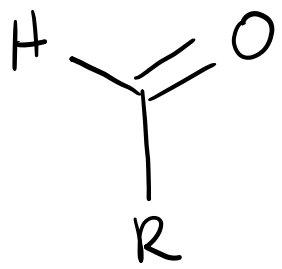
Carbohydrates: Chain Lengthening

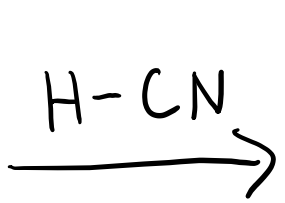
Amino Acid Intro

4/19/2023

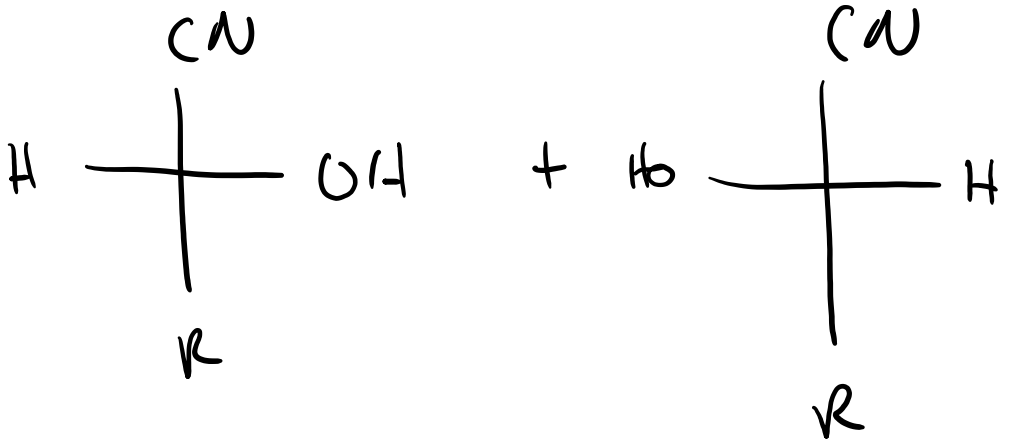
Chain Lengthening: Kiliani-Fischer Synthesis

