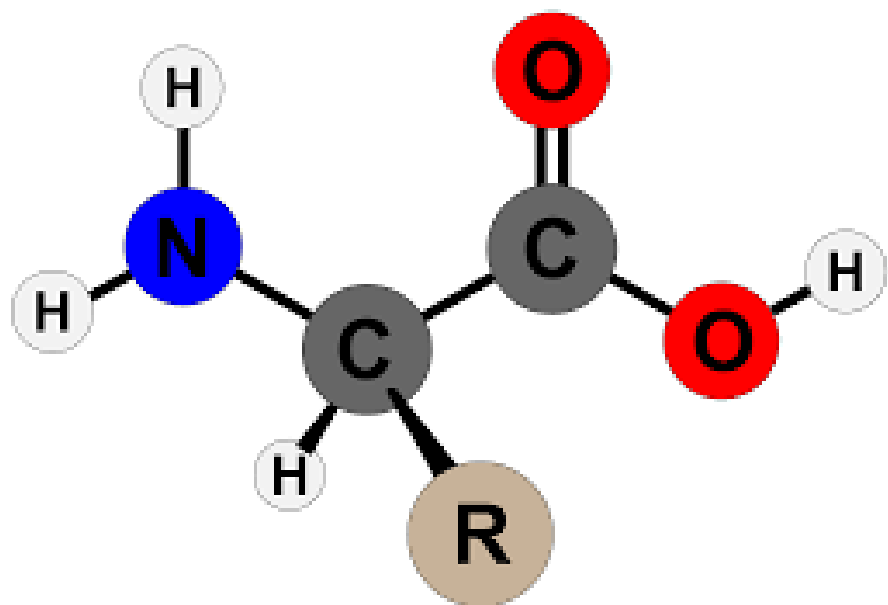
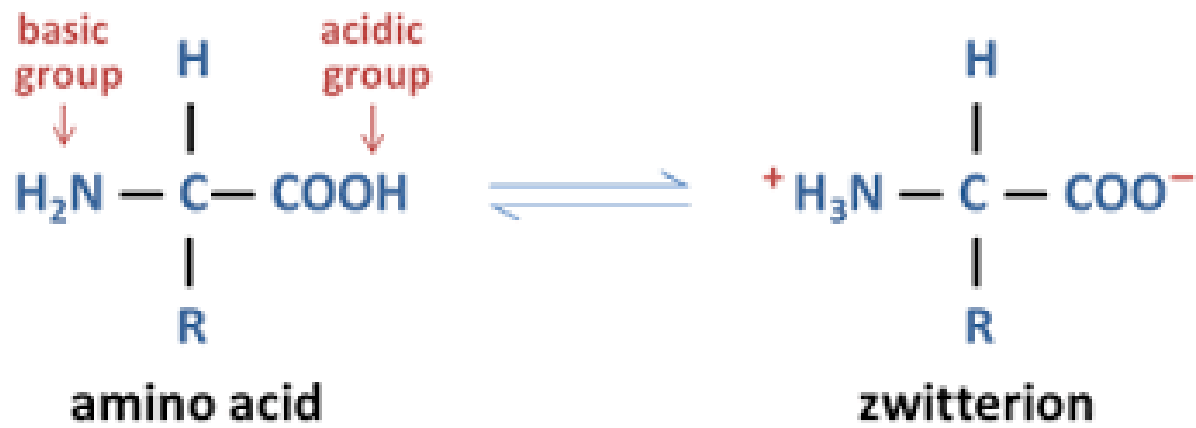
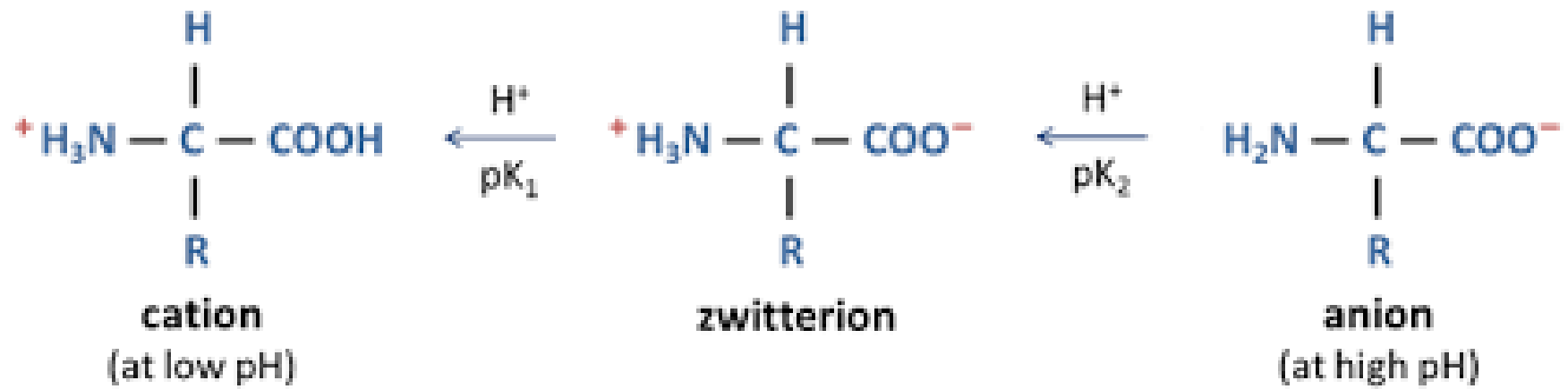


