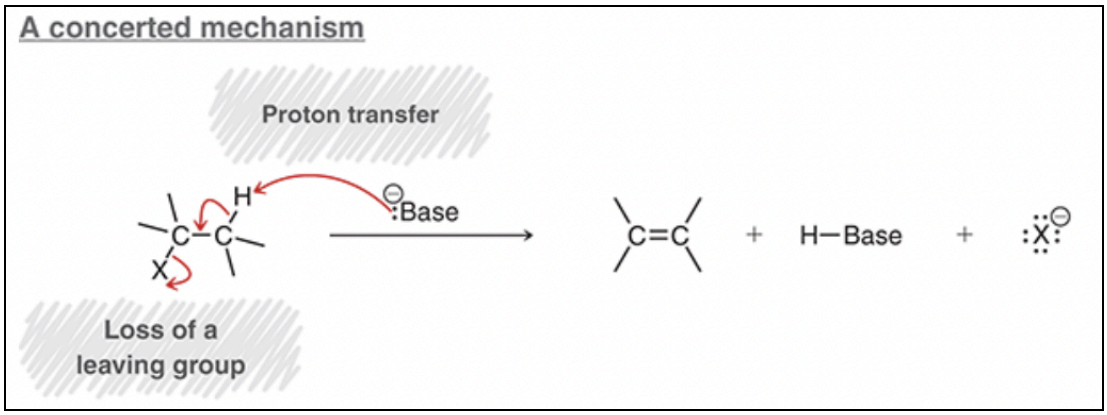
Alkoxide Base Synthesis:

> **HELPFUL HINT**
> **EtONa/EtOH is a common abbreviation for sodium ethoxide dissolved in ethanol.**



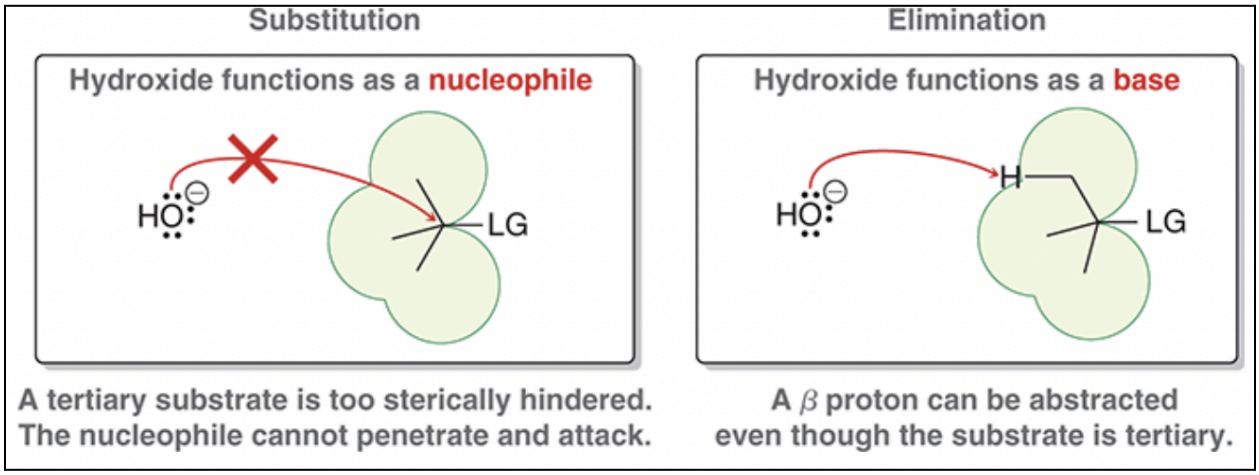
> **HELPFUL HINT**
> ***t*-BuOK/*t*-BuOH represents potassium *tert*-butoxide dissolved in *tert*-butanol.**



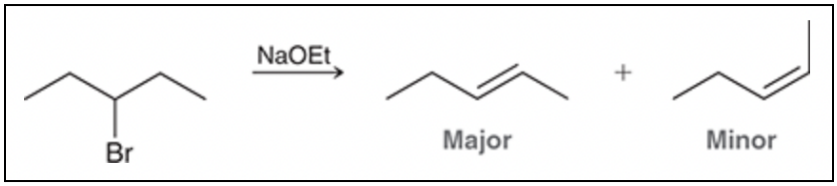


Kinetics:

E2 reacts better with _____ alkyl halides

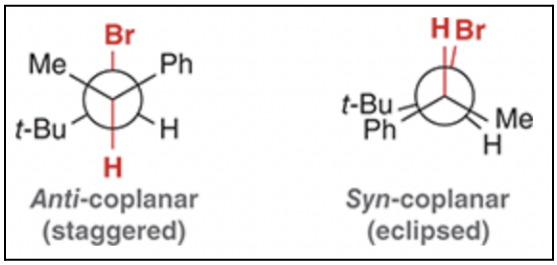


Stereoselectivity of E2:



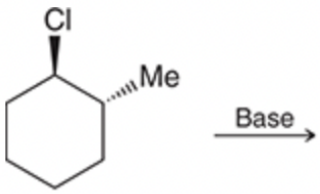
Antiperiplanar (Anti-coplanar):

Synperiplanar (Syn-coplanar):

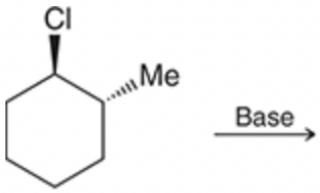


Example

What is observed:



What is NOT observed:



Types of strong bases:

Regioselectivity:

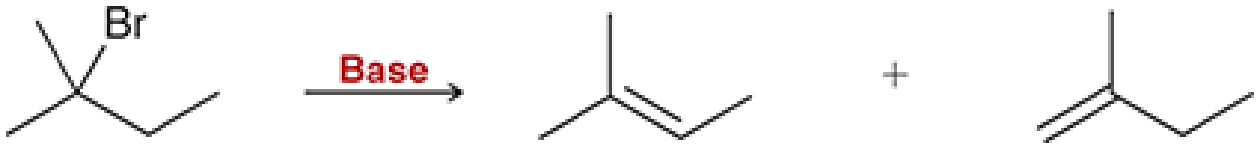
When a double bond can form in different regions of the compound, the reaction is

_____

Zaitsev product:

Hoffmann product:

Ex:



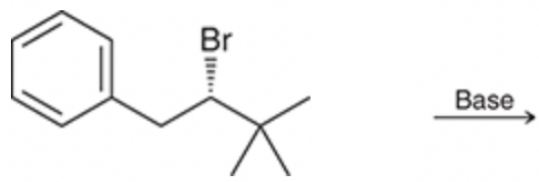
<u>The base you use determines the major/minor products</u>

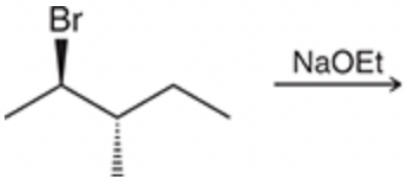
Bulky bases:

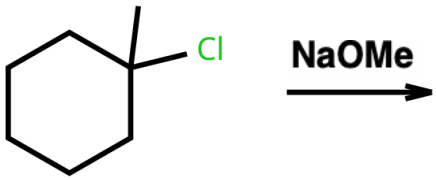
Non-bulky bases:

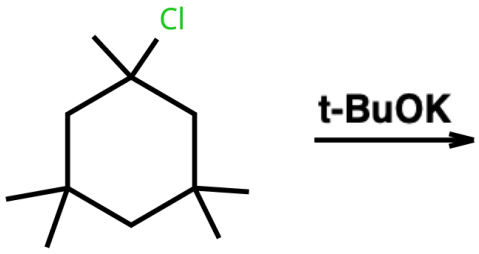
Common types of sterically hindered (bulky) bases:

Practice: Determine the major/minor products of the following E2 reaction:

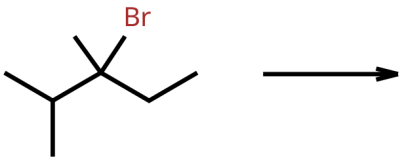


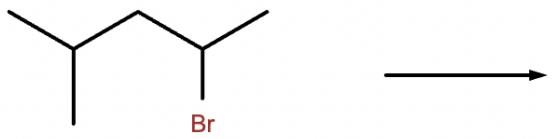


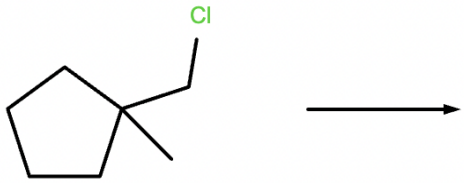

Cl
NaOMe

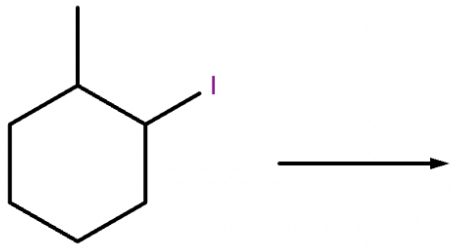

Cl
t-BuOK

Practice: E2 mechanism with major products in mind







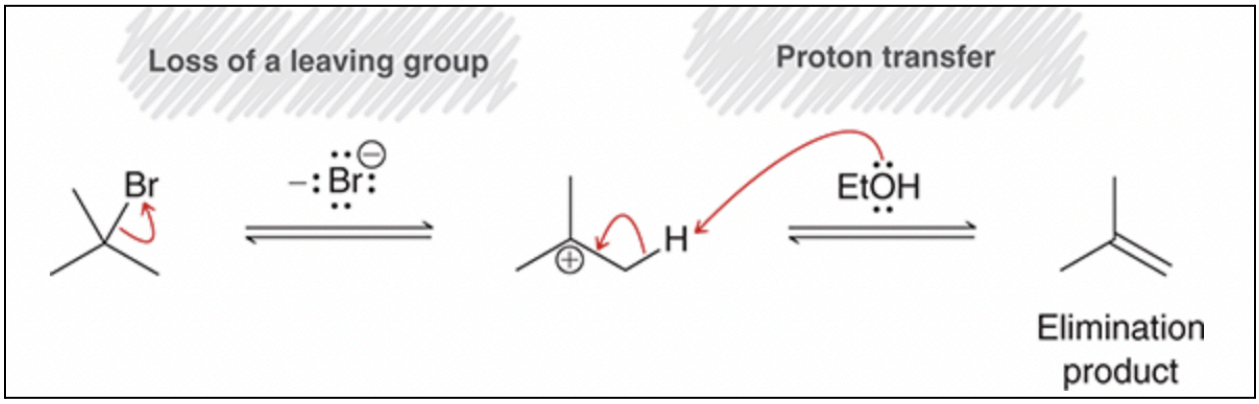


E1 Reactions

E1

E1 uses a _____ mechanism

Requires a _____ base

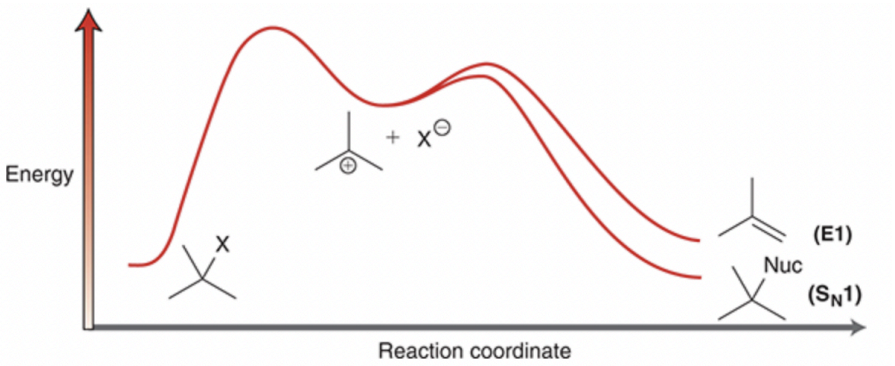


Kinetics:

E1 can only react with a _____ alkyl halide

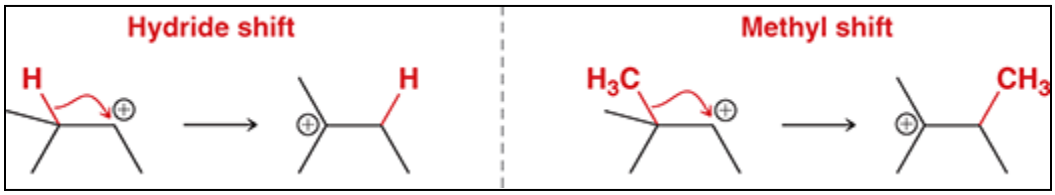
<u>In this reaction, both E1 and Sn1 products can be formed</u>

Energy diagram:

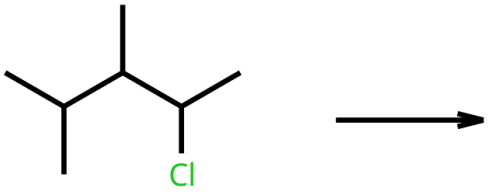


Types of weak bases

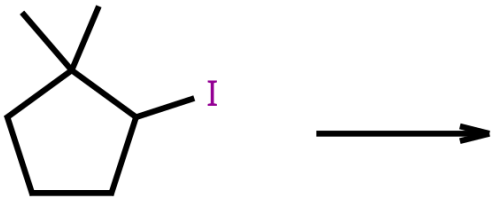
Just like with Sn1, our carbocation can undergo _____ to form the most stable product



Example (hydride shift):



Example (methyl shift):



Substitution/Elimination Reactions 101: How to determine when you're using Sn1/E1/Sn2/E2

1. **Determine the function of the reagent:**

Elimination:

Substitution:

Strong base Weak nucleophile	Strong base Strong nucleophile	Weak base Strong nucleophile	Weak base Weak nucleophile
DBN DBU	$HO^{\ominus}$ $MeO^{\ominus}$ $EtO^{\ominus}$	$I^{\ominus}$ $Br^{\ominus}$ $Cl^{\ominus}$ $RS^{\ominus}$ $HS^{\ominus}$ RSH H_2S	H_2O MeOH EtOH

2. **Look at your substrate to determine the mechanism**

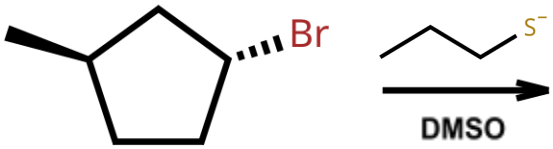
Memorize this diagram!!

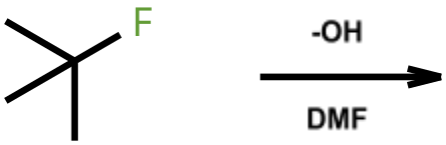
	Strong base Weak nucleophile	Strong base Strong nucleophile	Weak base Strong nucleophile	Weak base Weak nucleophile
1°	E2	E2 / S_N2	S_N2	✗
2°	E2	E2 / S_N2	S_N2	✗
3°	E2	E2	S_N1	S_N1 / E1

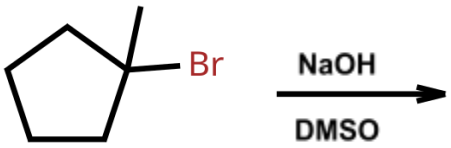
3. **Consider any regiochemistry or stereochemistry**

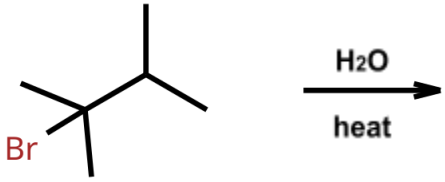
	Regiochemistry	Stereochemistry
Sn2		
E2		
Sn1		
E1		

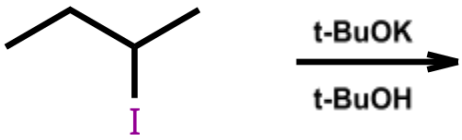
Practice problems :)






Br
NaOH
DMSO


Br
H2O
heat


I
t-BuOK
t-BuOH