From Exam question ↓

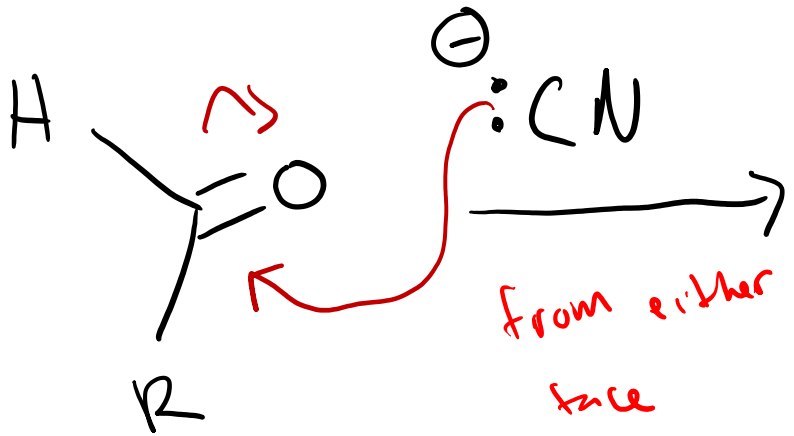


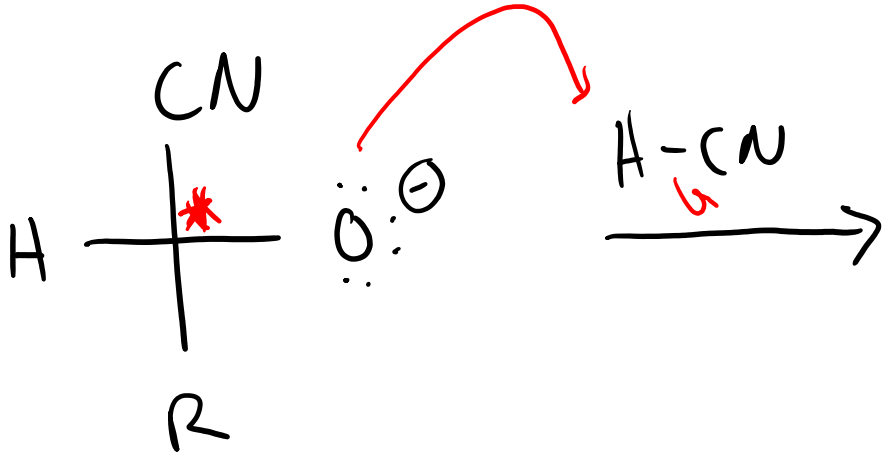


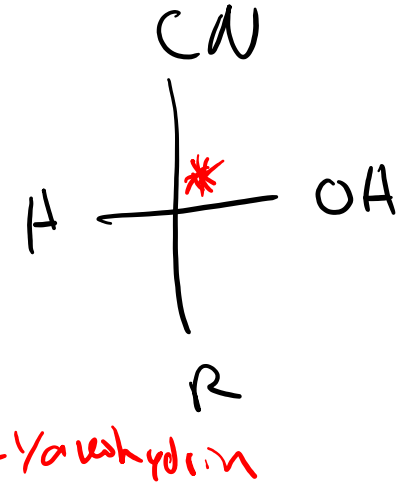
(Kiliani)



Mechanism:

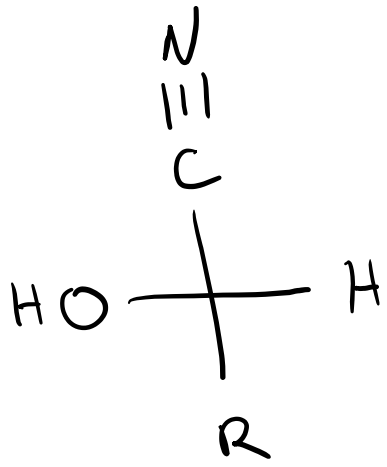




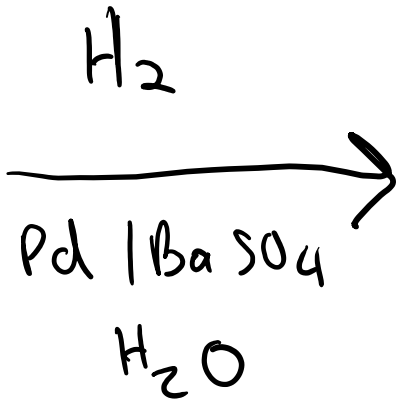


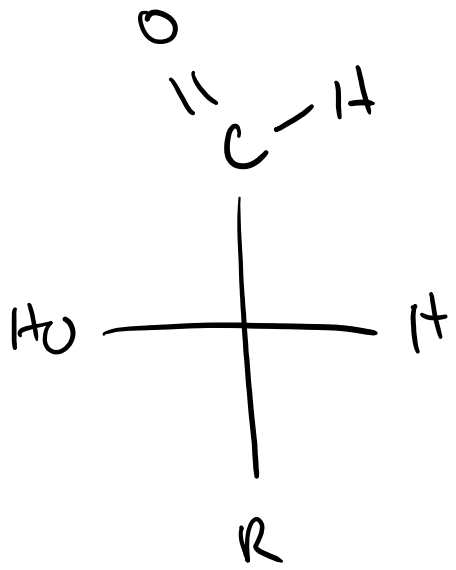
Chain Lengthening: Kiliani-Fischer Synthesis

nitrile

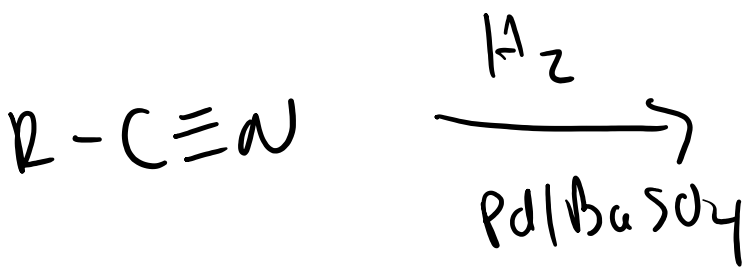


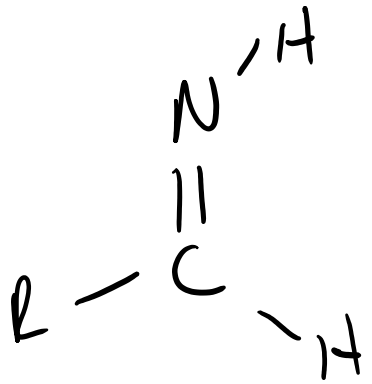
(Fischer)



