(7) **Today**

Sections 11:7 - 11:11: Elimination Reactions: E1, E2, E1cB

Section 17.6: Alcohols and Elimination Reactions

Next Class (8)

Sections 11.7 - 11.11: Elimination Reactions: E1, E2, E1cB

Competition between S_N1, E1, S_N2, and E2

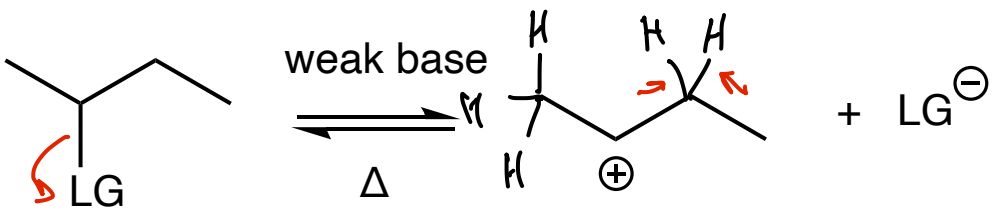
Chap 12: Mass Spectrometry and Infrared Spectroscopy

(9) **Second Class from Today**

Chap 12: Mass Spectrometry and Infrared Spectroscopy

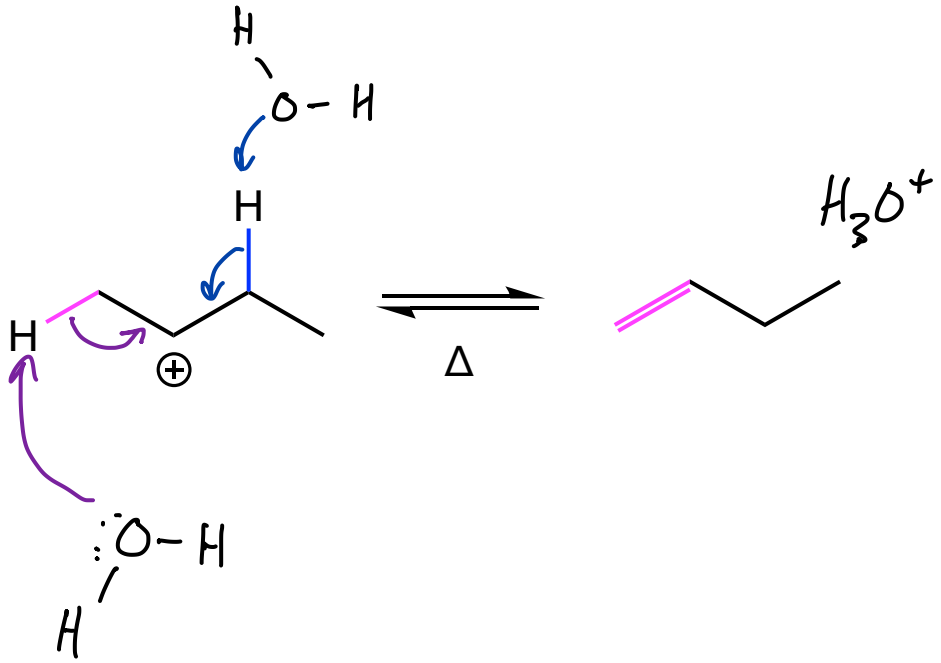
Third Class from Today (10)

Chap 13 : Nuclear Magnetic Resonance Spectroscopy



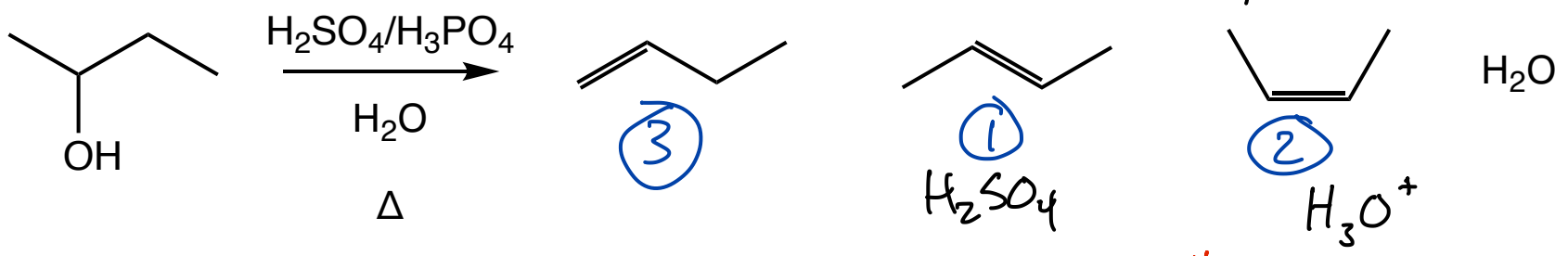
waiting for 1 molecule to ionize

empty p orbital on C+ draws e⁻ density away from neighboring σ bonds making β-H's more acidic

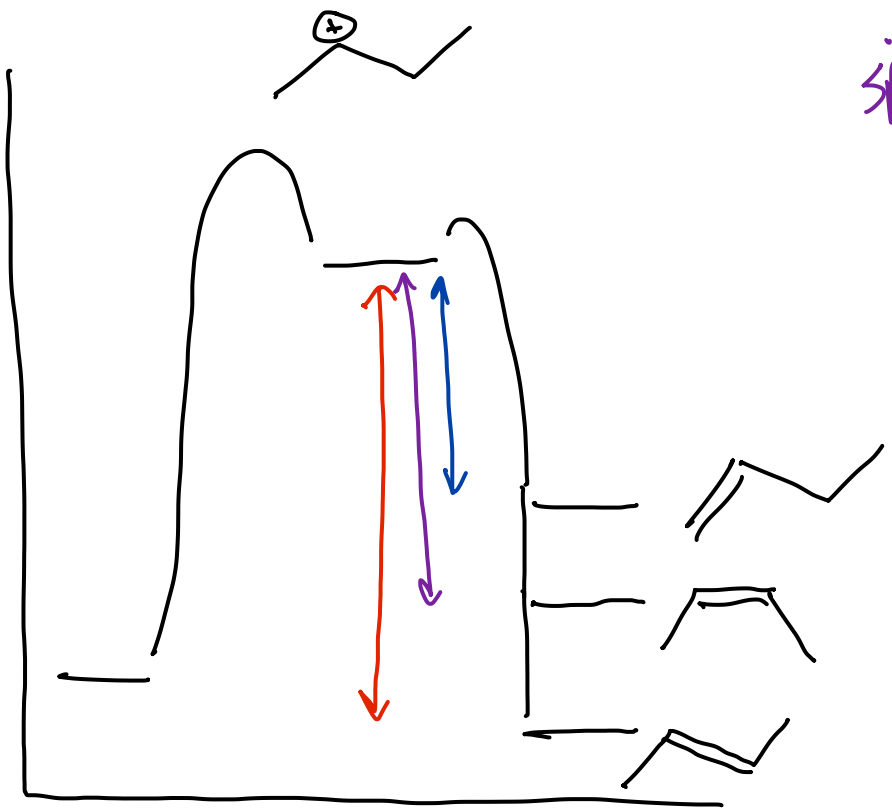


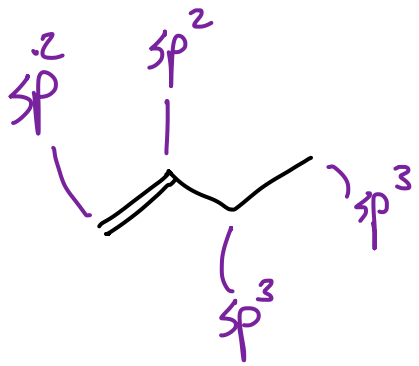
cross-cross bond shorthand for

The products can react and reform the intermediate Equilibrium rxn so product distribution is under thermodynamic control... most stable prod is major prod



