

Introduction to Biochemistry

CHEM 3653

Protein Structure: Amino Acids

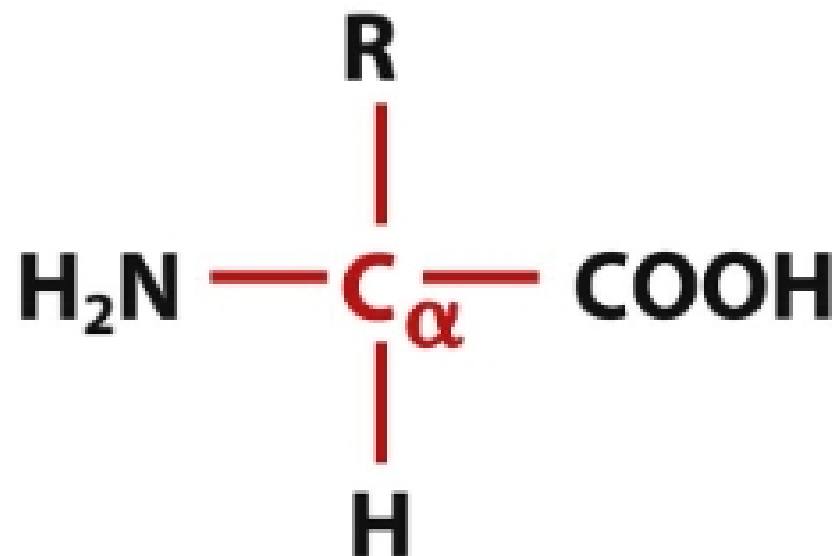
Chapter 4

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Amino Acids

- Proteins comprise the major part of the cell and play a central role in establishing metabolic networks
- Protein structure defines its function:
 - shape
 - reactive groups
- Protein structure is hard-wired in its sequence, i.e. its chemical formula
- Proteins are linear polymers of amino acids
- There are 20 natural amino acids, which differ in structure, size, polarity, charge and reactivity

General Structure of α -Amino Acid



α -Amino Acids

What is an amino acid?

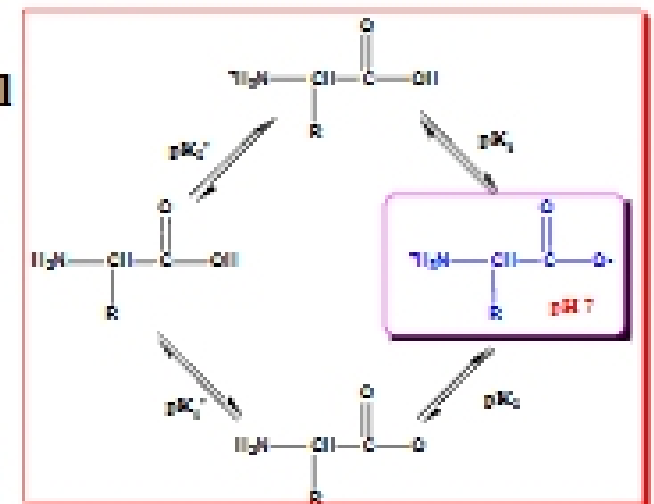
α -Amino Acids
 α -carboxyl
 α -amino
side chain

$pK_{a1} = 2.2$

$pK_{a2} = 9.5$

Amino acids

are zwitterionic



Condensation of Two Amino Acids

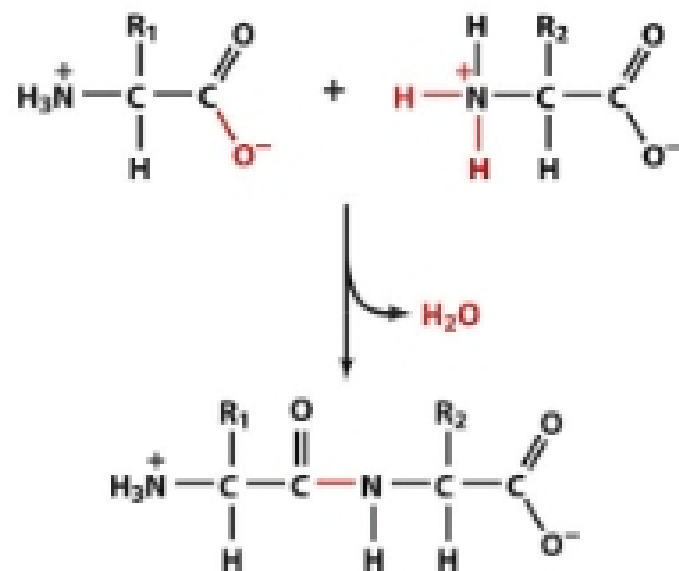


Figure 2
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Aliphatic Amino Acids

glycine

alanine

Hydrophobic –have an aversion to water and like to cluster:

