

Today

Section 6.1 and 6.2
Electrophilic Addition and Carbocation Stability

Section 6.7
Carbocations will rearrange

Next Classes

Sections 6.5 and 6.6
Addition of water and alcohols

Section 6.8
Hydroboration-oxidation

Section 6.9
Addition of halogens

Sections 6.12 and 6.13
Regio- and stereoselectivity

Section 6.16
Reactions and synthesis

Please hand in reworked test 2

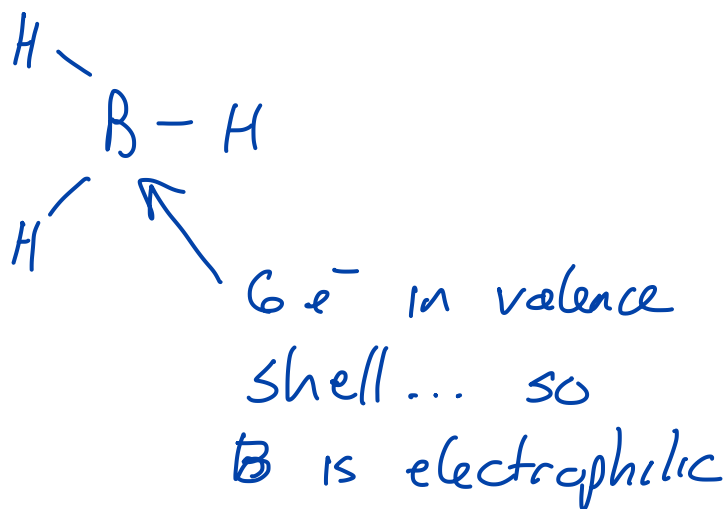
We will look at three kinds of electrophilic addition reactions each of them have similar regioselectivity (section 6.7) due to similarities in their transition states, but there each have different mechanisms based on the specific class of electrophile.

Sections 6.1, 6.2, 6.5, 6.6, 6.7 focus on using strong acids, H^+ , as the electrophile.

Section 6.9 focuses on using Cl_2 and Br_2 as the electrophile.

Section 6.8 focuses on the reaction of the electrophile BH_3 .

We will mix sections 6.12 and 6.13 in with sections that discuss regioselectivity, stereoselectivity, and stereospecificity in with our discussion of the various mechanisms and summarize at the end.



$Cl-Cl + Br-Br$ ~~F_2~~

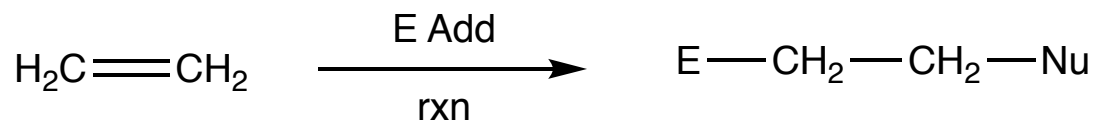
F_2 too reactive

looking for an easier source of electrons instead of fighting over e^- 's with another energy atom

I_2 less energy than Cl

Definitions

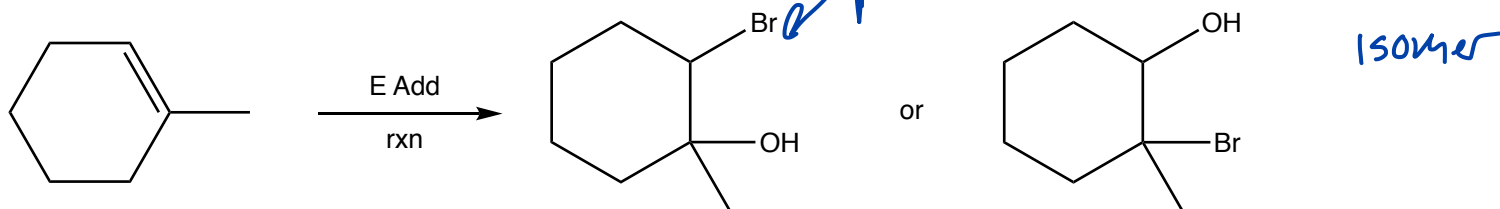
The reactions are called **electrophilic additions** because they are initiated by an electrophile and two groups/atoms are added across the double bond.