alkenes react with acid



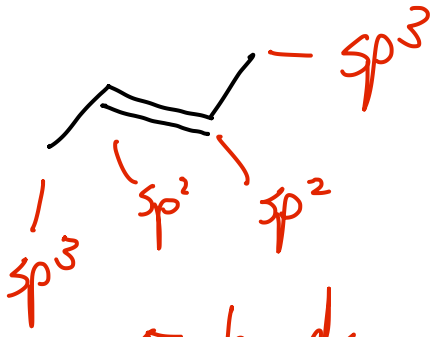


σ-bond

~~sp^2-sp^2~~

~~sp^2-sp^3~~

weaker sp^3-sp^3



σ-bonds

~~sp^3-sp^2~~

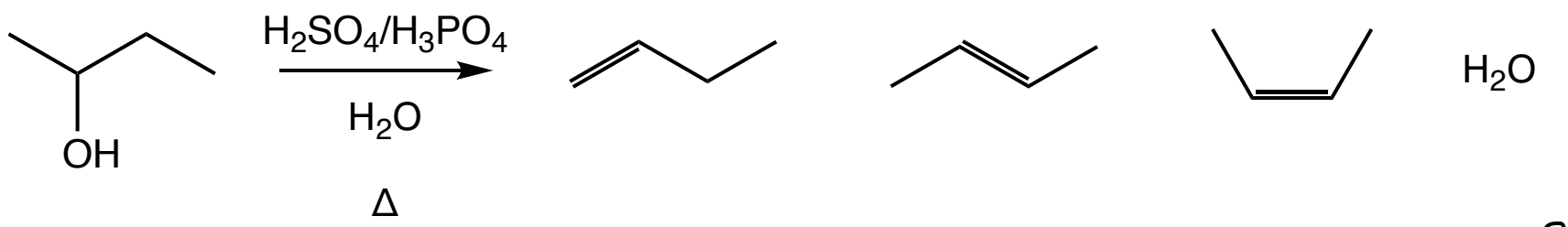
~~sp^2-sp^2~~

stronger sp^2-sp^3

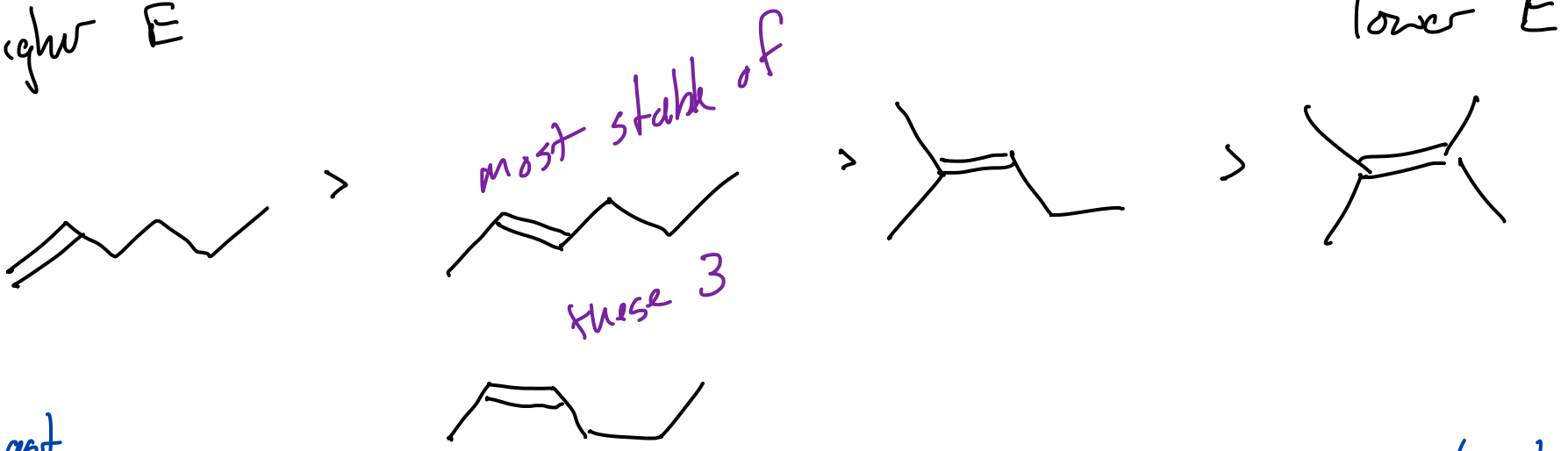
33% s
67% p

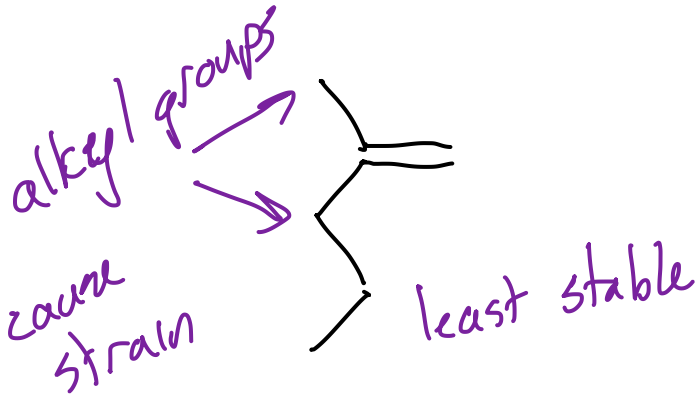
25% s
75% p

Section 7.6: Stability of Alkenes

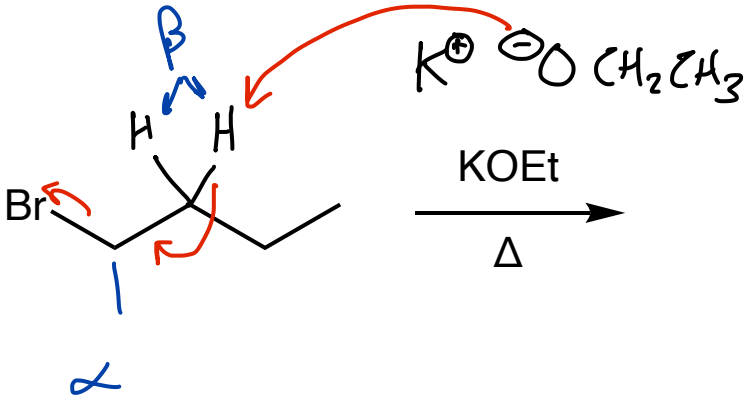


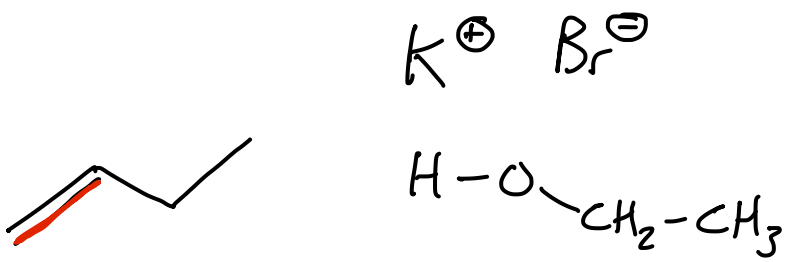
Higher E





Section 7.6: Stability of Alkenes





products don't react with each other

not an equilibrium

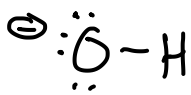
not under thermodynamic control

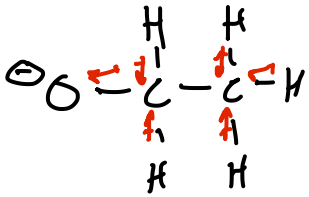
product distribution is under kinetic control

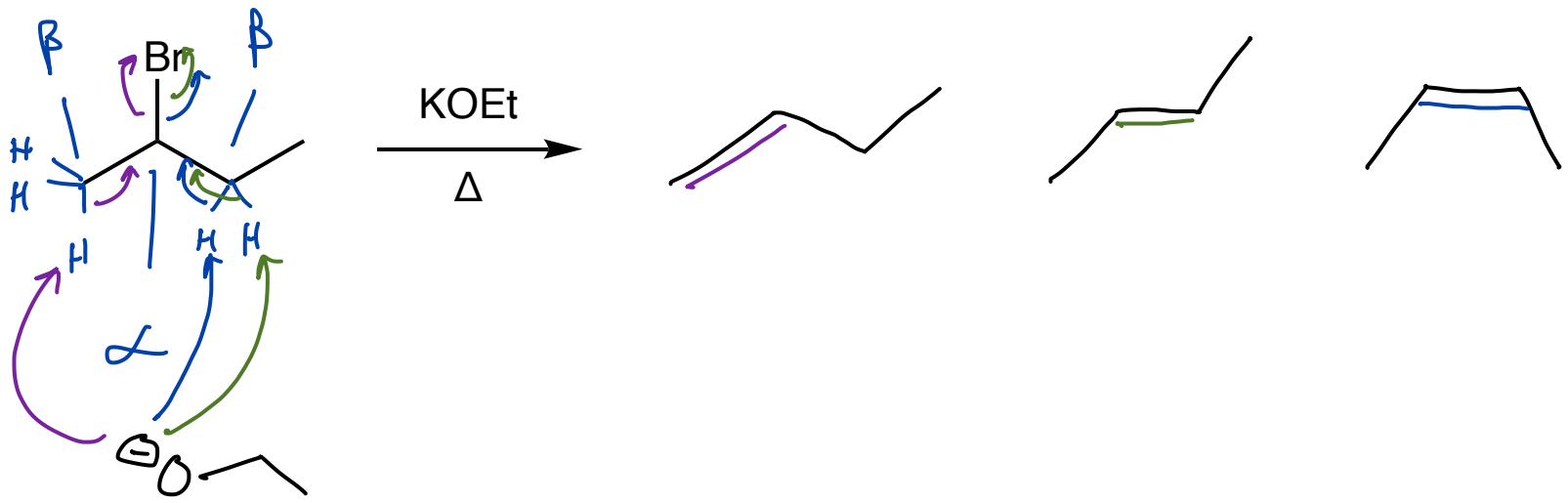
fastest forming product is major product