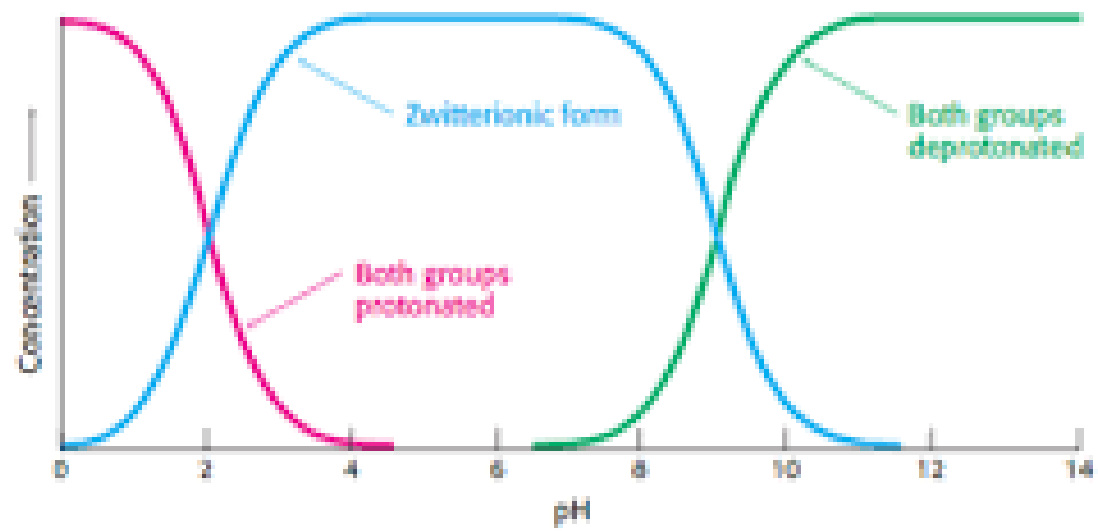
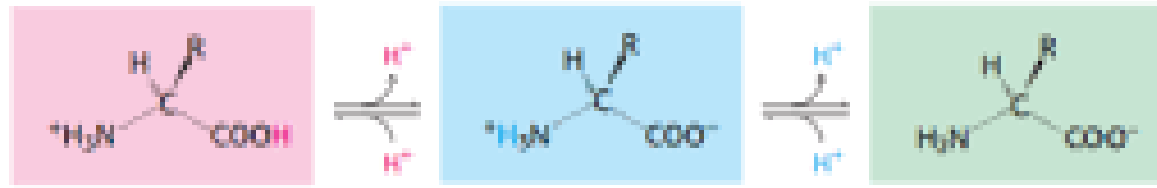
# Proteins

