Topics (Chapter 17)

Amino Acids

Acid/Base: Properties of AA's

Reactions of AA's

Peptides

The prototype structure for amino acids:

\[
\begin{align*}
\text{H}_2\text{N} & \rightarrow \text{C} & \text{R} \\
& \begin{cases} \text{H} & \text{R} \\
\alpha-\text{amino acid} & \text{OH}
\end{cases} \\
& \text{R}
\end{align*}
\]

\( \alpha \) carbon (chirality center)

so (R) is (S)

Natural occurring amino acids are almost always 

Fischer projection of amino acids

\[
\begin{align*}
\text{CH}_3 & \text{C} & \text{OH} \\
& \begin{cases} \text{OH} & \text{CH}_3 \\
\text{L-amino acids} & \text{OH}
\end{cases} \\
& \text{R}
\end{align*}
\]

Living systems only produce and use the 

L-amino acids

only 20 amino acids 

Naturally occurring only have to know 7!
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Course 341  
Lecturer Clausss
Day Wednesday  
Date 12/8/04
Notes Taken By Kolanko  
Total Number of Pages 5

Glycine (gly)  
Alanine (Ala)  
Serine (Ser)

Simplest (no D or L)

Very similar

Cysteine (Cys)  
Phenylalanine (Phe)

The 5 Neutral Amino acids to know:

Aspartic Acid (Asp)  
Lysine (Lys)

In the book all of them are in a
pH 8.0 - 4.81 table.

write on this side only - do not double side for genchem office
$\text{H}_2\text{N} - \text{C} - \text{C} - \text{OH} \quad \text{pK}_a \approx 2$

$\text{pK}_a \approx 9-10$

$\text{pK}_a - \text{N}_3$ (-$\text{NH}_3$)

$\text{H}_3\text{N} - \text{C} - \text{C} \rightarrow \text{H}_3\text{N} - \text{C} - \text{C} \rightarrow \text{H}_3\text{N} - \text{C} - \text{C}$

dipolar ion (Zwitter ion)

$\text{pK}_a \approx 1$

Charge $+1$

$pH \approx 9.7$

$\text{H}_2\text{N} - \text{C} - \text{C} - \text{OH} \rightarrow \text{H}_2\text{N} - \text{C} - \text{C} - \text{OH}$

$\text{pK}_a \approx 23$

$\text{pK}_a \approx 23$

Lower effect of pH on molecular structure

Izoelectric point $= pI = \frac{9.7 + 23}{2} = 16.0$

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Lysine
\[
\begin{align*}
\text{H}_2\text{N} &- \text{CH}-\text{CH}_2\text{CO}_2\text{H} \\
\text{H}_2\text{N} &- \text{CH}-\text{CH}_2\text{CO}_2\text{H} \\
\text{H}_2\text{N} &- \text{CH}-\text{CH}_2\text{CO}_2\text{H} \\
\end{align*}
\]

Methods to separate Amino Acid Mixtures

- In an exchange column (cation)
  - By slowly increasing the pH, you can separate the amino acids from the SO_3^- groups.
  - Separate out the amino acids and measure the pH.

- Other way: Electrophoresis
  - Gly/Ala pI = 6.0
  - Ser = 5.7
  - Cys = 5.0
  - Phe = 5.5
  - Asp = 3.0
  - Lys = 9.7

\[
\begin{align*}
glycine & \quad \text{pI} = 6.0 \\
alanine & \quad \text{pI} = 6.0 \\
serine & \quad \text{pI} = 5.7 \\
cysteine & \quad \text{pI} = 5.0 \\
phenylalanine & \quad \text{pI} = 5.5 \\
aspartic acid & \quad \text{pI} = 3.0 \\
lysine & \quad \text{pI} = 9.7
\end{align*}
\]
Reactions of Amino Acids

Fischer esterification

Peptides

di peptide of (ala + ser)

Common name: Alanyl serine (Ala-Ser)

\[(\text{AA})_n\]

- # of compounds = 20^n
- if it was a peptide long = 5\text{\textsuperscript{10}}