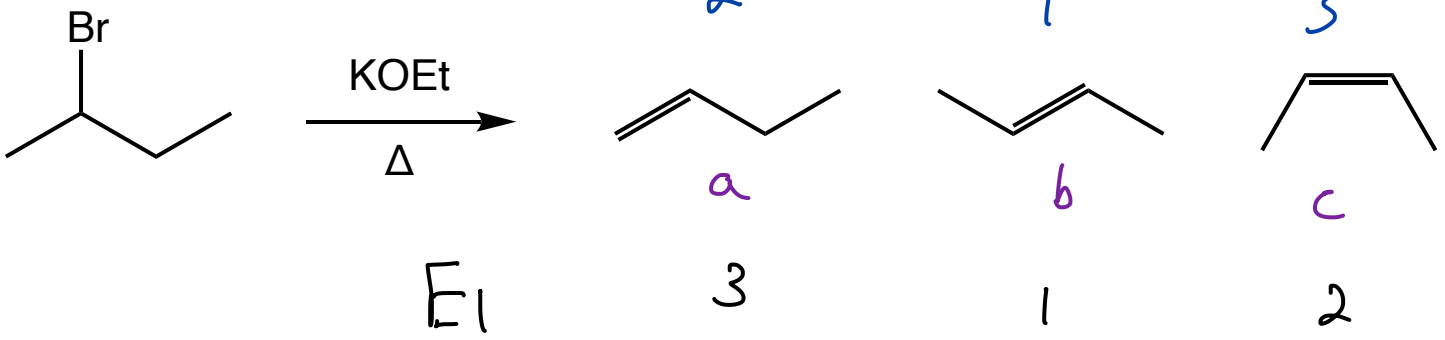
Et = ethyl = CH_2CH_3

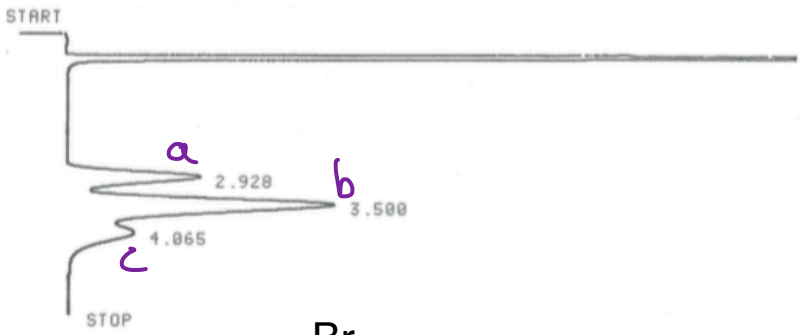
Me = methyl = CH_3

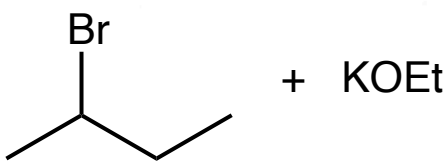





β
Br
β
H
H
H
H
H
α
KOEt
Δ

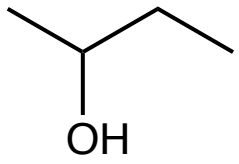






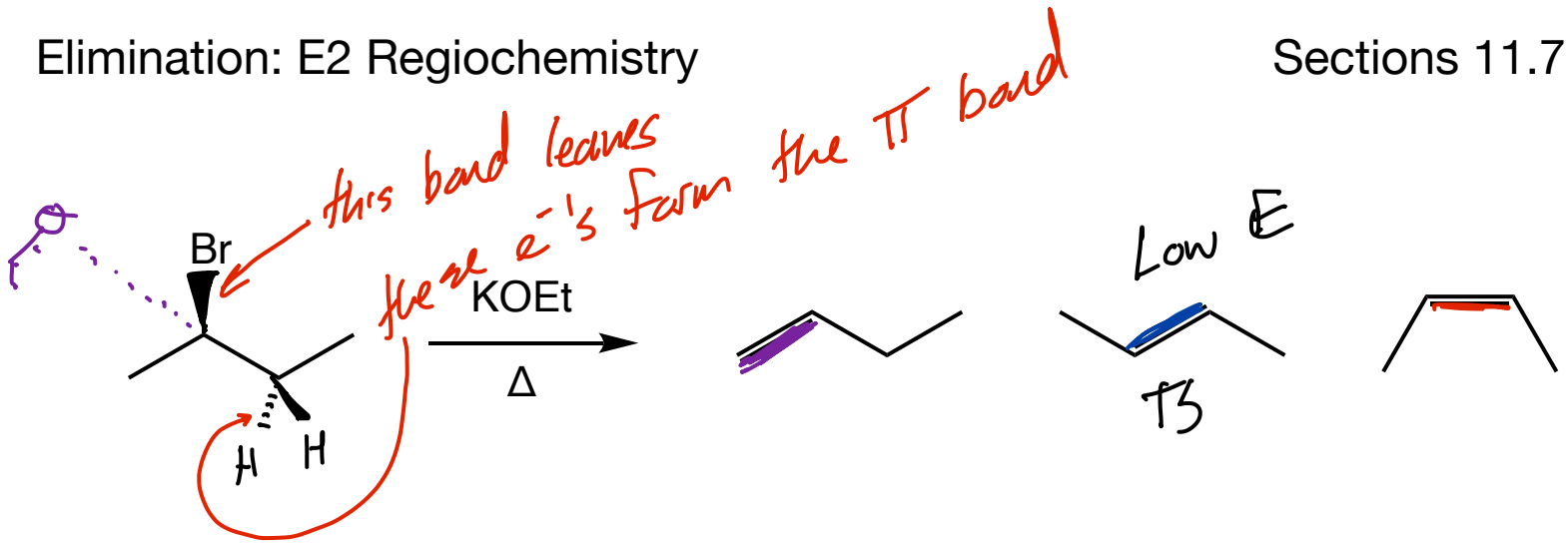