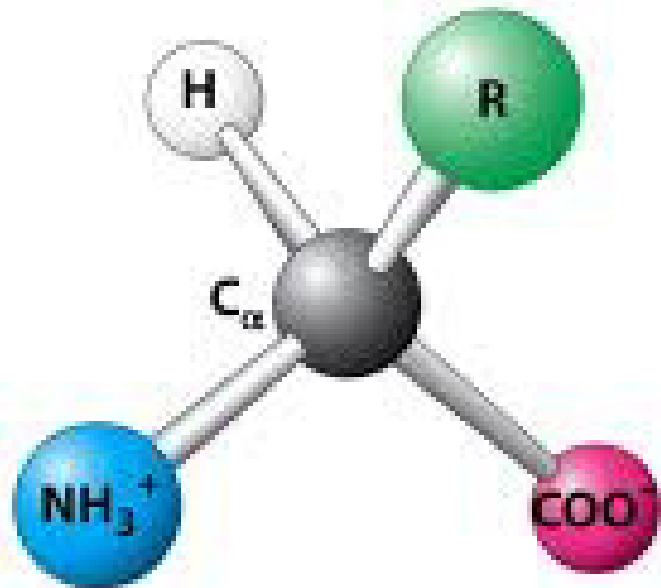
## Amino Acids: Structure & Classification



