

CHEM 109, Lecture 5

Mechanism Review

6. Elimination Reactions

7. Oxidation & Reduction Reactions

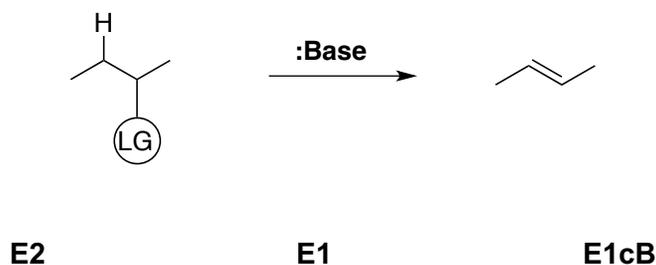
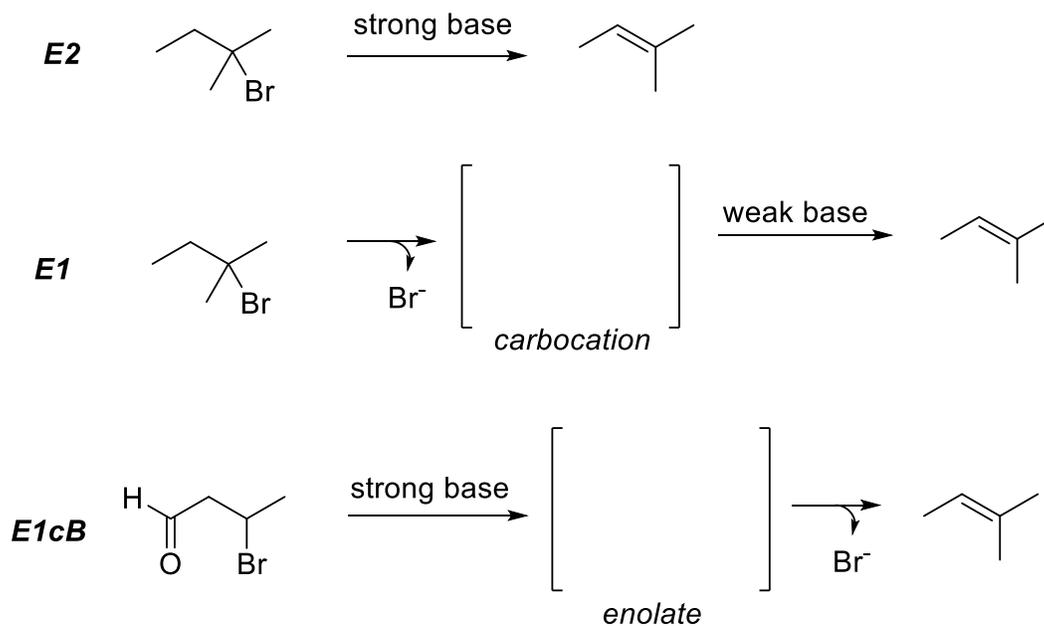
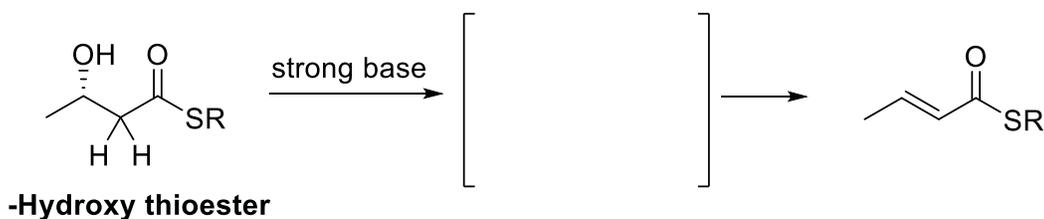
Polyprotic Acids & pKa