+ KOEt

E2



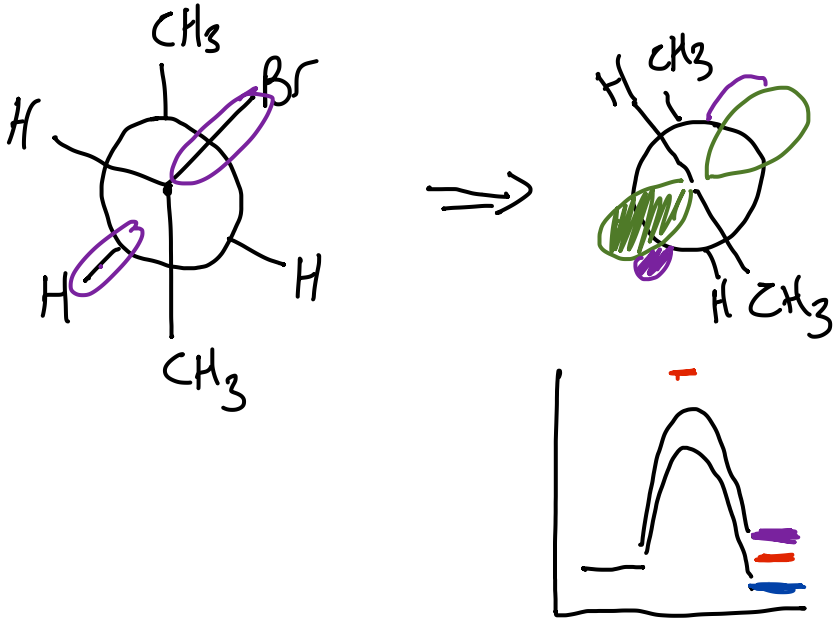
+ H_2SO_4/H_3PO_4 (aq)

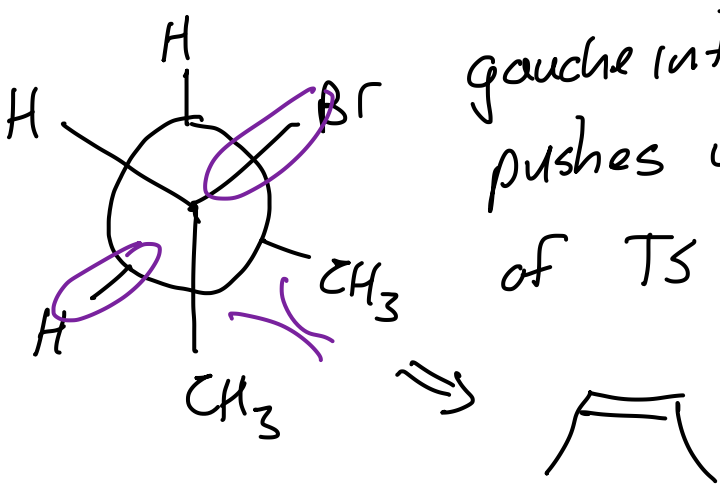
E1



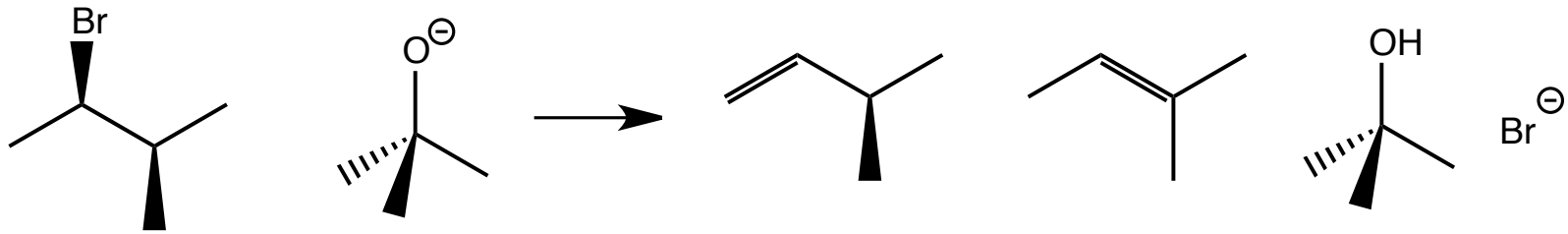
antiperiplanar arrangement between β-C to β-H bond and the α-C to LG bond is required