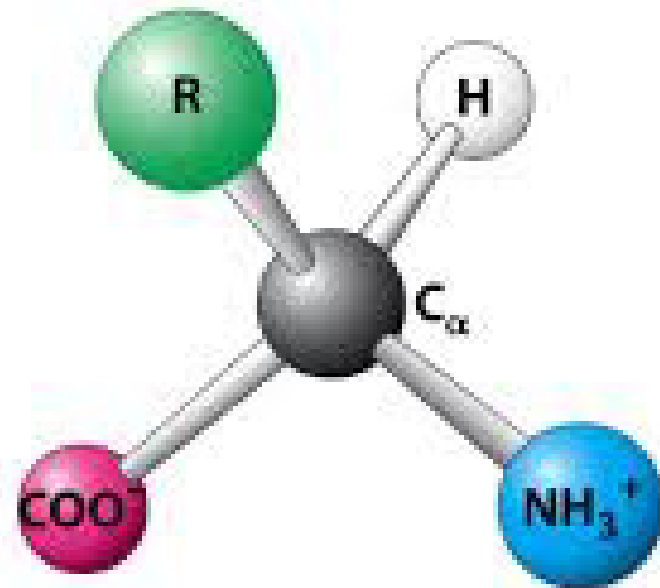






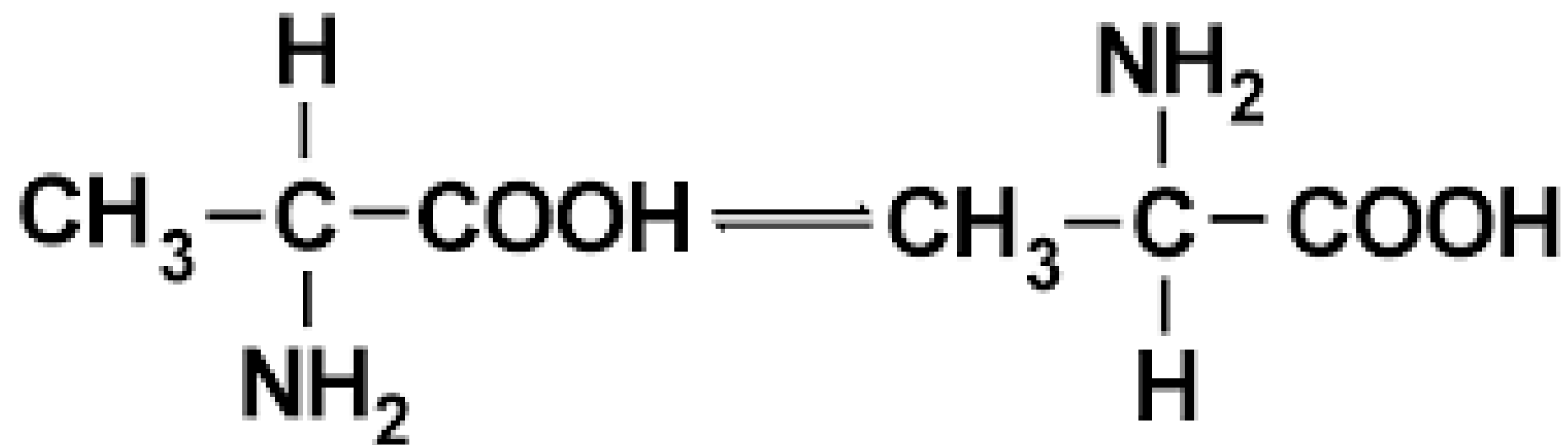


**L isomer**



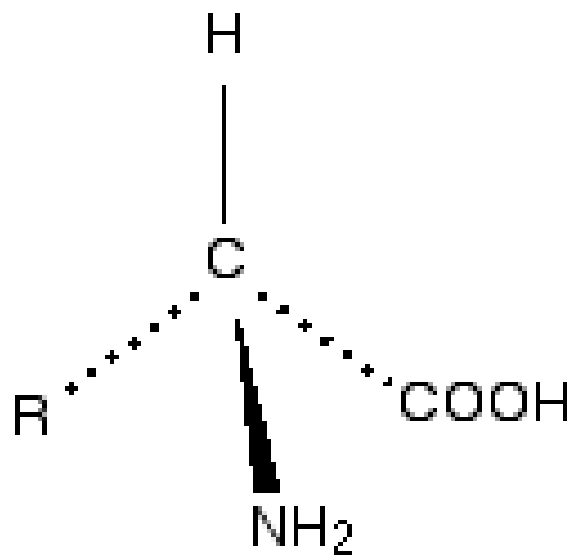
**D isomer**

Figure 2-4  
Biochemistry, Seventh Edition  
