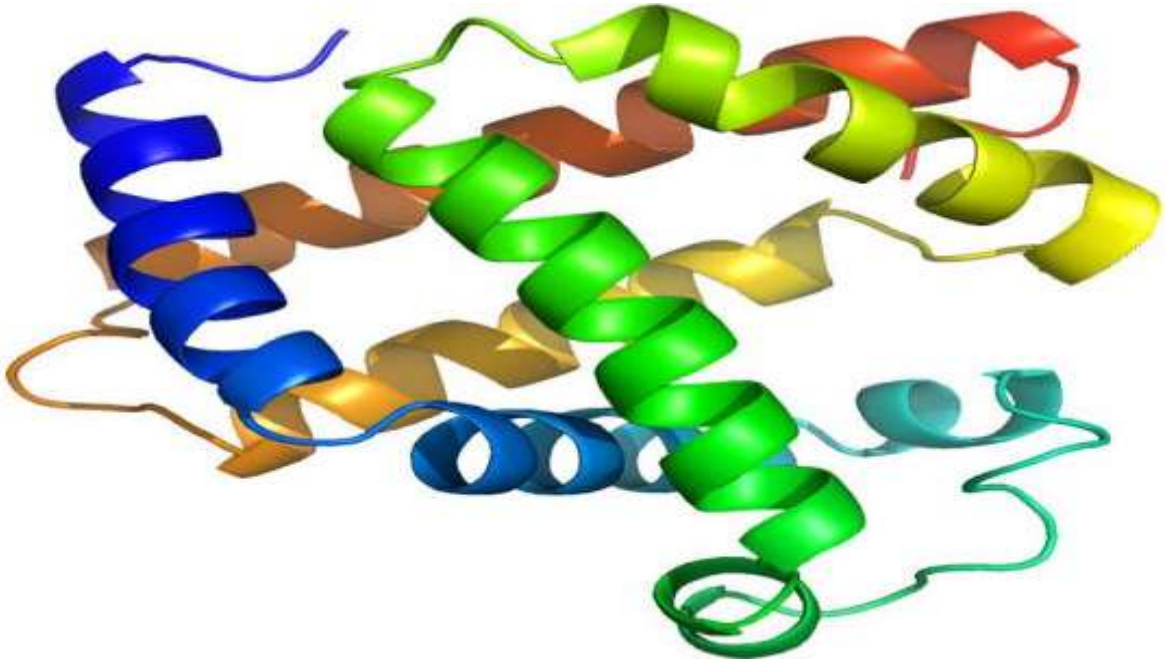
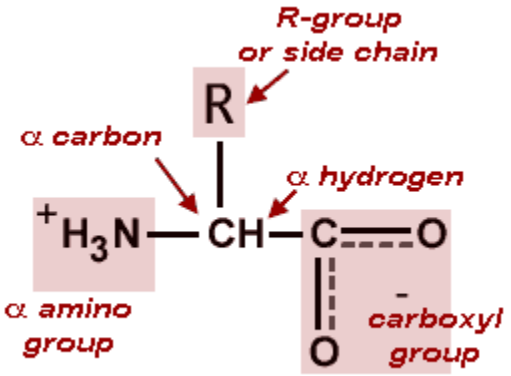
AMINO ACID: STRUCTURE AND CLASSIFICATION.