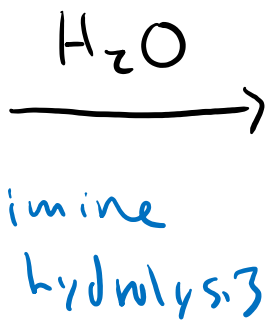


aldehyde

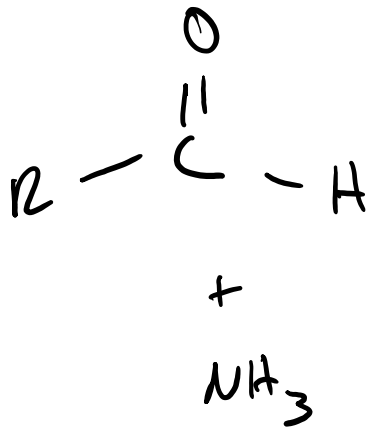




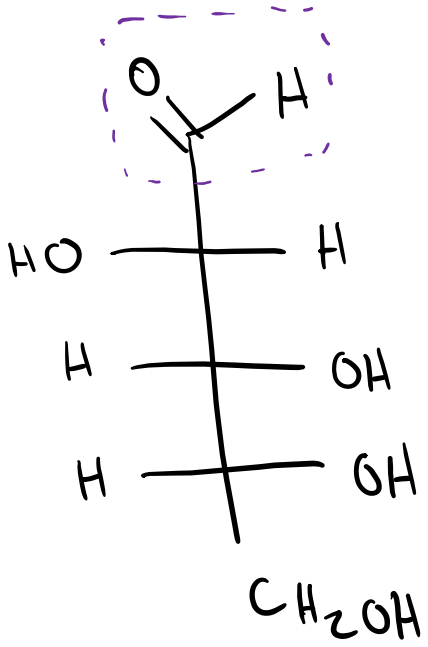
imine



imine hydrolysis



Chain Lengthening: Kiliani-Fischer Synthesis

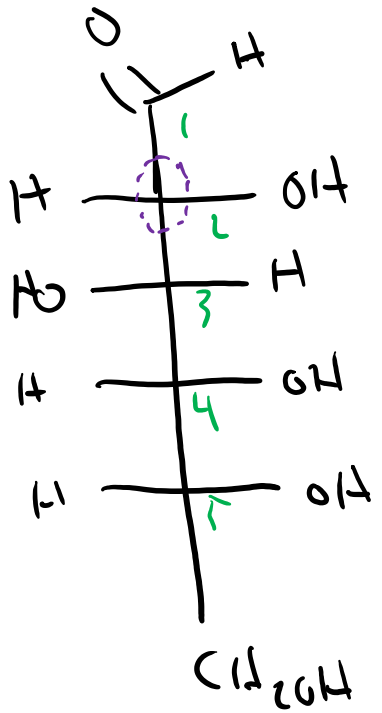


D- Arabinose

1) HCN

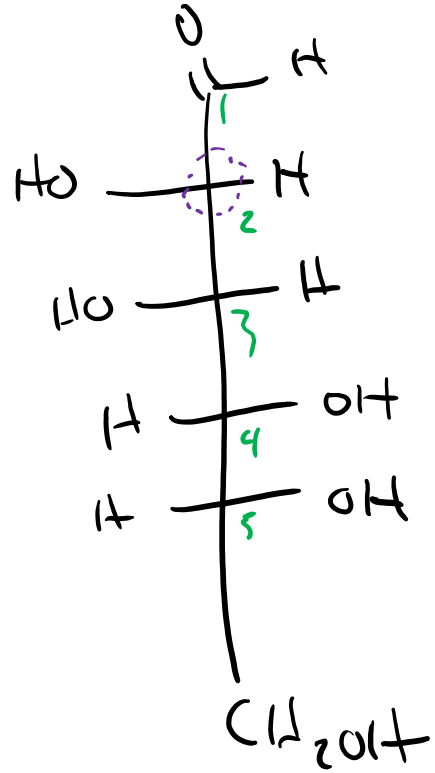
2) H_2 + Pd / $BaSO_4$

H_2O



D- Glucose

+

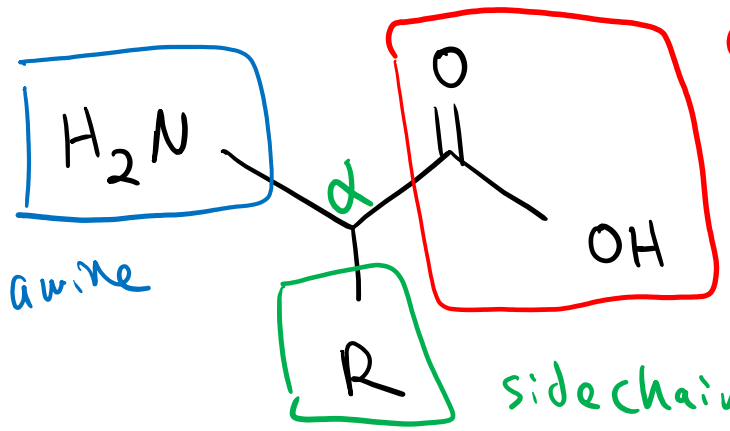


D- Mannose

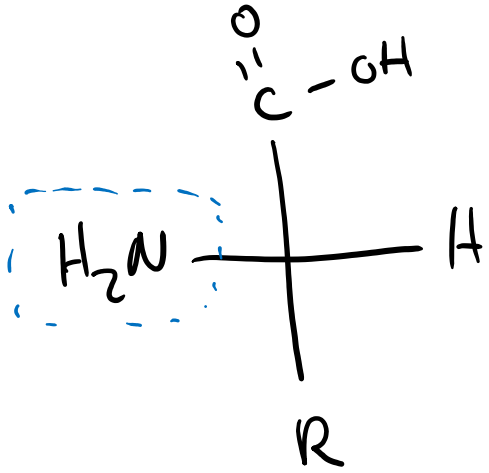
Relationship? C2 epimers!

Amino Acids and Peptides

(25.1)