valine

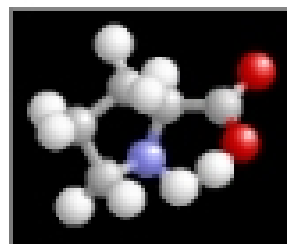
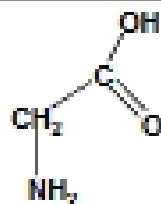
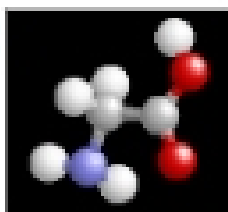
leucine

isoleucine

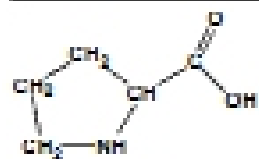
proline - contains a *pyrrolidine* ring; *α-imino acid* – side chain is bonded to both nitrogen and α carbon atom

Amino Acids: Structure & Properties

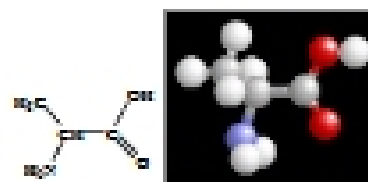
Gly (G)



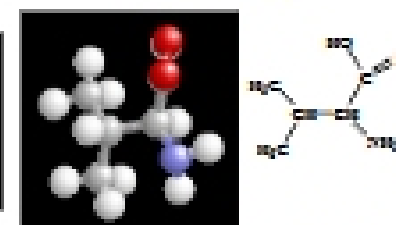
Pro (P)



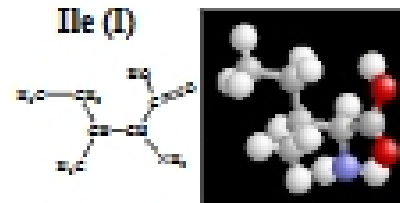
Ala (A)



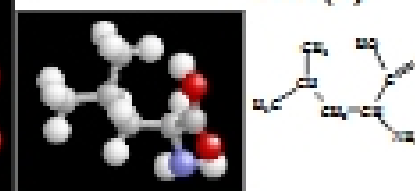
Val (V)



Ile (I)



Leu (L)



Space-filling view for some amino acids

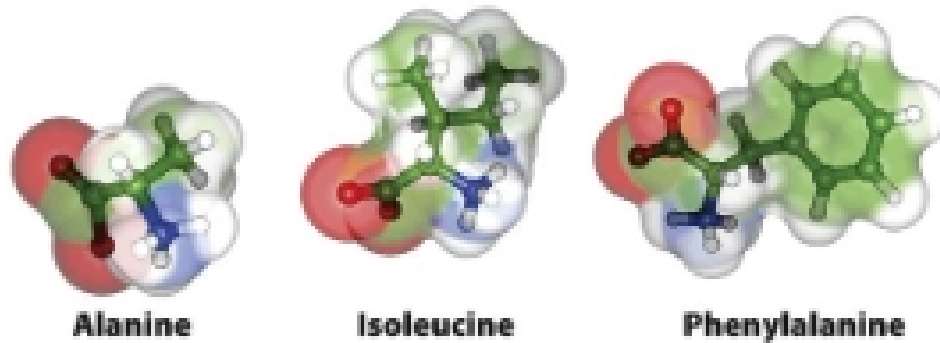
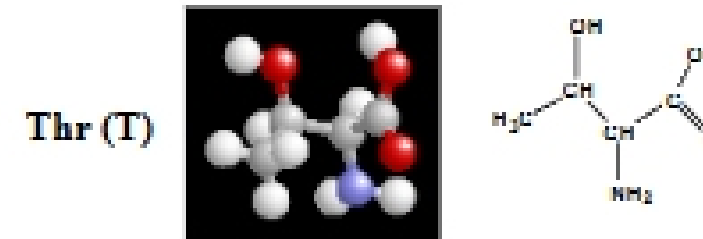
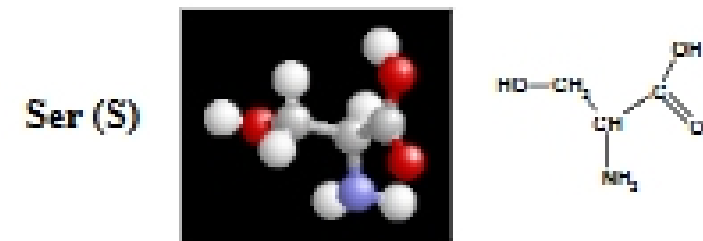


Figure 3-8
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Aliphatic hydroxyl-containing



Aromatic Amino Acids

- all are considered hydrophobic.
However, tyrosine and tryptophan also
can form hydrogen bonds.

phenylalanine
tyrosine
tryptophan - containing an *indole* group