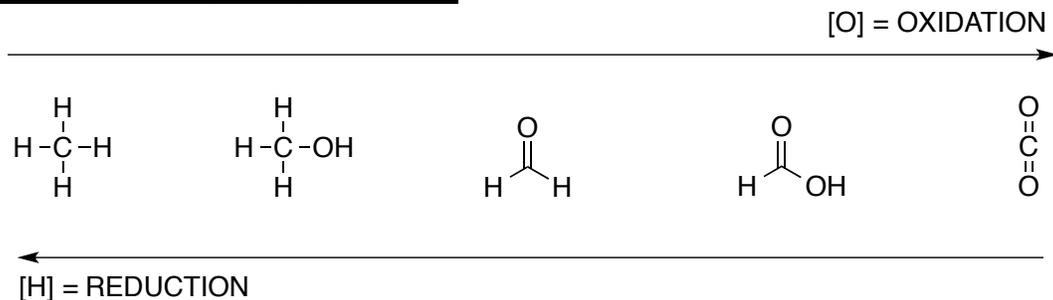
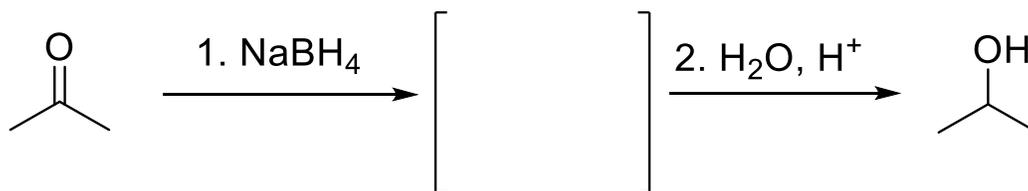
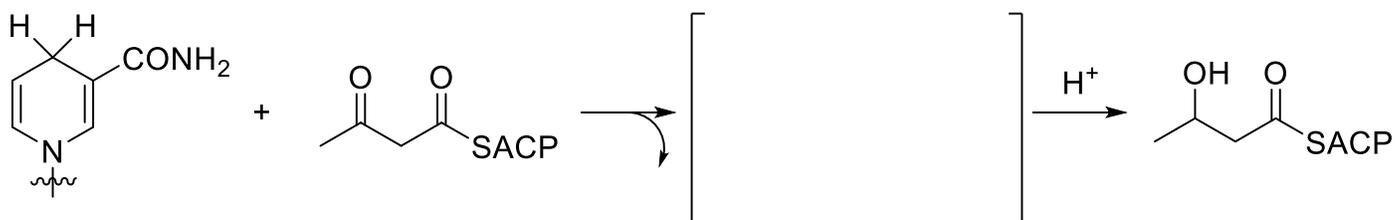
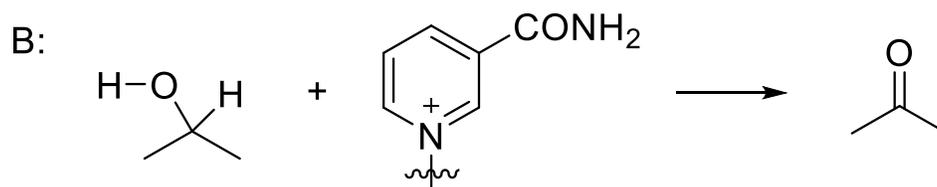
- o Relationship between (pKa of acid) and (pH of solution)
- o Titration of amino acids

**** Know the full structures & abbreviations of the 20 common amino acids (p 7) ****

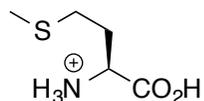
6. Elimination Reactions

What is eliminated?

**Elimination in synthesis...****Elimination in Biology – Fatty Acid Synthesis**

7. Oxidation and Reduction (Redox) Reactions**Reduction in Synthesis****Redox in Biology...**REDUCING AGENTS: NADH & NADPHOXIDIZING AGENTS: NAD⁺ & NADP⁺

Titration of a L-Methionine, a neutral amino acid



L-Methionine
(fully protonated)

pH < 2.28

Charge:

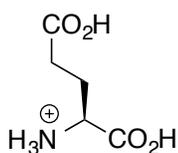
2.28 < pH < 9.21

pH > 9.21

pI = Isoelectric point – pH at which the molecule is neutral (not necessary neutral @ pH 7)

- Calculate by taking the average of the 2 pKa's on either side of neutral molecule

Titration of L-Glutamic Acid, an acidic amino acid



L-Glutamic Acid
(fully protonated)

pH < 2.10

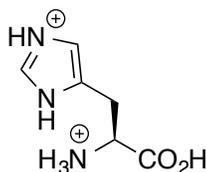
Charge:

2.10 < pH < 4.07

4.07 < pH < 9.47

pH > 9.47

Titration of L-Histidine, an interesting basic amino acid



L-Histidine
(fully protonated)

pH < 1.77

Charge:

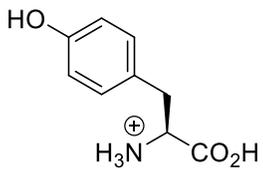
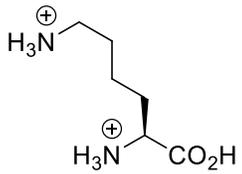
1.77 < pH < 6.10

6.10 < pH < 9.18

pH > 9.18

pH of solution vs. charge of amino acids...