© 2004 W. H. Freeman and Company

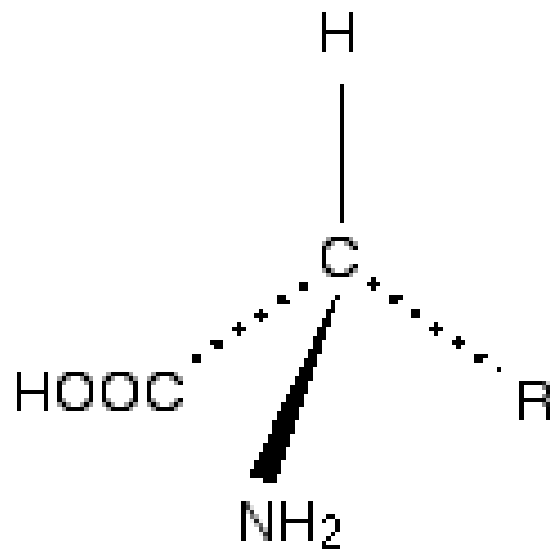


L-Alanine

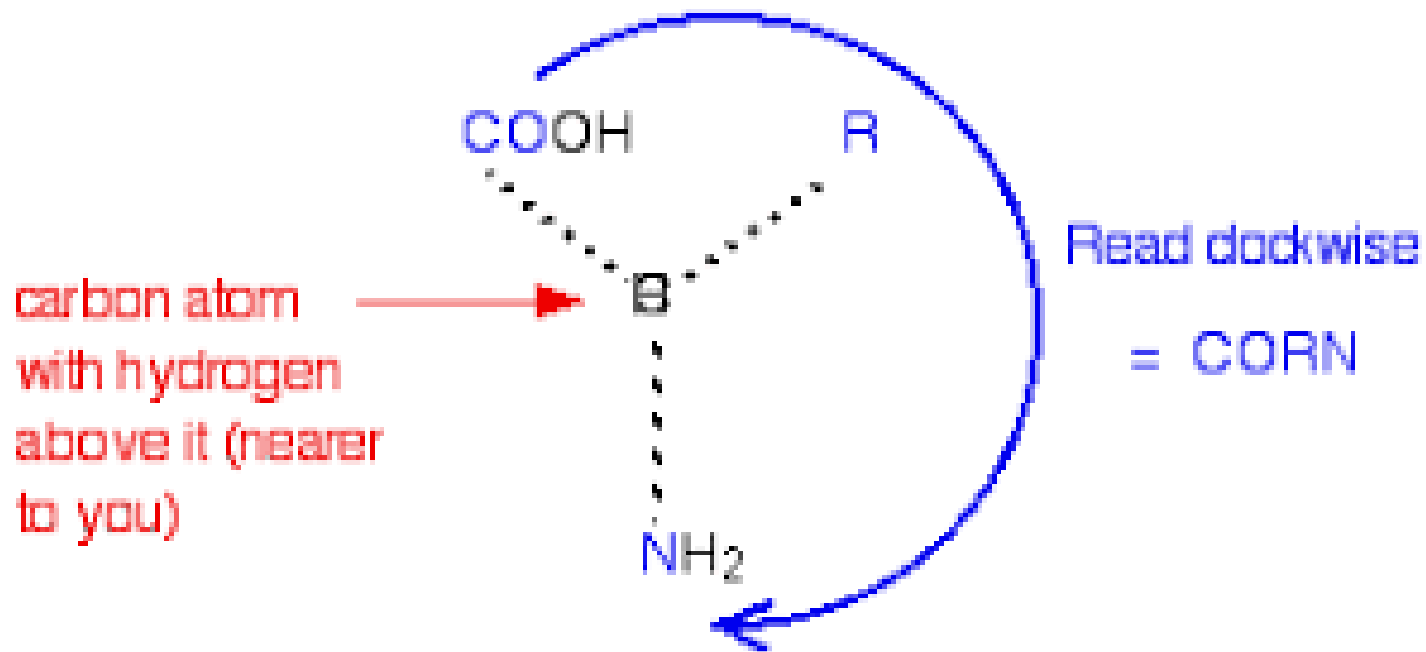
D-Alanine



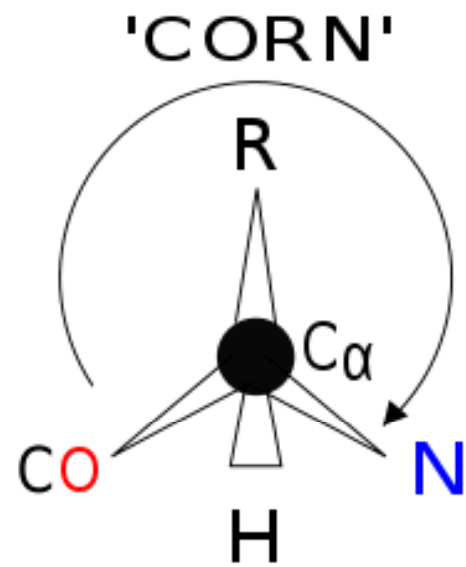
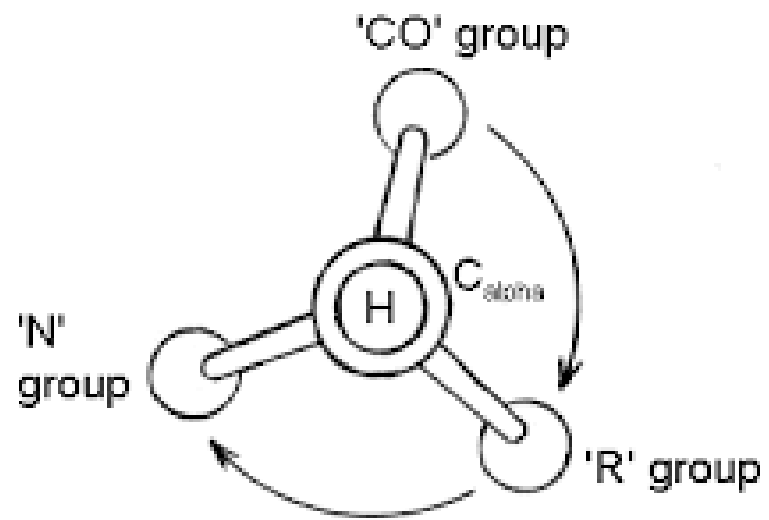
mirror