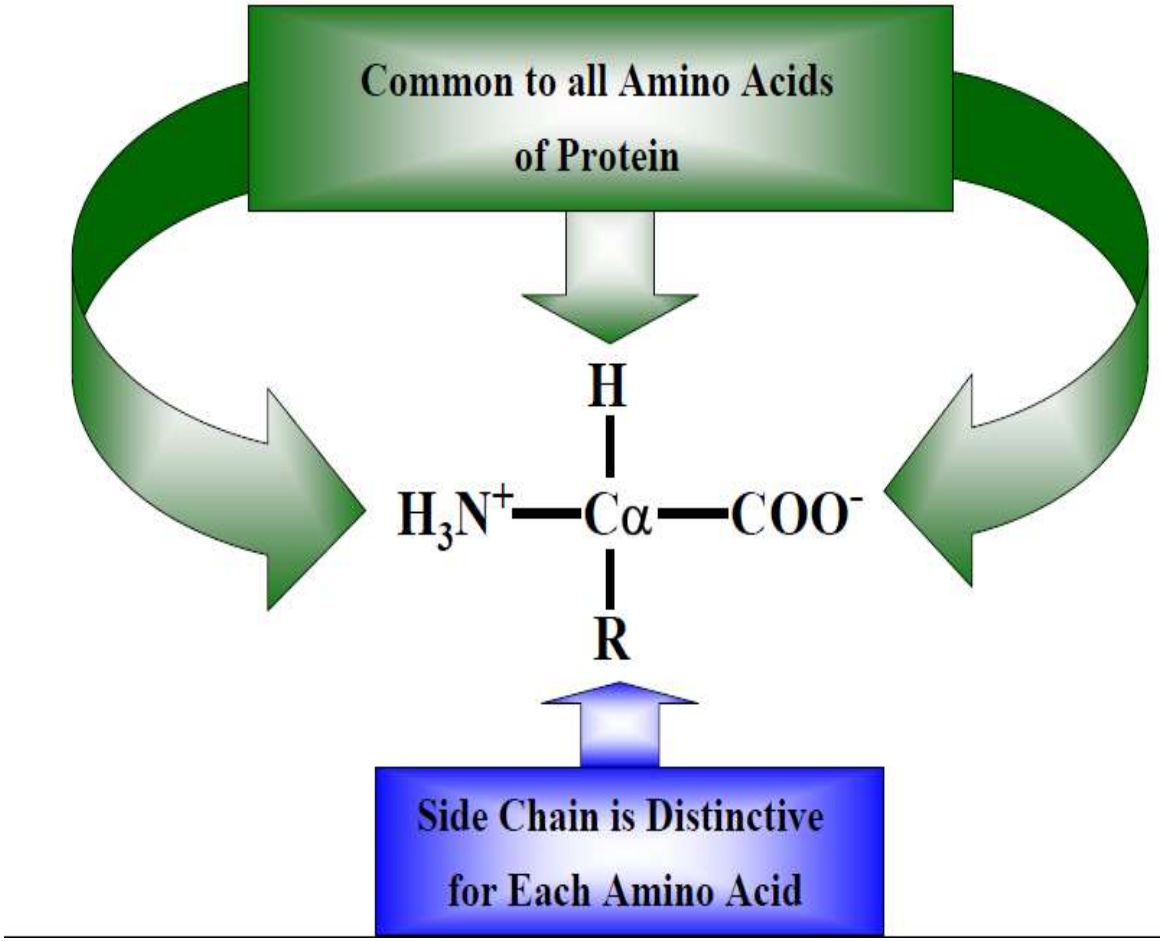


Amino Acids:

- Building units of proteins
- There are about 300 amino acids occur in nature.
- Only 20 of them occur in proteins
- 20 standard amino acids correspond to codons.



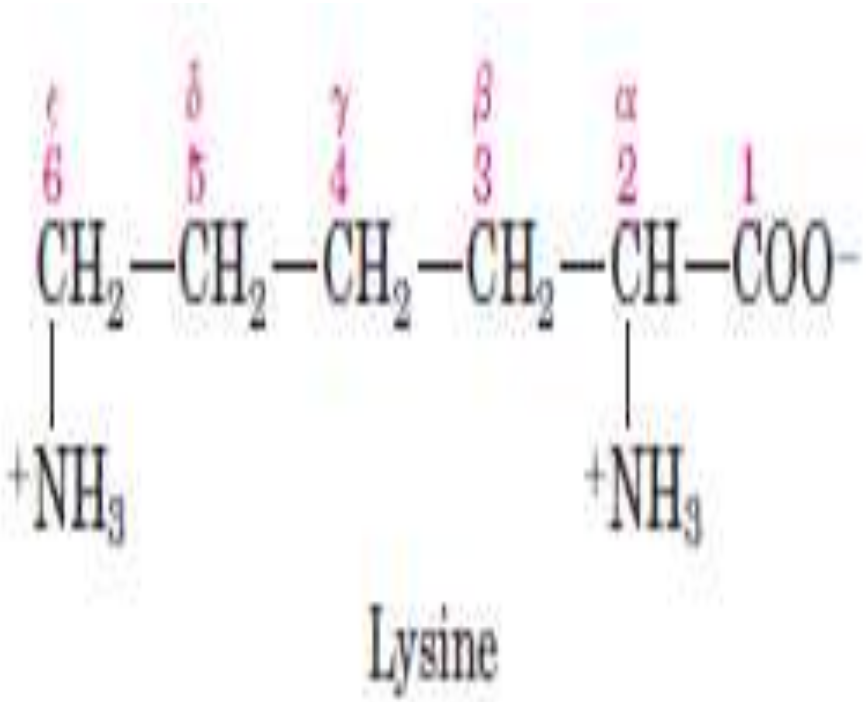
AMINO ACID STRUCTURE



Amino Acid Structure

α – Carbon:

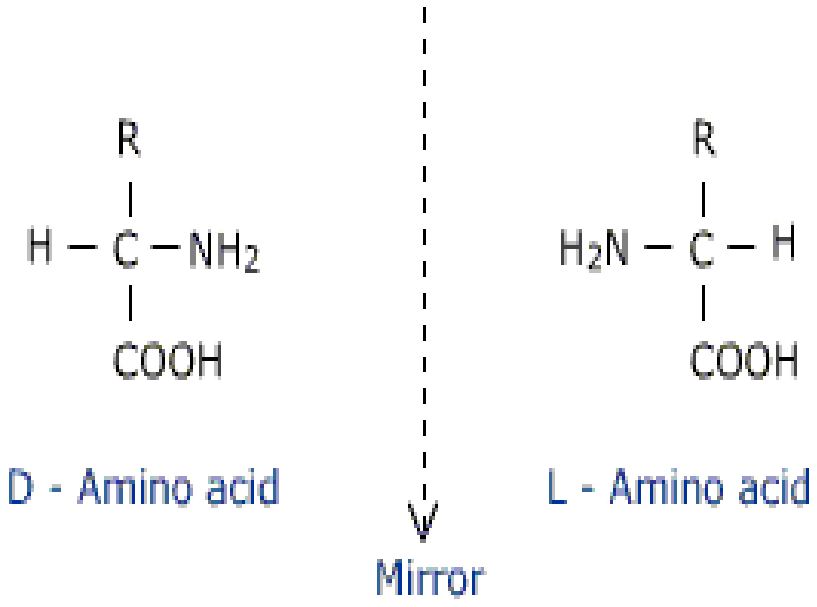
- The carboxyl carbon of an amino acid is numbered as C-1 and the α-*carbon is C-2*
- In Latin numbers
  - Central chiral carbon is α
  - Carbon next to it is β and so on
  - Carboxylic carbon is not numbered in this system.



Lysine

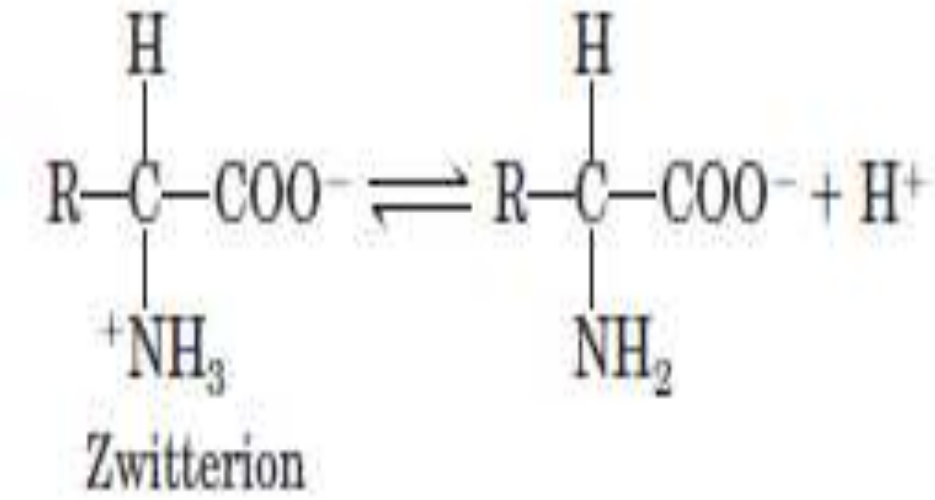
Chiral Center:

- The α-carbon atom is a chiral (asymmetric) center
- When a carbon atom has four different substituent groups (A, B, X,Y), they can be arranged in two ways that represent non-superimposable mirror images of each other (enantiomers).



Zwitter Ion:

- At physiological PH (7.4)
  - COOH group (weak acid/proton donor) is dissociated forming a negatively charged carboxylate ion (COO-)
  - amino group (weak base/proton acceptor) is protonated forming positively charged ion (NH3+) forming.