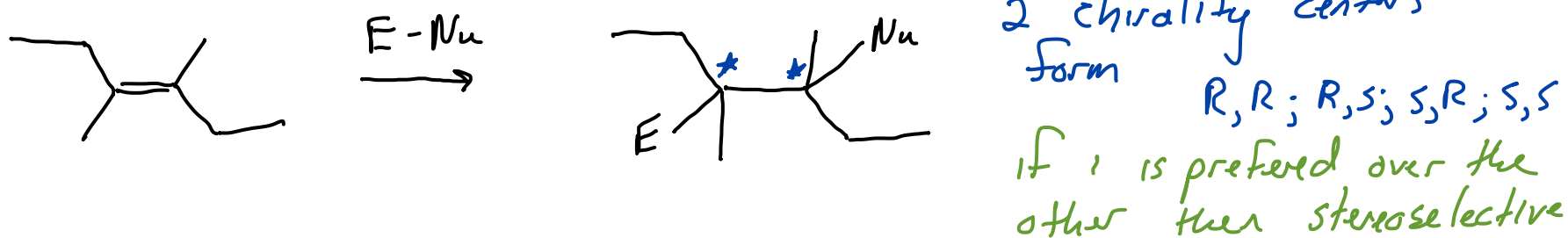
E = generic electrophile

Nu = generic nucleophile

Regioselectivity: The ability of a reaction to prefer the formation of one constitutional/structural isomer over another.

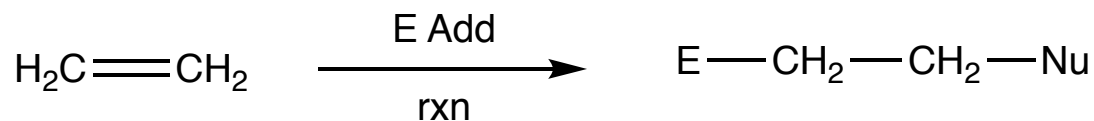


Stereoselectivity: The ability to prefer the formation of one stereoisomer over another.



Definitions

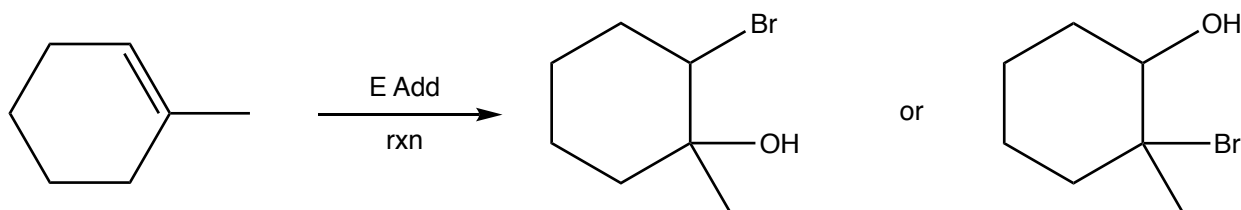
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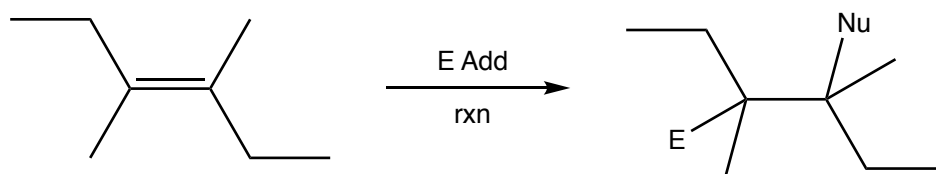
E = generic electrophile