rotate back C 120° clockwise



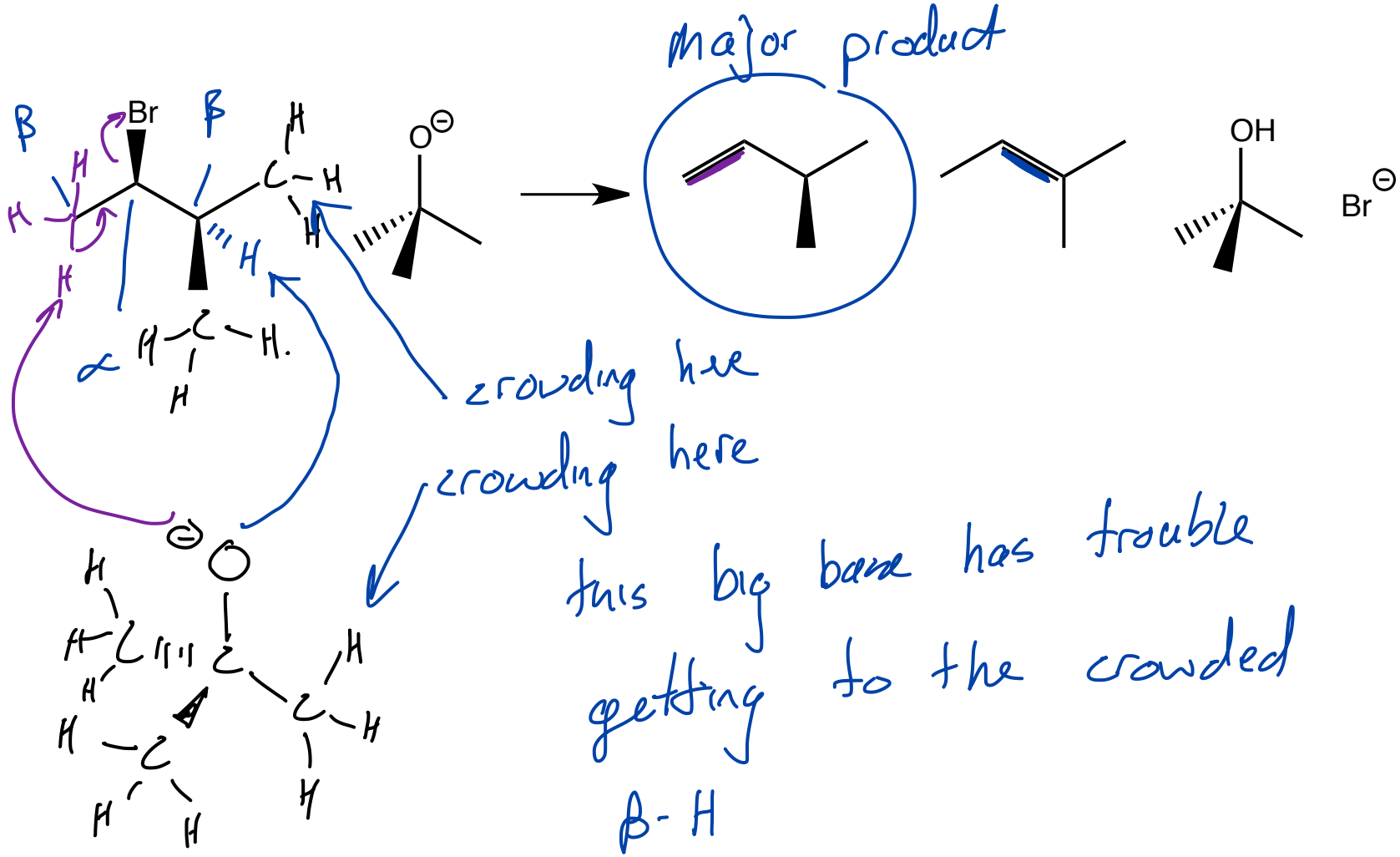


gauche interaction pushes up E of TS



Big base exception: big base can't get into crowded spots

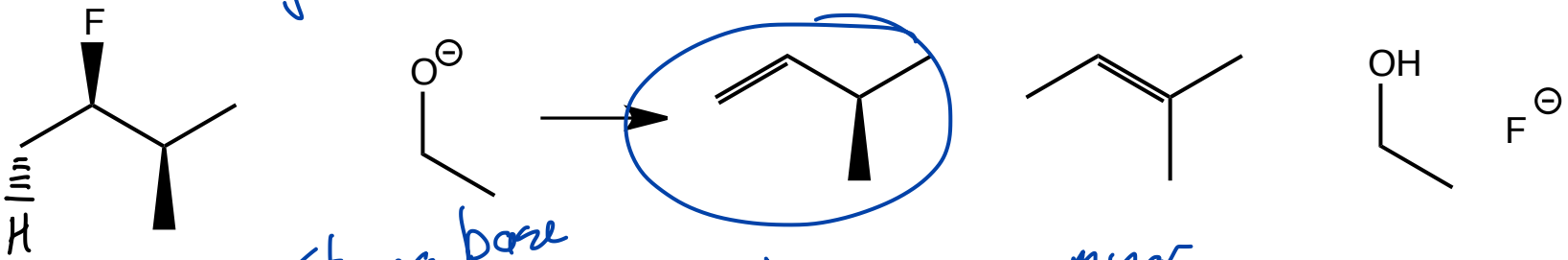
Poor LG exception: LG doesn't leave quickly and changes the kinetics