- The molecule attains both +ve and –ve charges with **NO NET** charge
- A zwitterion can act as either an acid (proton donor) or a base (proton acceptor)
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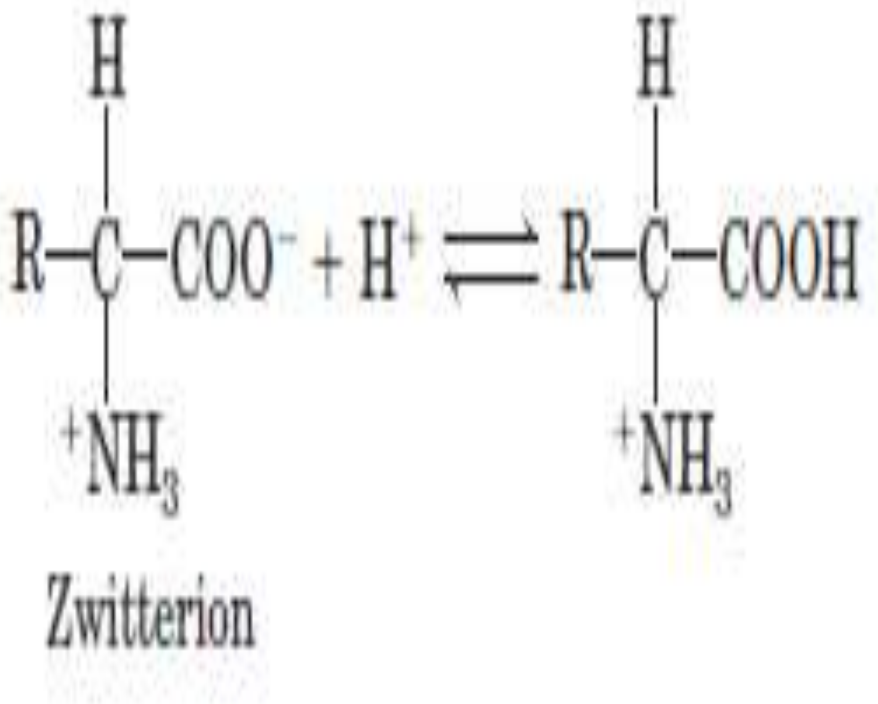