	pH 1	pH 3	pH 5	pH 7	pH 9	pH 11
Met						
Glu						
His						
Lys						
Tyr						



Next time...Biosynthesis of select amino acids

The 20 Common Amino Acids – pKa's and Isoelectric Points (pI)

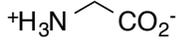
Name	pKa₁	pKa₂	pKa_R	pI
Alanine	2.34	9.69	-	6.01
Arginine	2.17	9.04	12.48	10.76
Asparagine	2.02	8.80	-	5.41
Aspartic Acid	1.88	9.60	3.65	2.77
Cysteine	1.96	10.28	8.18	5.04
Glutamic Acid	2.19	9.67	4.25	3.22
Glutamine	2.17	9.13	-	5.65
Glycine	2.34	9.60	-	5.97
Histidine	1.82	9.17	6.00	7.59
Leucine	2.36	9.60	-	5.98
Isoleucine	2.36	9.60	-	5.98
Lysine	2.18	8.95	10.53	9.74
Methionine	2.28	9.21	-	5.74
Phenylalanine	1.83	9.13	-	5.48
Proline	1.99	10.60	-	6.30
Serine	2.21	9.15	-	5.68
Threonine	2.09	9.10	-	5.60
Tryptophan	2.83	9.39	-	5.89
Tyrosine	2.20	9.11	10.07	5.66
Valine	2.32	9.62	-	5.96

* You do not need to memorize these pKa's. You should know how to use them when given. *

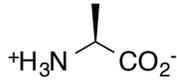
* Learn the name, structure, and abbreviations for all of the amino acids below *

NEUTRAL AMINO ACIDS

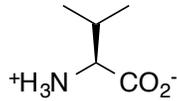
NON-POLAR AMINO ACIDS



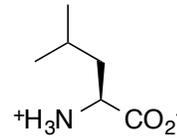
L-Glycine
(Gly, G)



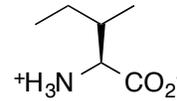
L-Alanine
(Ala, A)



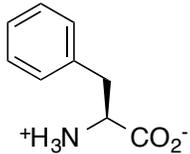
L-Valine
(Val, V)



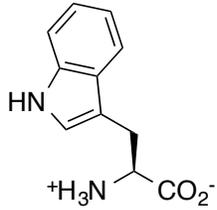
L-Leucine
(Leu, L)



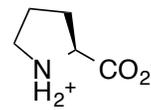
L-Isoleucine
(Ile, I)



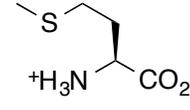
L-Phenylalanine
(Phe, F)



L-Tryptophan
(Trp, W)

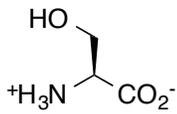


L-Proline
(Pro, P)

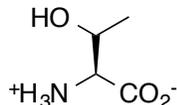


L-Methionine
(Met, M)

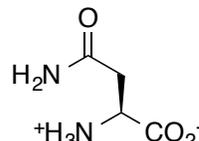
POLAR AMINO ACIDS



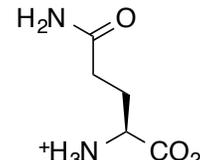
L-Serine
(Ser, S)



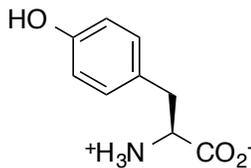
L-Threonine
(Thr, T)



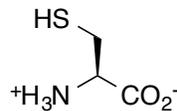
L-Asparagine
(Asn, N)



L-Glutamine
(Gln, Q)

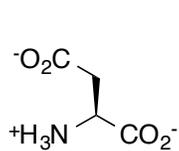


L-Tyrosine*
(Tyr, Y)

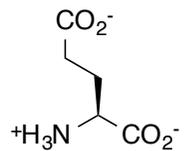


D-Cysteine*
(Cys, C)

ACIDIC AMINO ACIDS

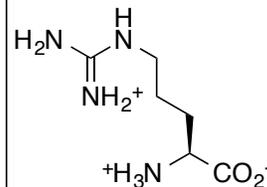


L-Aspartic Acid
(Asp, D)

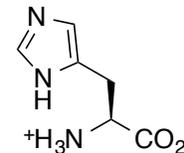


L-Glutamic Acid
(Glu, E)

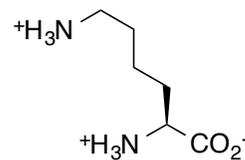
BASIC AMINO ACIDS



L-Arginine
(Arg, R)



L-Histidine
(His, H)



L-Lysine
(Lys, K)