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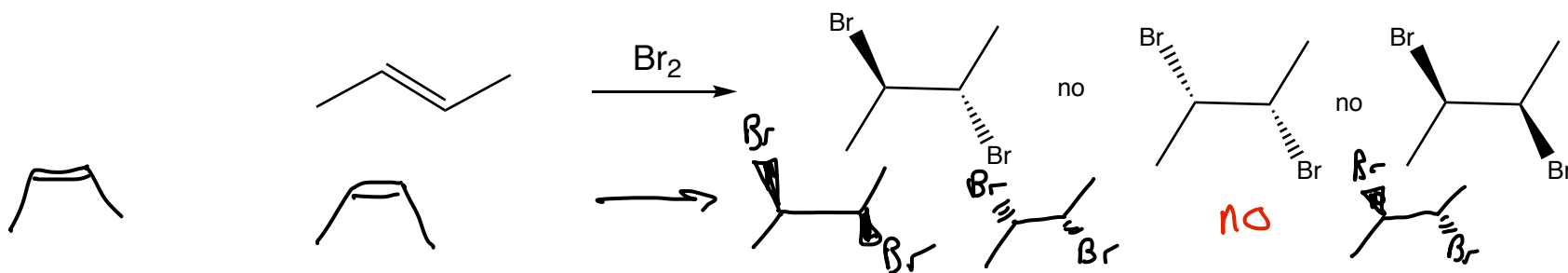
Regioselectivity: The ability of a reaction to prefer the formation of one constitutional/structural isomer over another.



Stereoselectivity: The ability to prefer the formation of one stereoisomer over another.



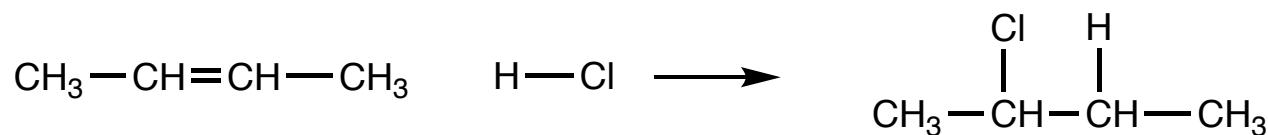
Stereospecificity: The ability of a reaction to form only **specific stereoisomers** from one **stereoisomeric reactant**.



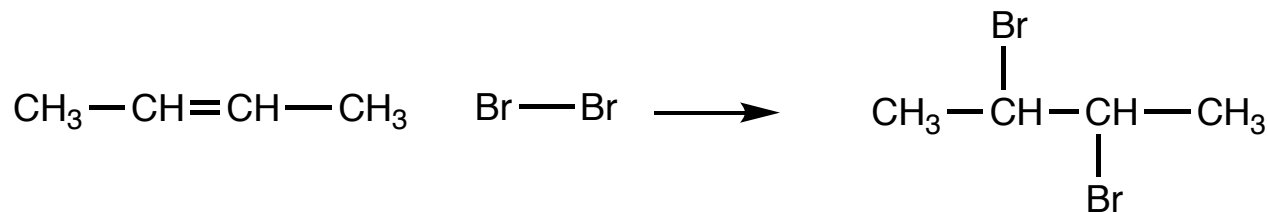
Electrophilic Addition Reactions

Section 6.1

Two step mechanism (6.1, 6.5, 6.6)



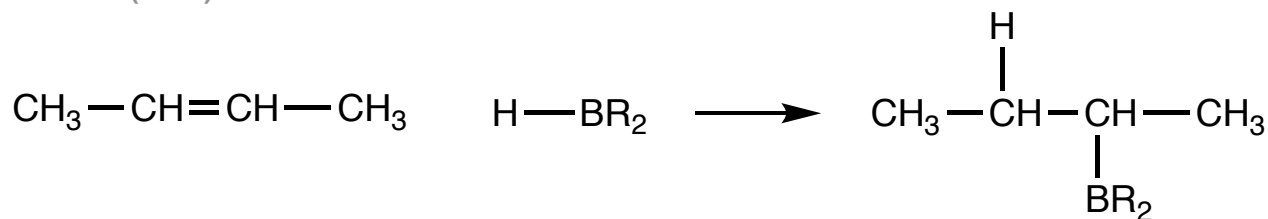
1



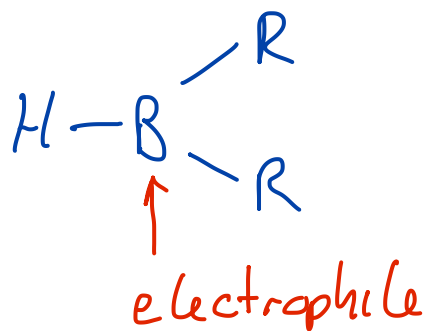
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alkene reacts with E \longrightarrow reactive intermediate \longrightarrow reacts with Nu \longrightarrow products