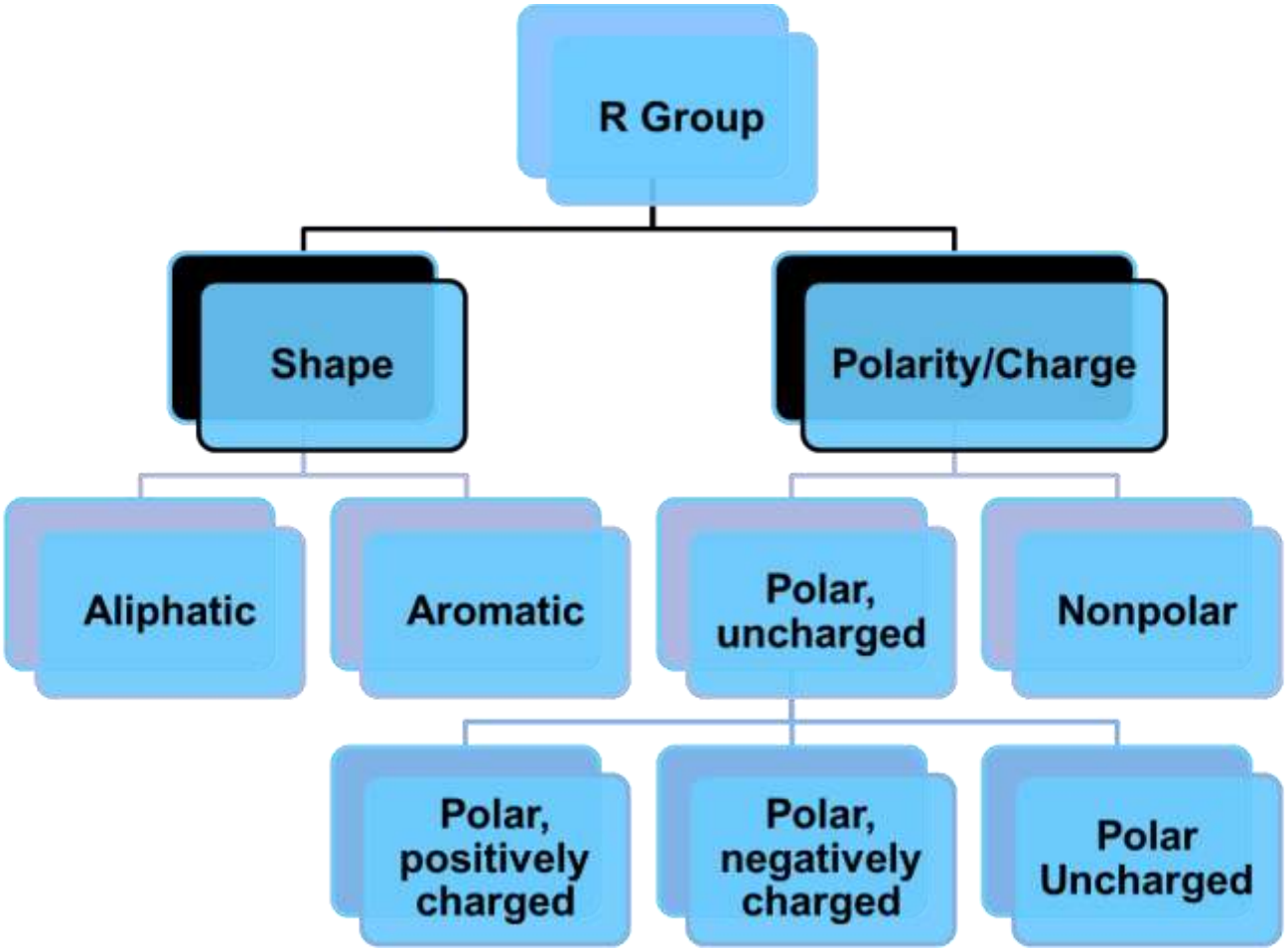
Zwitter Ion: Significance

Buffer
Acid Base Balance

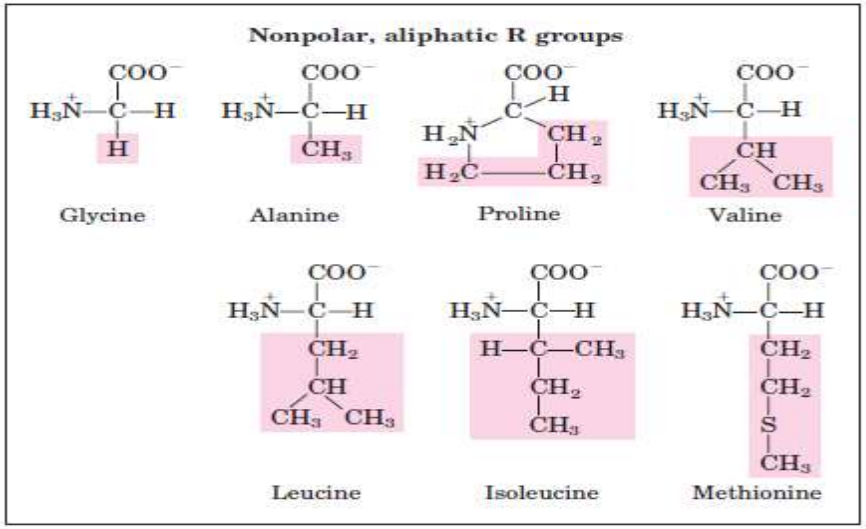
Classification of Amino Acids:

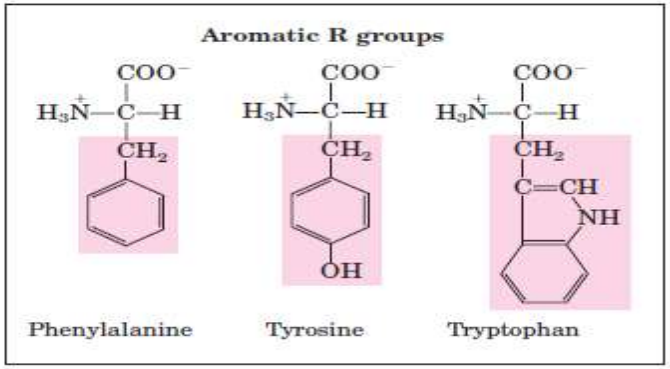
- I. Classification by R group
- II. Chemical Classification
- III. Nutritional Classification
- IV. Metabolic Classification.