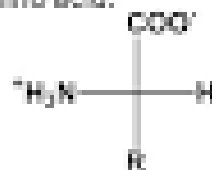
The L-configuration



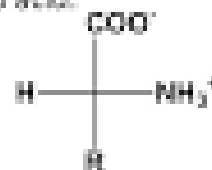
## How to identify the stereochemistry of an amino acid (D or L?)

### Fisher projection

L-amino acid:



D-amino acid:



If projection is aligned with:

- carbon chain vertical
- carboxylate on top
- amino group on left = L
- amino group on right = D

### The CORN rule

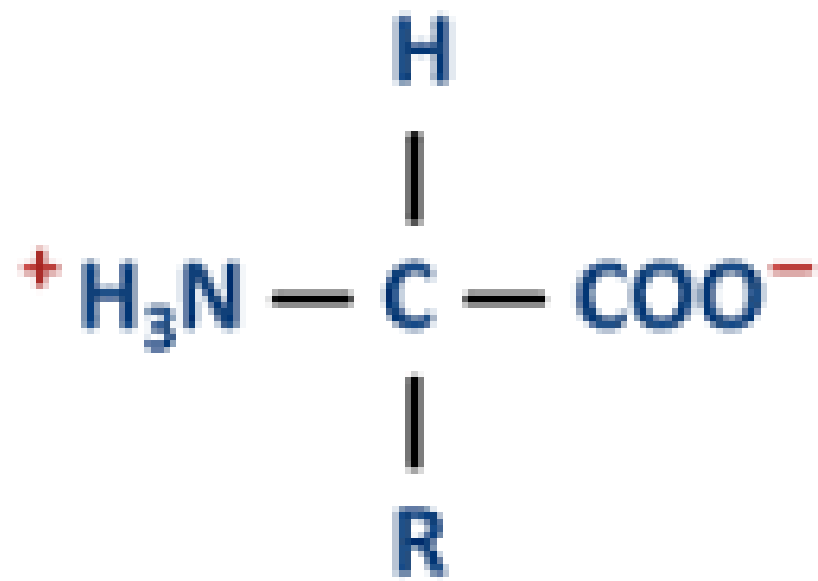
L-amino acid:

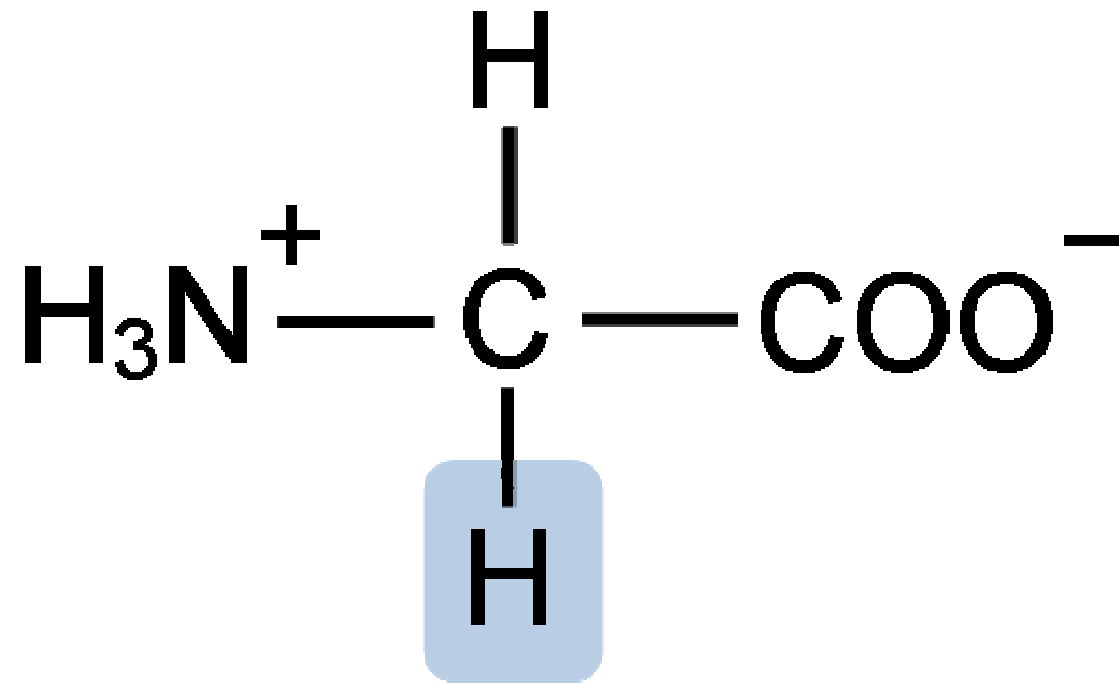


D-amino acid:

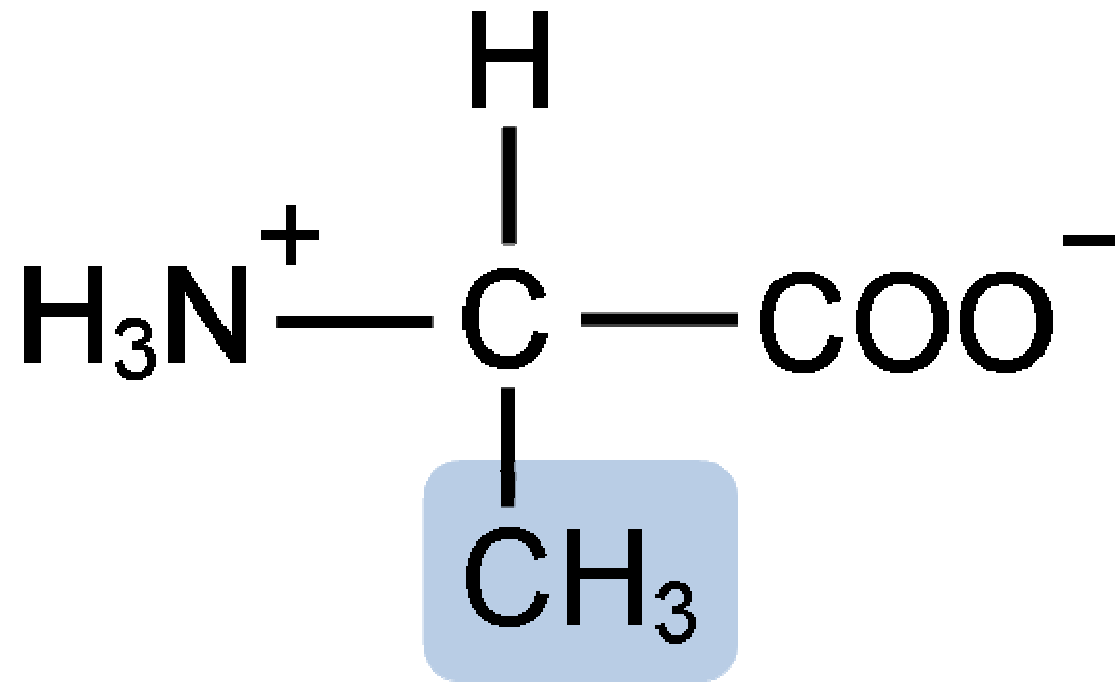


1. Orient the structure to look down the  $\text{C}_\alpha\text{-H}$  bond
2. Follow the other  $\text{C}_\alpha$  substituents to spell CORN (carboxylate, R-group, amino): counterclockwise is L, clockwise is D