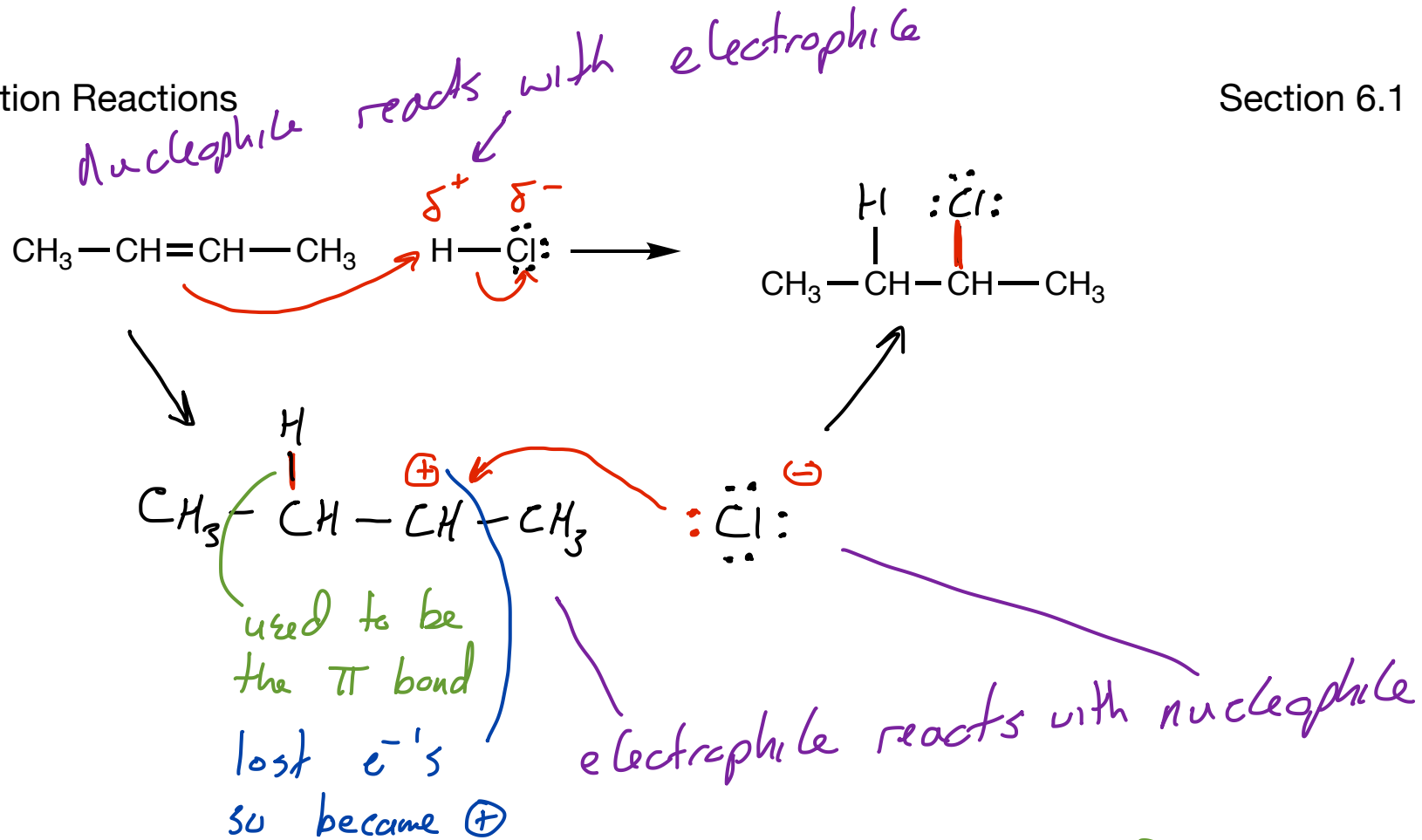
One step mechanism (6.8)



3



Electrophilic Addition Reactions



With H⁺ electrophiles, carbocation intermediates form
 Strong acids required. . weak acids like acetic acid

(vinegar) can't initiate the reaction

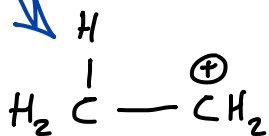
though dangerous not strong enough for this rxn

pKa	H-Cl	H-I	H-Br	H-F
	-6	-11	-9	4

The Carbocation Intermediate and Regioselectivity

Sections 6.2 and 6.4

least stable
not made ...