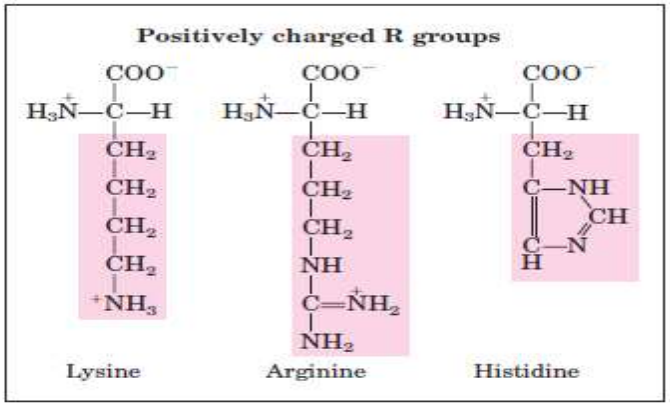
Classification: R Group:

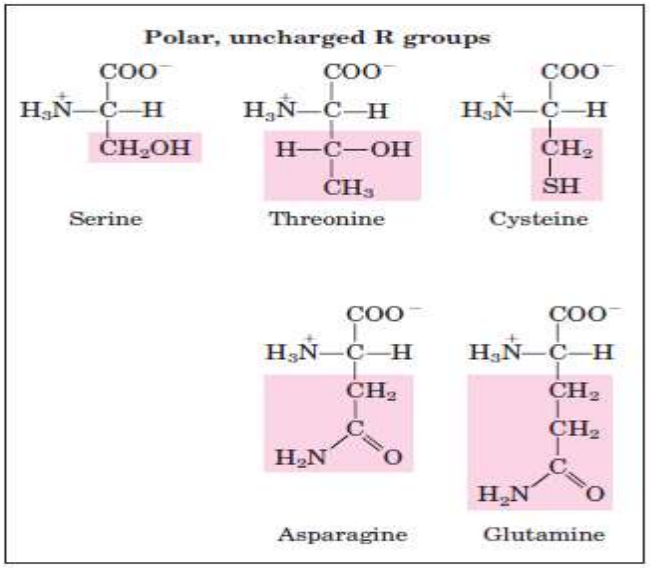


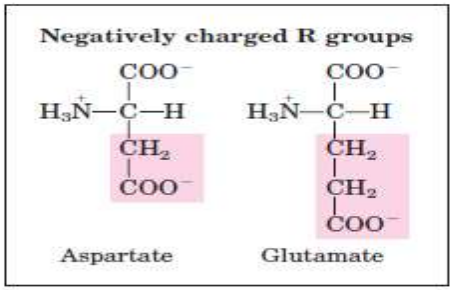
I. Classification by R-Group











II. Chemical Classification

- A. Neutral Amino Acid
- Glycine
- Alanine
- Valine
- Leucine
- B. Basic Amino Acid
- Lysine
- Arginine
- Histidine
- C. Acidic Amino Acid
- Aspartic Acid
- Glutamic Acid

III. Nutritional Classification

Essential amino acids	Non-essential amino acids
Histidine	Alanine
Isoleucine	Arginine
Leucine	Asparagine
Lysine	Aspartic acid
Methionine	Cysteine
Phenylalanine	Glutamic acid
Threonine	Glutamine
Tryptophan	Glycine
Valine	Proline
	Serine
	Tyrosine