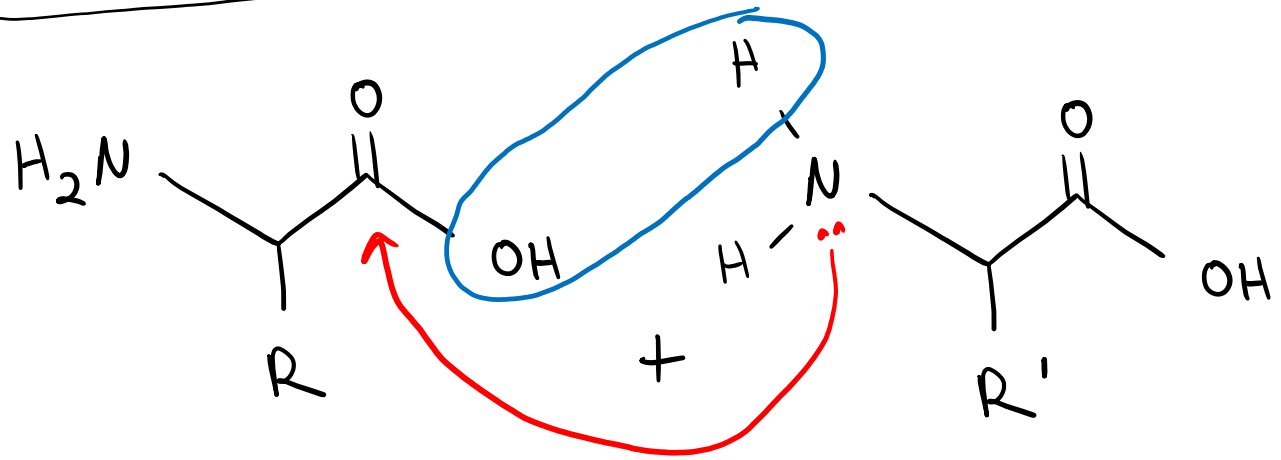


α - amino acids



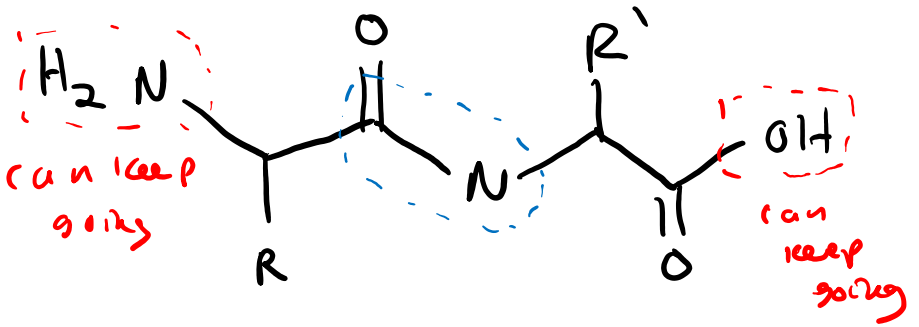
L- amino acids

(in organisms)



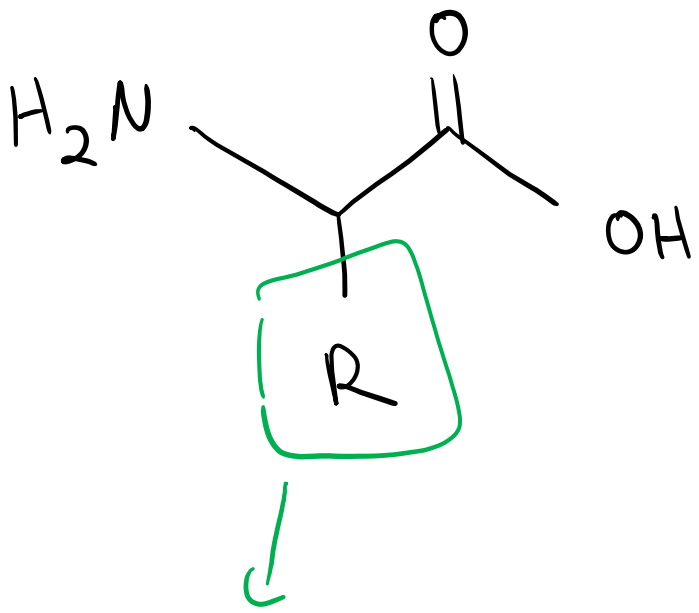
a condensation reaction

a peptide bond



dipeptide – 2 a.a's connected

Amino Acid Side Chains



May be polar

or nonpolar

acidic, basic,

neither

- 20 different side chains commonly found in organisms