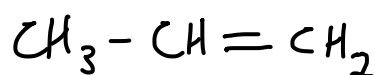
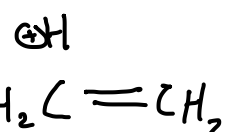


1° C⁺

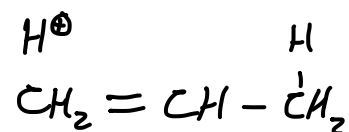
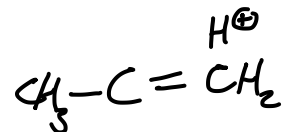
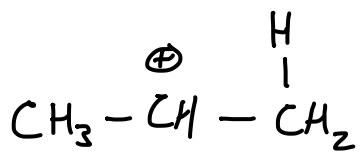
too unstable to form under typical lab conditions



hyperconjugation with C-H bonds on neighbor

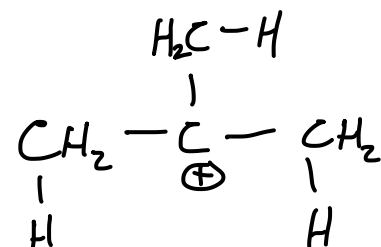
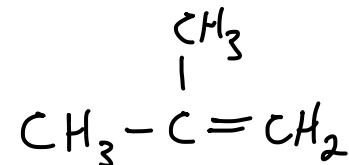


2° 1°



6 neighboring σ bonds to do hyperconjugation (in this case 6 C-H bonds)

most stable



9 neighboring σ bonds to do hyperconjugation

easiest to form

Summary, so far..

Reaction starts at π bond: π bond is lost and σ bonds to electrophile and nucleophile form

Identify the electrophile: so far the H^+ of a strong acid

Identify the nucleophile: so for the conjugate base of the strong acid, the X^- of the HX

Create intermediate: open π bond and determine where the $+$ goes (based stability of $+$) and attach electrophile to other end.

Are the ends of the double bond identical?

Yes. It doesn't matter put the $+$ at either end and move on.

No. Is there a reason to prefer making one end of the bond $+$?

Yes. Major and minor products will form. Place the $+$ at the end where it will be more stable, and move on.

No. ~1:1 mixture of products will result. Two intermediates form each one with a $+$ at one end.

Check for carbocation rearrangement: would plus be more stable on neighboring C?