Big base exception encourages formation of the less crowded alkene

F^- NR_3

not a great LG ... it is slow to leave

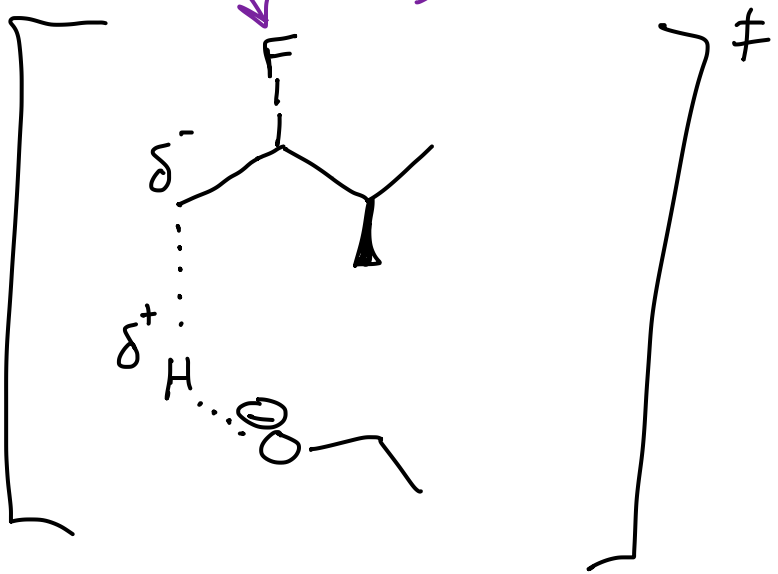


strong base

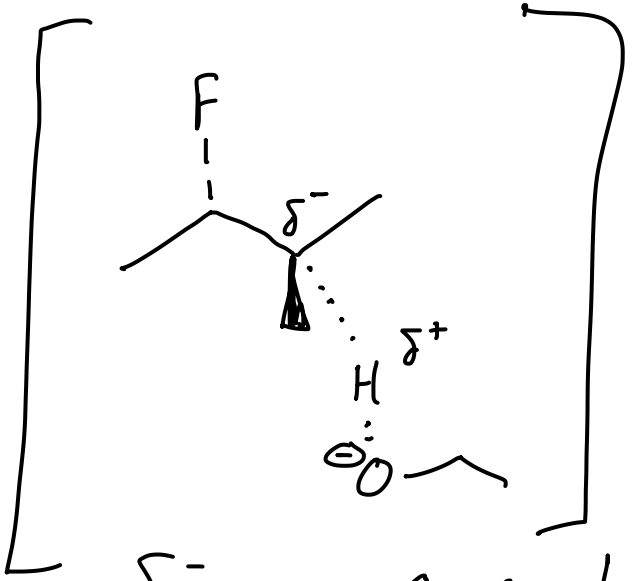
major

minor

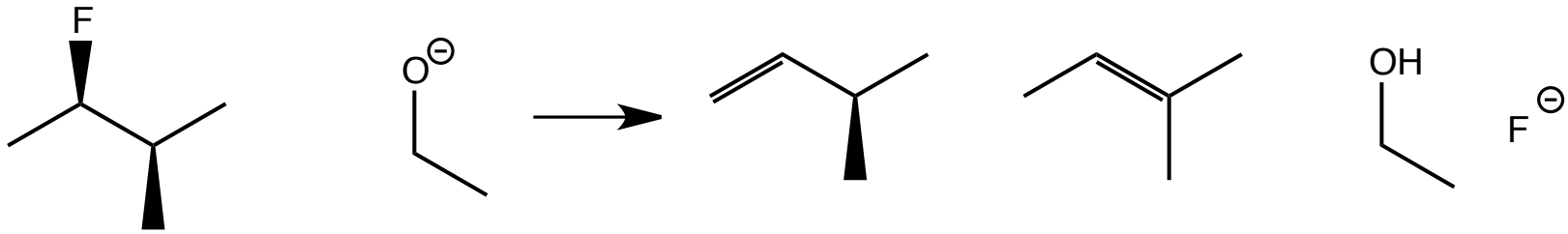
F is supposed to carry away ⊖ but does it slowly so δ- builds up on β-C

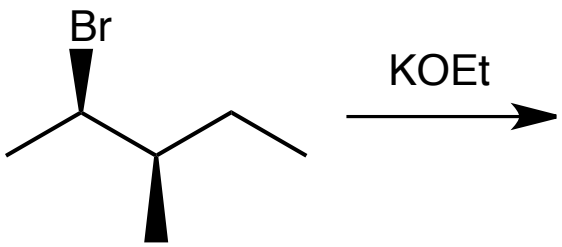


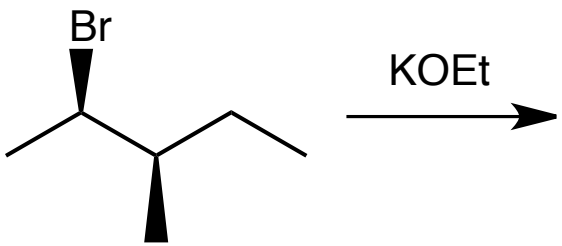
δ- on 1° C is lower in E so this one forms more quickly

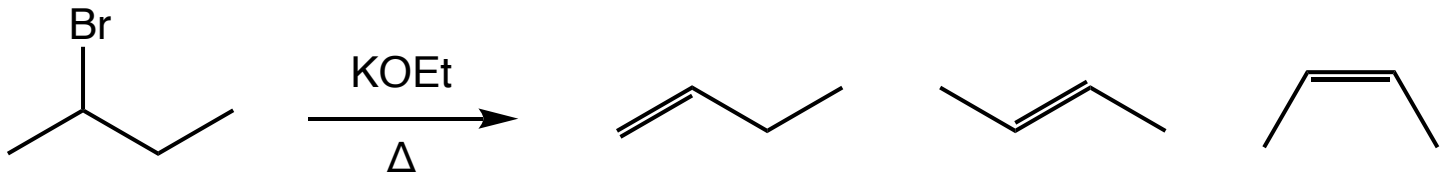


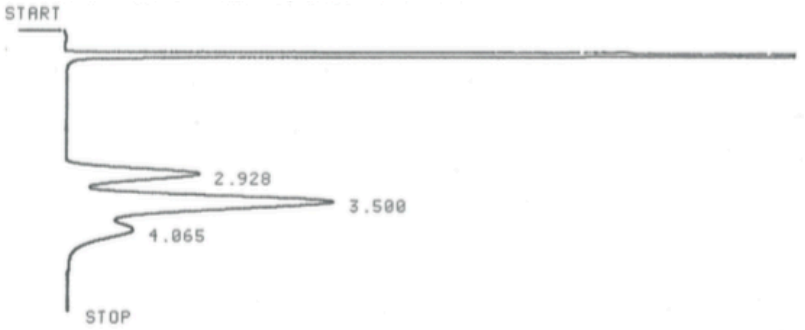
δ- on 3° C because e- density on neighbors repells δ- on β-C

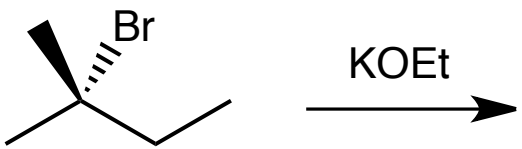

F
O
OH
F


Br
KOEt


Br
KOEt


Br
KOEt
Δ


START
2.928
3.500
4.065
STOP


Br
KOEt

(8) **Today**

Sections 11.7 - 11.11: Elimination Reactions

Section 17.6: Alcohols and Elimination Reactions

Next Class (9)

Competition between S_N1, E1, S_N2, and E2

Chap 12: Mass Spectrometry and Infrared Spectroscopy

(10) **Second Class from Today**

Chap 12: Mass Spectrometry and Infrared Spectroscopy

Third Class from Today (11)

Chap 13 : Nuclear Magnetic Resonance Spectroscopy

(9) **Today**

Sections 11.7 - 11.11: Elimination Reactions

Section 17.6: Alcohols and Elimination Reactions

Competition between SN1, E1, SN2, and E2

Next Class (10)