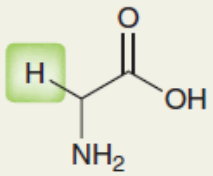
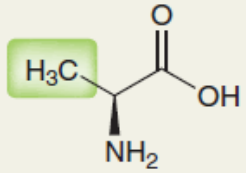
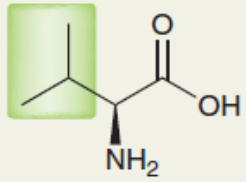
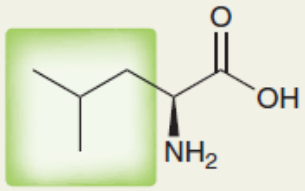
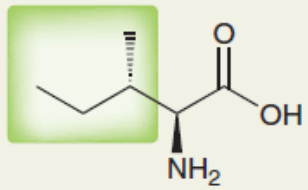
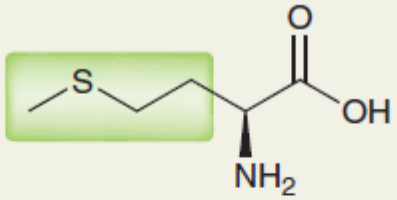
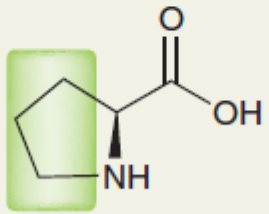
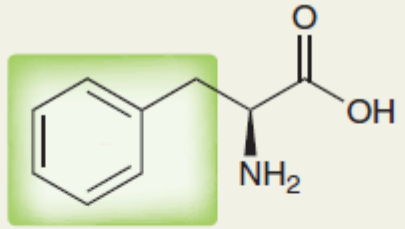
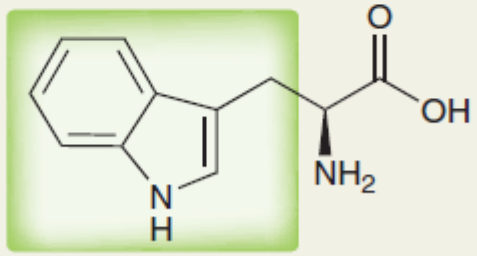
- makes each a.a. react & behave differently