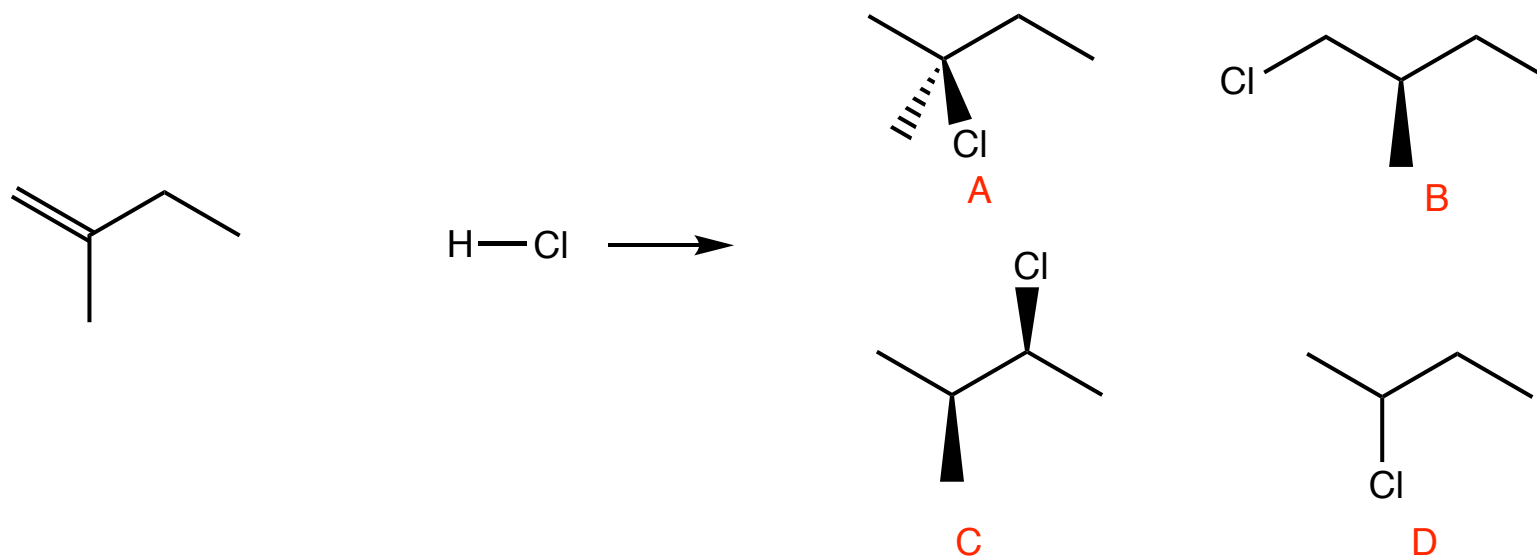
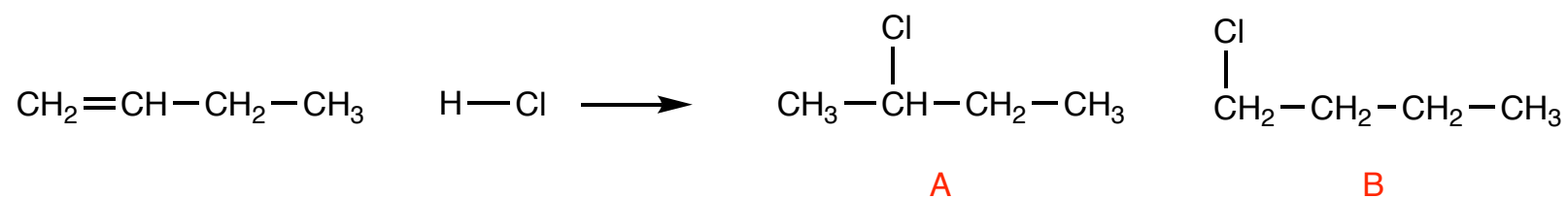
yes, rearrange

no

leave $+$ where it is

Make a bond from the nucleophile to the C with the $+$ charge.

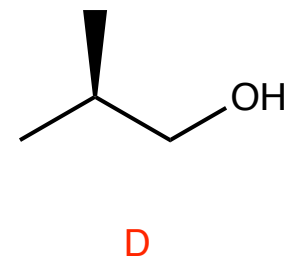
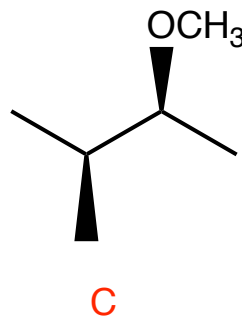
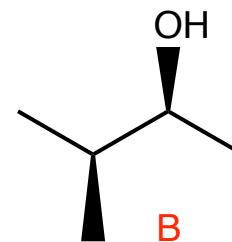
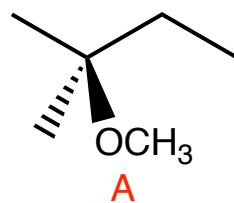
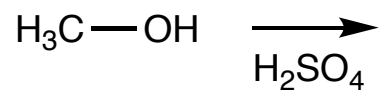
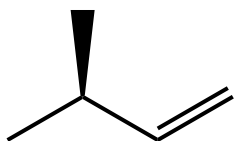
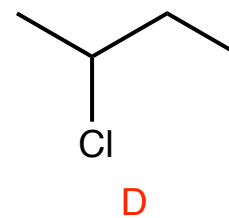
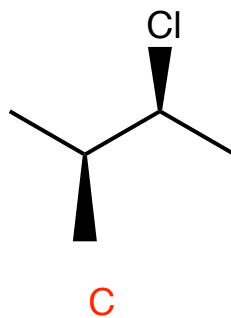
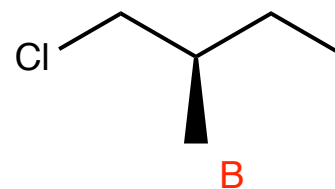
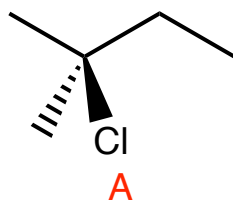
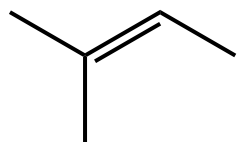
E Add Reactions