Chap 12: Mass Spectrometry and Infrared Spectroscopy

(11) **Second Class from Today**

Chap 12: Mass Spectrometry and Infrared Spectroscopy

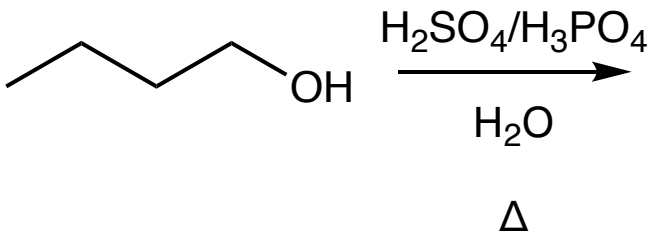
Third Class from Today (12)

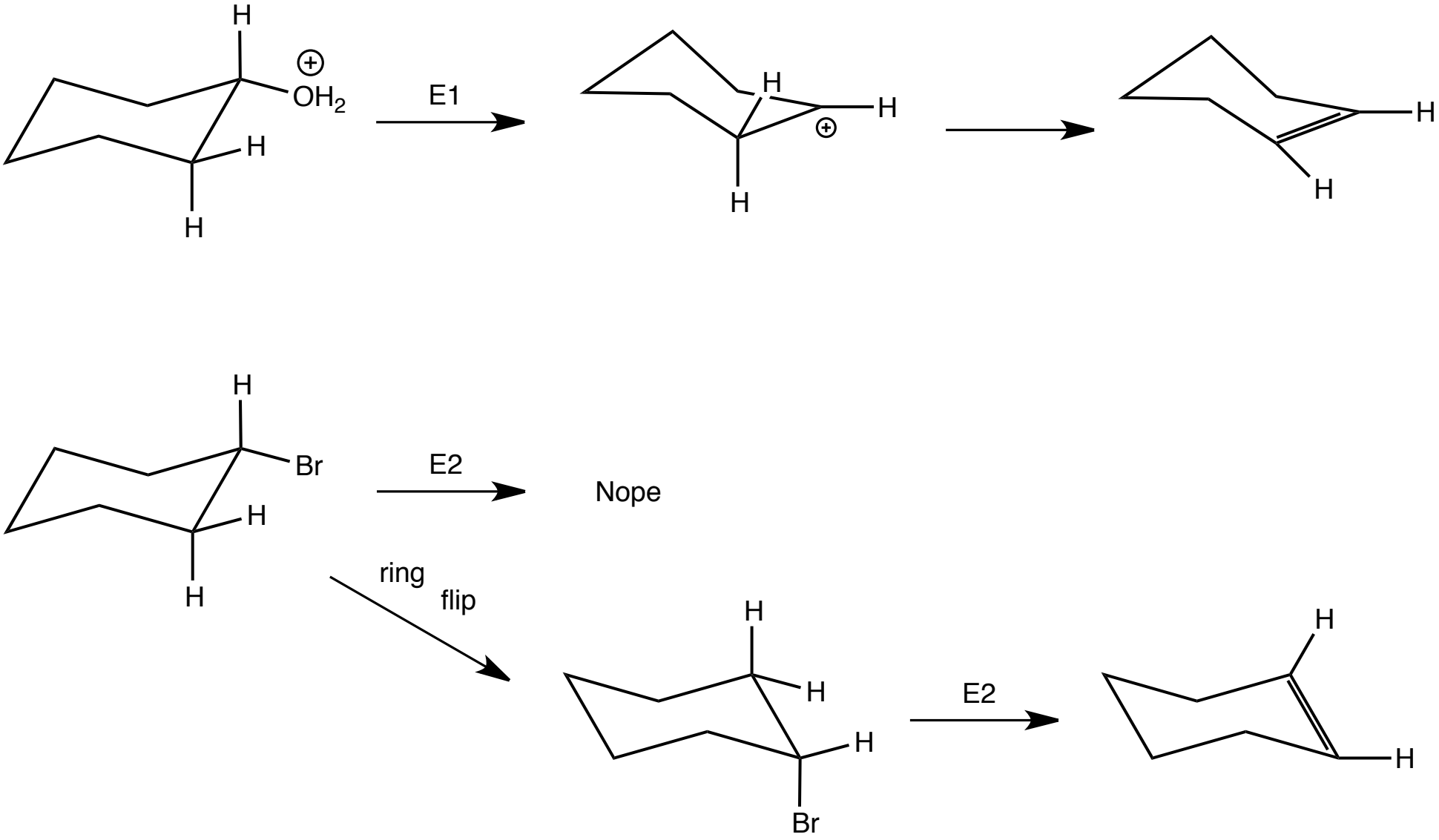
Chap 13 : Nuclear Magnetic Resonance Spectroscopy

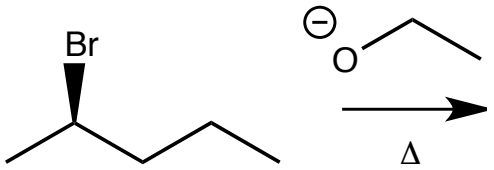
Test one week from today

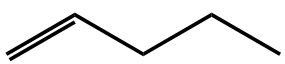
Elimination: Issues with Acid Catalyzed Elimination of Alcohols

Sections 11.7 - 11.11 and 17.6

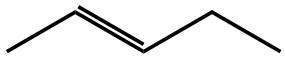



H
OH2
H
H
E1
H
H
H
H
H
Br
H
H
E2
Nope
ring
flip
H
H
H
Br
E2
H
H

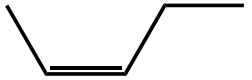




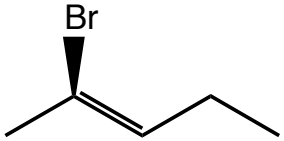
A



B



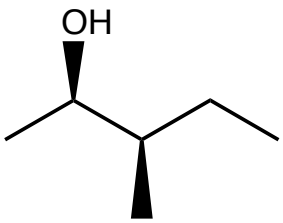
C



D

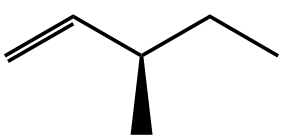
Elimination

Practice

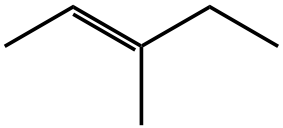


H_2SO_4/H_3PO_4

Δ



A



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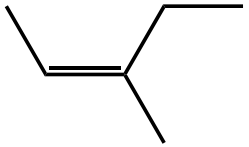
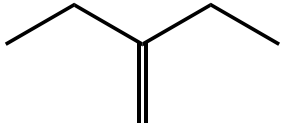