- Essential Amino Acids
  - 10 in number
  - Can’t be synthesized in the body
  - Essential to be taken in diet.
  - Arginine and histidine are semi-essential
- Non-essential
  - Can be synthesized in the body
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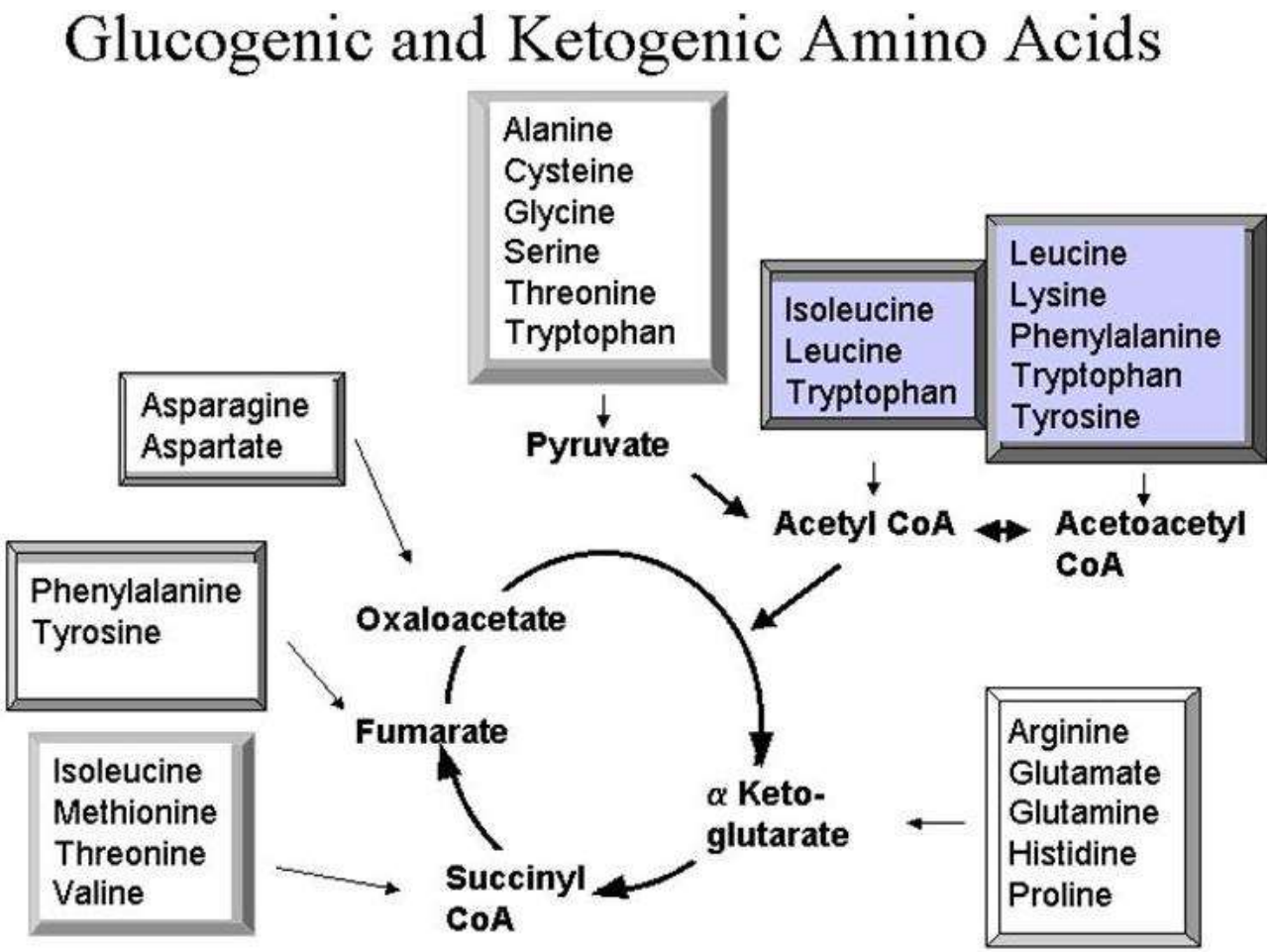
IV. Metabolic Classification