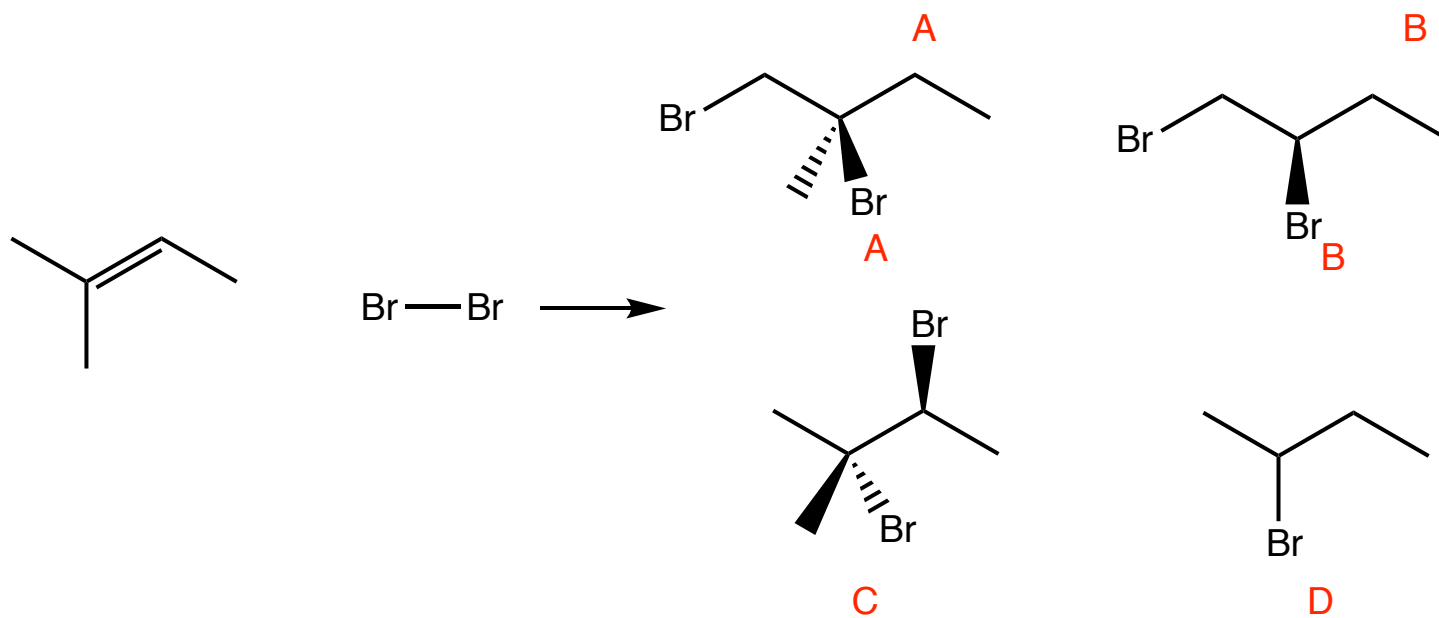
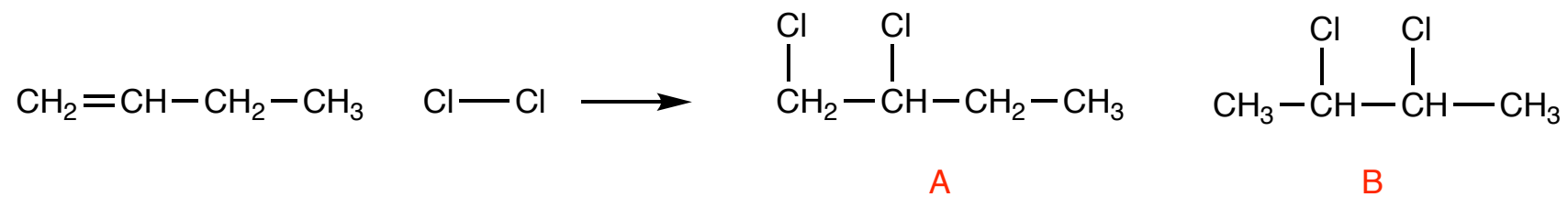
How about Getting Other Nucleophiles to finish the reaction