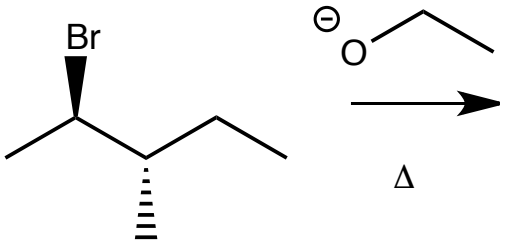
C

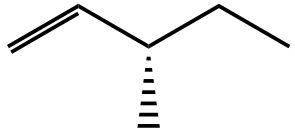


D

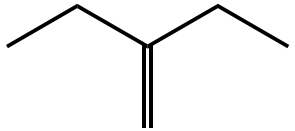
Elimination

Practice

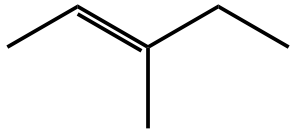




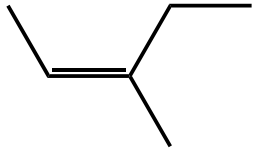
A



B



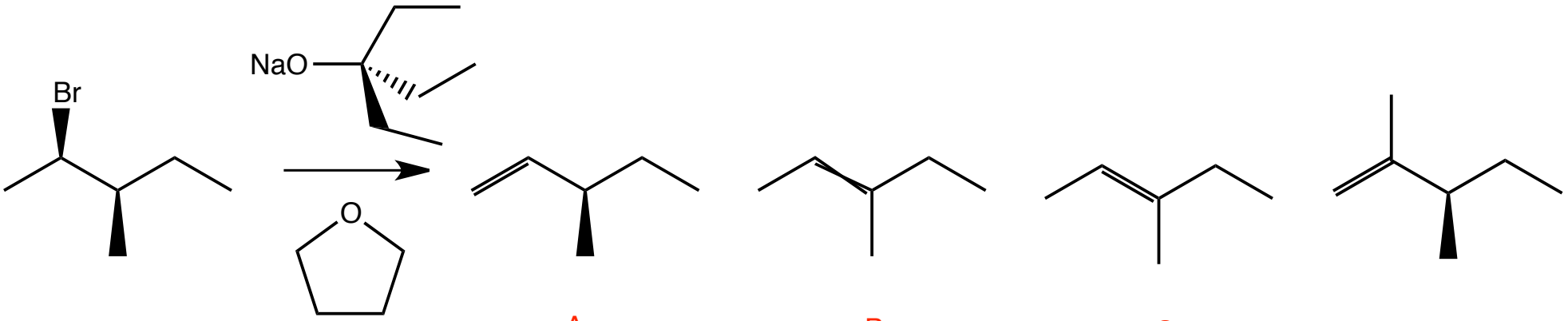
C



D

Elimination

Practice



A

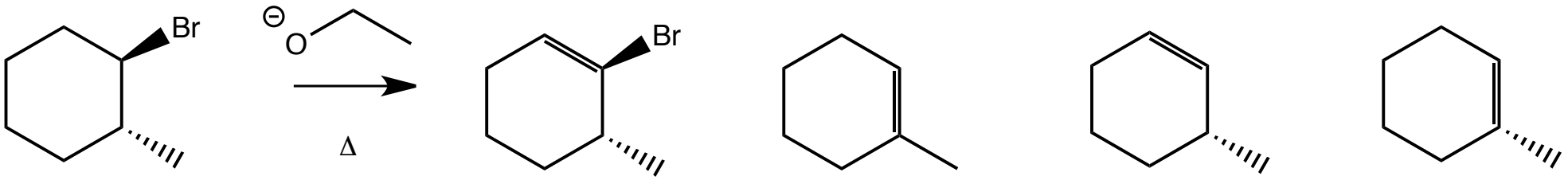
B

C

D

Elimination

Practice



A

B

C

D

Competition

Section

$S_N2/E2$

$S_N1/E1$

Conjugate Acid	pK_a	Nucleophile
HI	–10	I^-
HBr	–9	Br^-
HCl	–7	Cl^-
$CH_3OH_2^+$	–2.5	CH_3OH
H_3O^+	–1.7	HOH
HF	3.2	F^-
H_2S	7.0	HS^-
$HC{\equiv}N$	9.1	$C{\equiv}N^-$
NH_4^+	9.4	NH_3
CH_3CH_2SH	10.5	$CH_3CH_2S^-$
CH_3OH	15.5	CH_3O^-
HOH	15.7	HO^-
HCCH	25	HCC^-

(10) **Today**

Competition between SN1, E1, SN2, and E2

Chap 12: Mass Spectrometry and Infrared Spectroscopy

Next Class (11)

Chap 12: Mass Spectrometry and Infrared Spectroscopy

(12) **Second Class from Today**

Chap 12: Mass Spectrometry and Infrared Spectroscopy

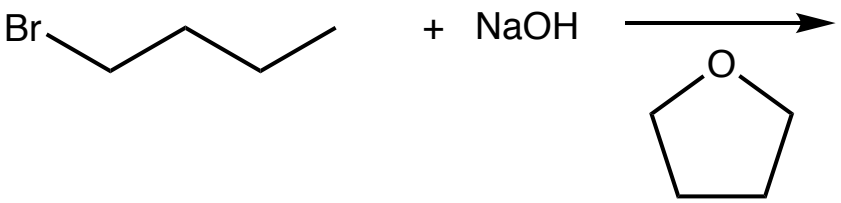
Third Class from Today (13)

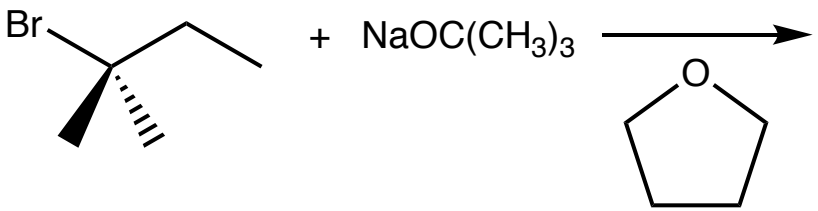
Chap 13 : Nuclear Magnetic Resonance Spectroscopy

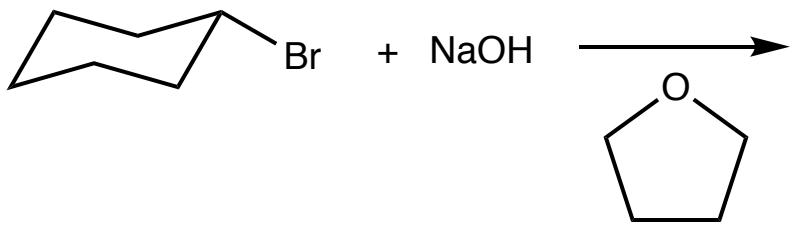
Test on substitution and elimination on Friday

1-butanol reaction				t-butanol reaction			
area under 1-chlorobutane peak	area under 1-bromobutane peak	% Cl	% Br	area under t-butyl chloride peak	area under t-butyl bromide peak	% Cl	% Br
3.0184	39.1592	7.2	92.8	30.7310	89.2060	25.6	74.4
5.8862	91.6926	6.0	94.0	19.1382	61.8448	23.6	76.4
1.3768	21.3868	6.0	94.0	18.6189	41.2592	31.1	68.9
1.4171	19.5425	6.8	93.2	37.4692	81.1158	31.6	68.4

Competition







Competition