- "nickname" for each different a.a. based on R group

Amino Acid Side Chains

3 letter codes

one letter codes

Glycine		Gly	G
Alanine		Ala	A
Valine		Val	V
Leucine		Leu	L
Isoleucine		Ile	I
Methionine		Met	M
Proline		Pro	P
Phenylalanine		Phe	F
Tryptophan		Trp	W

non polar side chains

I will give these tables on the Exams!

Amino Acid Side Chains

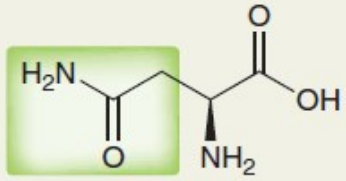
carboxylic acid side chains

polar side chains

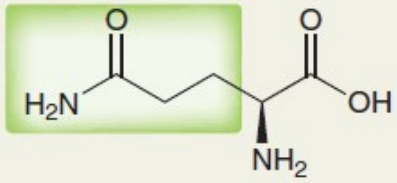
most can H-bond

important for 3D structure of protein

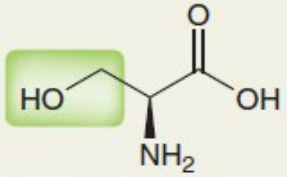
Asparagine — Asn N



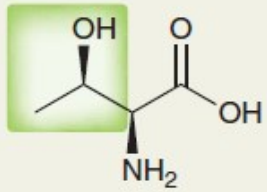
Glutamine — Gln Q



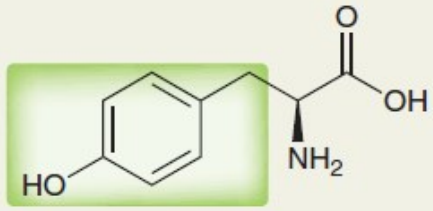
Serine — Ser S



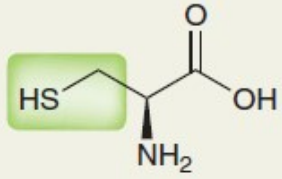
Threonine — Thr T



Tyrosine — Tyr Y

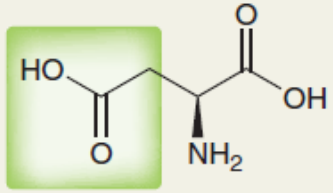


Cysteine — Cys C

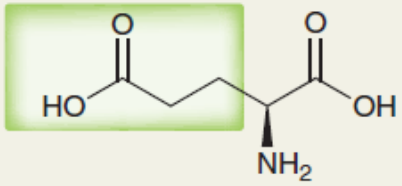


Amino acids with acidic side chains

Aspartic acid — Asp D

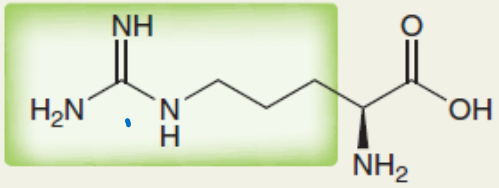


Glutamic acid — Glu E