Section 6.7

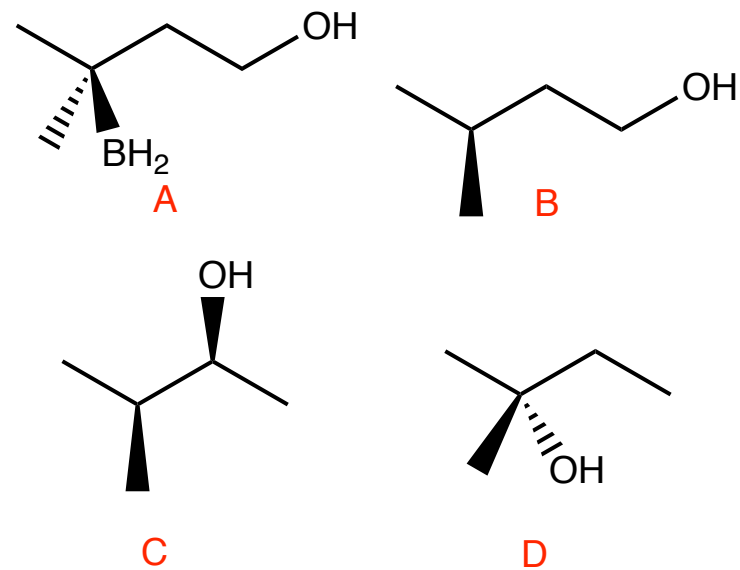
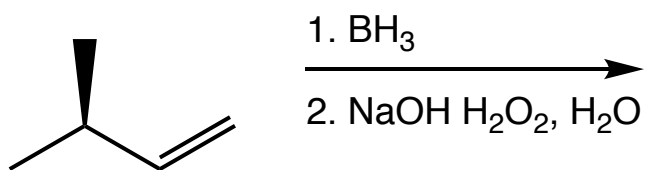
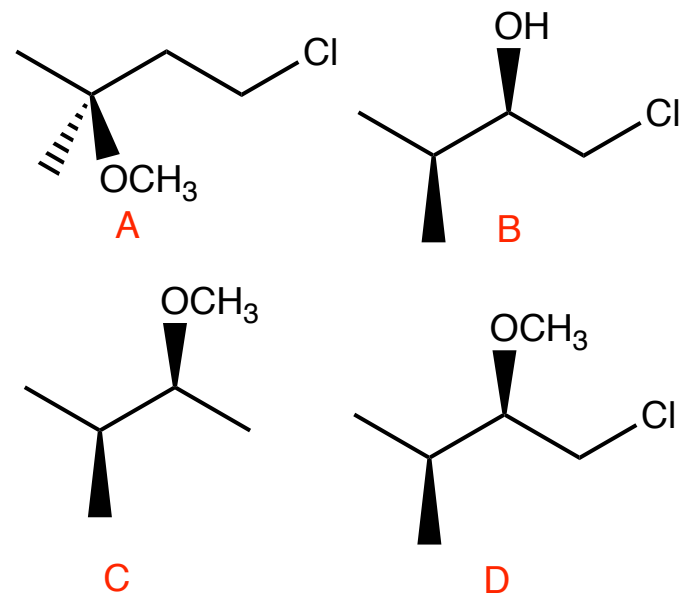
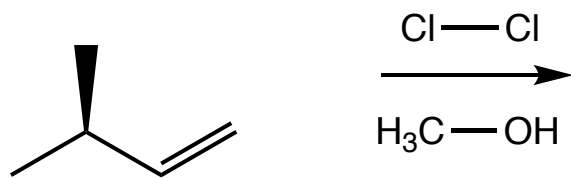
E Add Rxns



Reactions



Reactions



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Section

