**CHEM 8B, LECTURE 15**

- Titration of Amino Acids

**pH & pKa**



 pH < pKa

 pH = pKa

 pH > pKa

**Titration of Phosphoric Acid** (pKa1 2.1; pKa2 7.2; pKa3 12.3)



Indicate the charge of the *dominant* ionic phosphate species at…

 pH 1 \_\_\_\_\_\_ pH 2.1 \_\_\_\_\_\_\_ pH 5 \_\_\_\_\_\_ pH 7.2 \_\_\_\_\_\_\_

 Physiological pH (7.4)? \_\_\_\_\_\_\_ pH 12.3 \_\_\_\_\_\_\_ pH 13 \_\_\_\_\_\_\_

**Amino Acids** – common representations



**Titration of L-Leucine, neutral amino acid** (pKa1 2.4, pKa2 9.6; pKaR N/A)





**pI = Isoelectric point** – pH at which the highest concentration of molecules are in neutral form (not necessary neutral @ pH 7)

* Calculate by taking the average of the 2 pKa’s on either side of neutral molecule

**Titration of L-Aspartic Acid, an acidic amino acid** (pKa1 1.9, pKa2 9.6; pKaR 3.7)



Isoelectric Point of Aspartic Acid…

 pI =

**Titration of L-Lysine, a basic amino acid** (pKa1 2.2; pKa2 9.0; pKaR 10.5)

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Isoelectric Point, pI =

Heterocycle basics



**Titration of L-Histidine, an interestingly basic** amino acid (pKa1 2.2; pKa2 9.0; pKaR 10.5)



Isoelectric Point, pI =

It’s the Final Countdown!!!

Next time…Chapter 26.3-5, 26.7 – check out those reading questions!

- peptide primary structure @ different pH ranges

- synthesis of amino acids

Wednesday…A lil bit on lipids

Thursday…Q&A

Friday…Final Exam!

**CHEM 8B, Lecture 16 – Amino Acids & Peptides**

- Synthesis of Amino Acids: HVZ & Reductive Amination

- Peptide primary structure & charge at various pH ranges

**Synthesis of Racemic Amino Acids**



Alpha-Substitution (Chapter 22 reboot)



Reductive Amination (Chapter 24 reboot)





*Synthesize leucine via alpha-substitution*

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*Synthesize isoleucine via reductive amination*



**Peptide Primary Structure**





**Peptide Charge vs. pH**



 pKa1 2.0 pKa1 1.9pKa1 2.2

 pKa2 10.6 pKa2 9.6pKa2 9.0

 pKaR N/A pKaR 3.7pKaR 10.5

Draw the dominant ionic form of the Pro-Asp-Lys peptide at all relevant pH ranges to determine its **isoelectric point**.



Below are the *dominant* ionic forms of the **20 common amino acids** at physiological pH (7.4)

\*\*Amino acid structures and pKa’s will be provided on the final\*\*