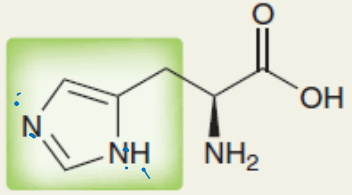


Amino acids with basic side chains

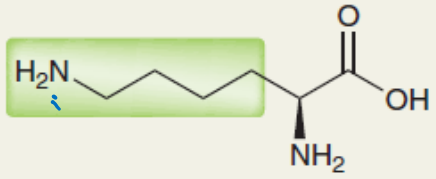
Arginine — Arg R



Histidine — His H



Lysine

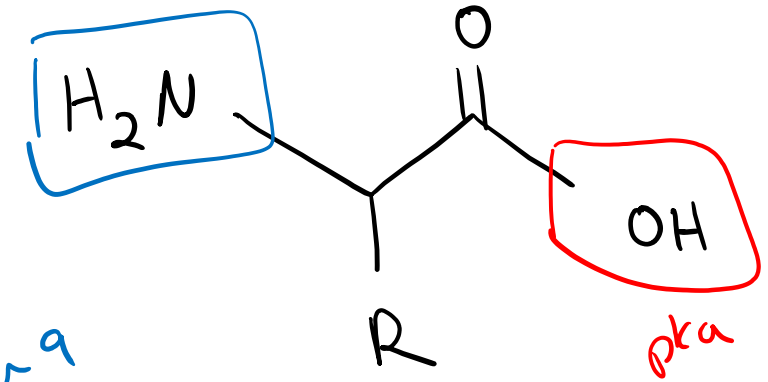


} amine / imine side chain → basic sidechains

Acid/Base Properties of Amino Acids

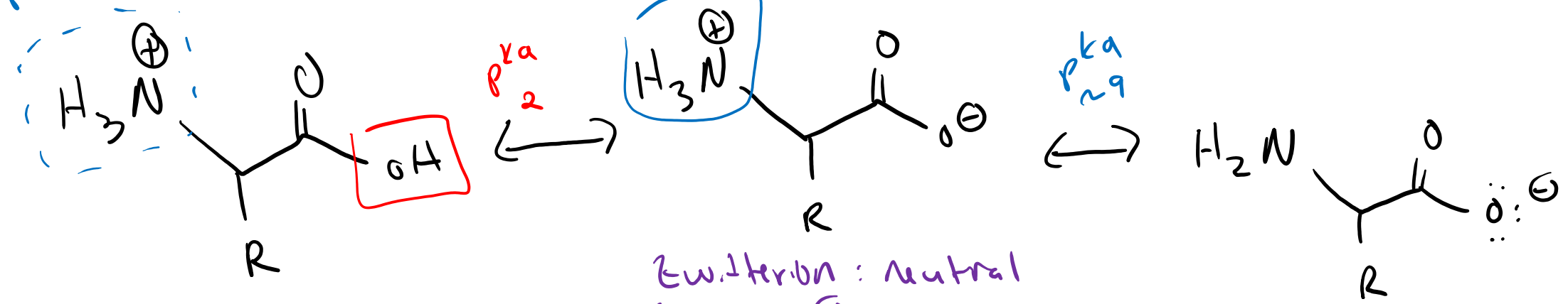
2 groups sensitive to solution pH

(3 if side chain is acid/base)



pka ~9

pka ~2



at very low pH

high $[H^+]$

Zwitterion: neutral form w/ $\oplus$ & $\ominus$

somewhere in between

at very high pH

A Brief Reminder about pH and pKa

$$pH = -\log[H^+]$$

describes H^+ content in a solution

$$HA \rightleftharpoons H^+_{(aq)} + A^-$$

$$Ka = \frac{[H^+][A^-]}{[HA]}$$

$$pKa = -\log Ka$$

describes acidity of a molecule or part of a molecule

$$pH = pKa + \log\frac{[A^-]}{[HA]}$$

NH_4^+ — pKa = 9.3

- @ pH = 12 → mostly NH_3 present
- @ pH = 9.3 → $[NH_4^+] = [NH_3]$
- @ pH = 3 → mostly NH_4^+ present

if $[A^-] = [HA]$

then pH = pKa

pH above pKa - more A^-

below more HA