

# Substitution vs. Elimination (7.9)

Summarize what you know about each of the following mechanisms. (circle all that apply)

H<sub>2</sub>O  
ROH  
X<sup>-</sup>

	<b>S<sub>N</sub>2</b>	<b>S<sub>N</sub>1</b>	<b>E2</b>	<b>E1</b>
bi/unimolecular?	bi <del>uni</del>	<del>bi</del> uni	bi <del>uni</del>	<del>bi</del> uni
one-step mech.?	yes <del>no</del>	<del>yes</del> no	yes <del>no</del>	<del>yes</del> no
need <b>good LG?</b>	yes <del>no</del>	yes <del>no</del>	yes <del>no</del>	yes <del>no</del>
need strong Nu:?	yes <del>no</del>	<del>yes</del> no	yes <del>no</del>	<del>yes</del> no
need strong base?	<del>yes</del> no	<del>yes</del> no	yes <del>no</del>	<del>yes</del> no
sterics important?	yes <del>no</del>	yes <del>no</del>	<del>yes</del> no	<del>yes</del> no
preferred LG type?	1° 2° 3° allylic	<del>1°</del> 2° 3° allylic	1° 2° 3° allylic	<del>1°</del> 2° 3° allylic
stereochemistry?	inversion	racemization	anti LG	mixed stereochem.
other notes	polar aprotic solvent	* solvolysis * protic solvent H <sub>2</sub> O, ROH	only if + BuOK Zait/Hof.	E + Z Zaitsev

Backside Attack →  
Carbocation →  
Strong base attack! →  
Carbocation →

STERICS!

unstable C<sup>+</sup>

only if + BuOK  
anti LG  
+ βH  
Zait/Hof.

mixed stereochem.  
E + Z  
Zaitsev

Categorize the following species as a strong or weak nucleophile, AND as a strong or weak base.

- <sup>+</sup>NaOH, NH<sub>3</sub>, MeOH, NaCN, iPrOH, NaOEt, NaNH<sub>2</sub>, PhNH<sub>2</sub>  
<sup>-</sup>I<sup>-</sup>, tBuOK, NaSH, Ph<sub>3</sub>P, H<sub>2</sub>O, CH<sub>3</sub>O<sup>-</sup>, PhS<sup>-</sup>, CH<sub>3</sub>CH<sub>2</sub>OH, acetate

**strong Nu:**

**S<sub>N</sub>2**

HO<sup>-</sup>, CH<sub>3</sub>O<sup>-</sup>, CN<sup>-</sup>, I<sup>-</sup>, PhNH<sub>2</sub>, Ph<sub>3</sub>P, :NH<sub>3</sub>, PhS<sup>-</sup>, SH<sup>-</sup>

**strong base**

**E2**

HO<sup>-</sup>, OEt<sup>-</sup>, NH<sub>2</sub><sup>-</sup>, tBuO<sup>-</sup>, CH<sub>3</sub>O<sup>-</sup>

stronger than OH<sup>-</sup>! (Base only)

**weak Nu:**

**S<sub>N</sub>1**

MeOH, iPrOH (YOH), H<sub>2</sub>O, CH<sub>3</sub>CH<sub>2</sub>OH

**weak base**

**(NOTE E2)** NH<sub>3</sub>, CN<sup>-</sup>, PhNH<sub>2</sub>, I<sup>-</sup>, CH<sub>3</sub>CH<sub>2</sub>OH, MeOH, SH<sup>-</sup>, iPrOH, PhS<sup>-</sup>, H<sub>2</sub>O

more stable weaker base

ATTACK!

Note: these are the only neutral ones!

bigger than R<sub>3</sub>N<sup>+</sup>, so a great Nu:!

# Competing Substitution and Elimination Mechanisms

For each reaction, determine the mechanism and predict the major product(s). N.R. if no reaction.