The Peptide Bond

- In proteins, amino acids are joined covalently by peptide bonds.
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- These are amide linkages between the α-carboxyl group of one amino acid and the α-amino group of another
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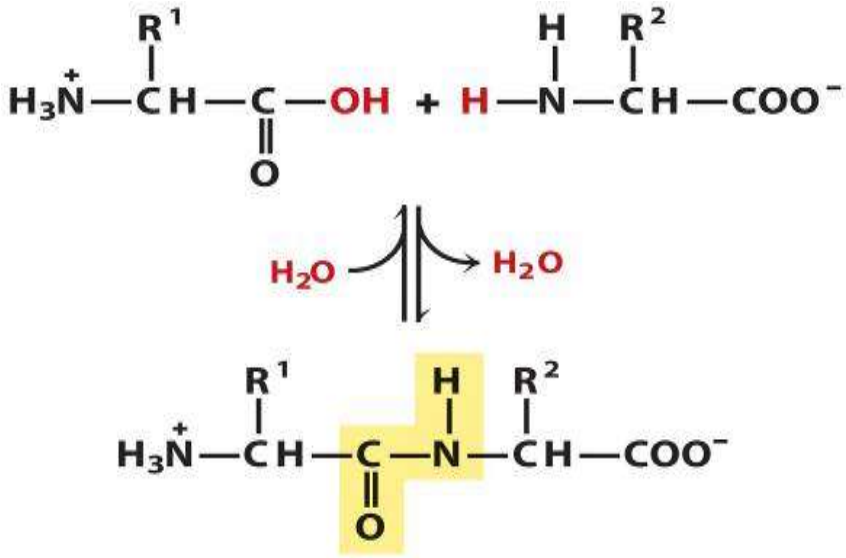
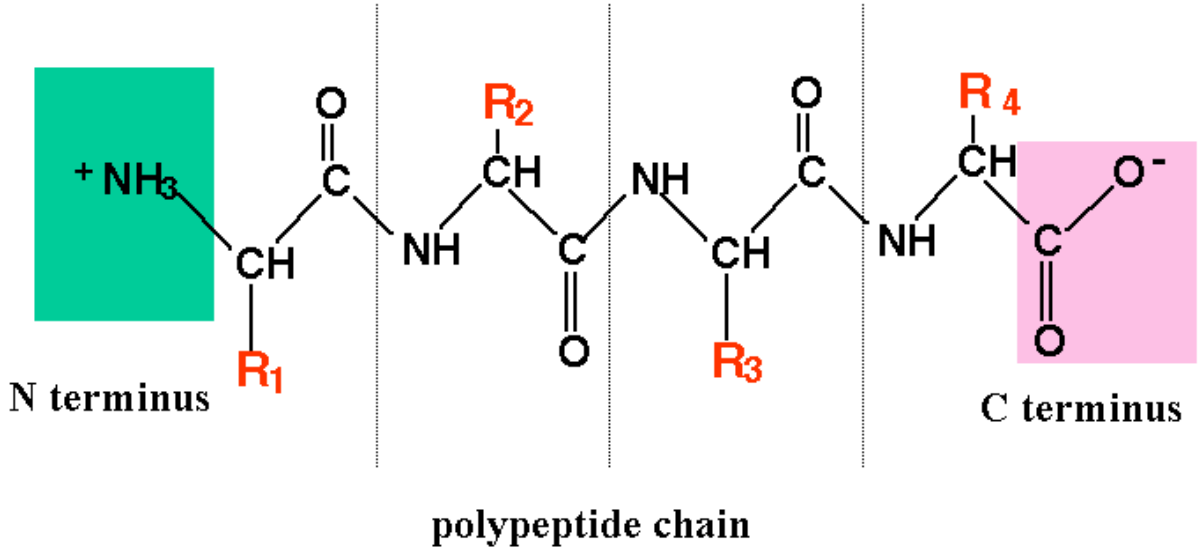


The Peptide Bond: Direction

Peptide = chain of amino acids



The Peptide Bond: Modified Amide Bond:

- Formed at the ribosomes by ribozymes
- Partial double bond character
- Not broken by conditions that denature proteins, such as heating or high concentrations of urea
- Prolonged exposure to a strong acid or base at elevated temperatures is required to hydrolyze these bonds non-enzymatically.
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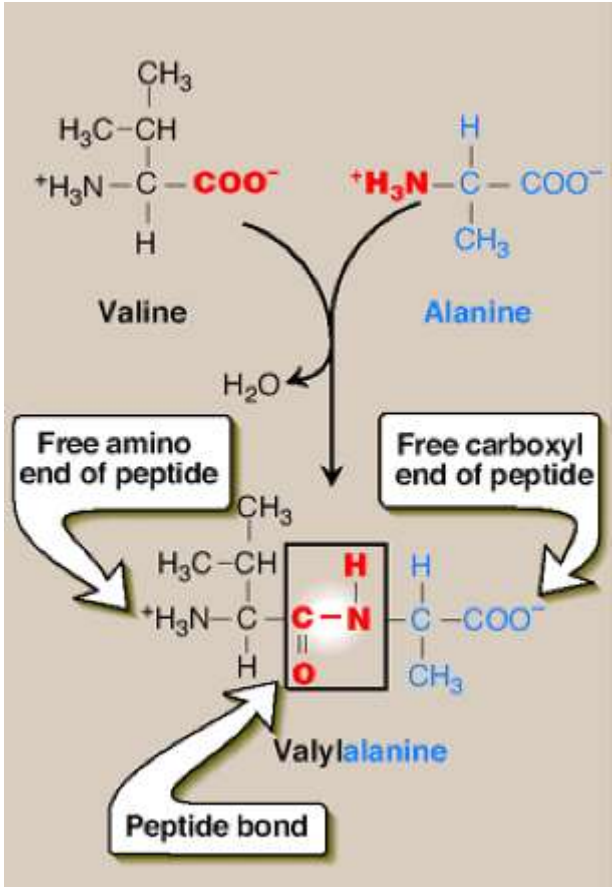

THANK YOU