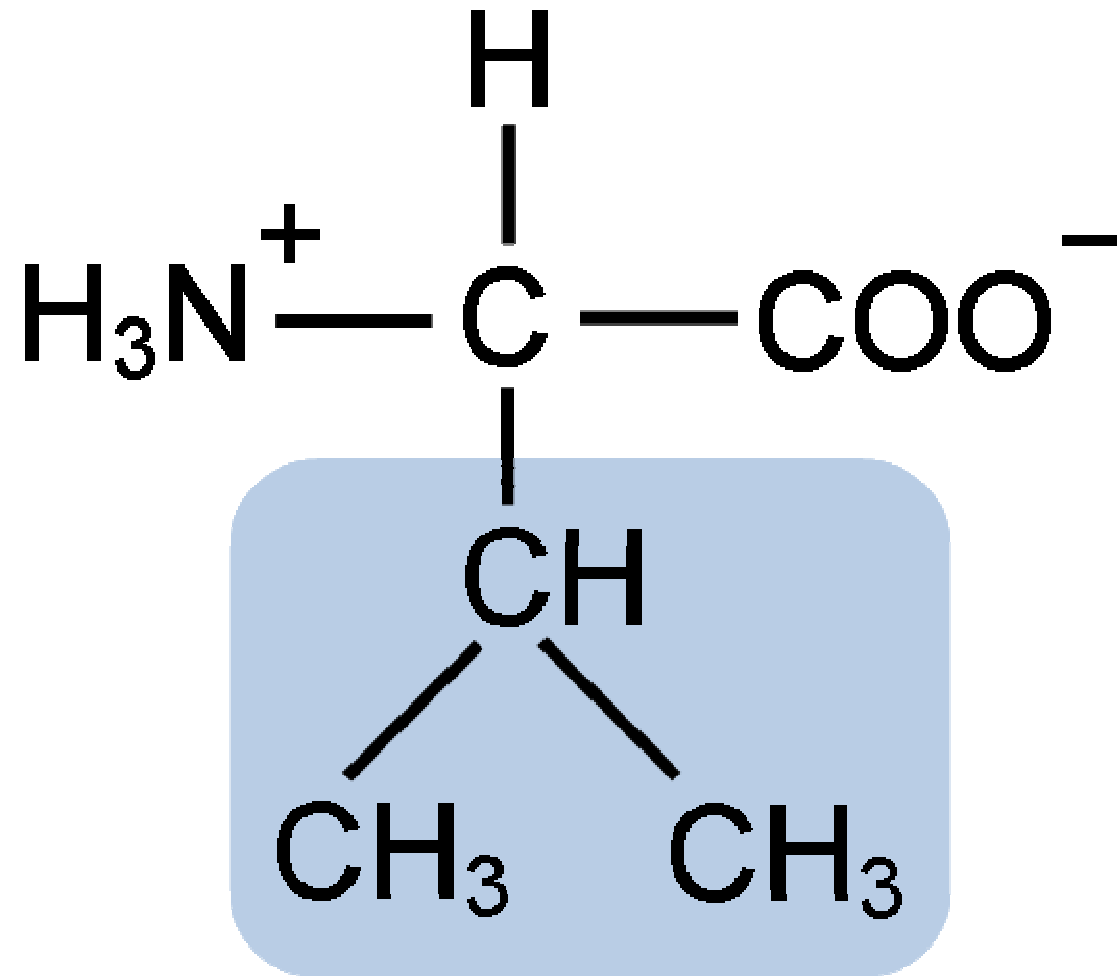




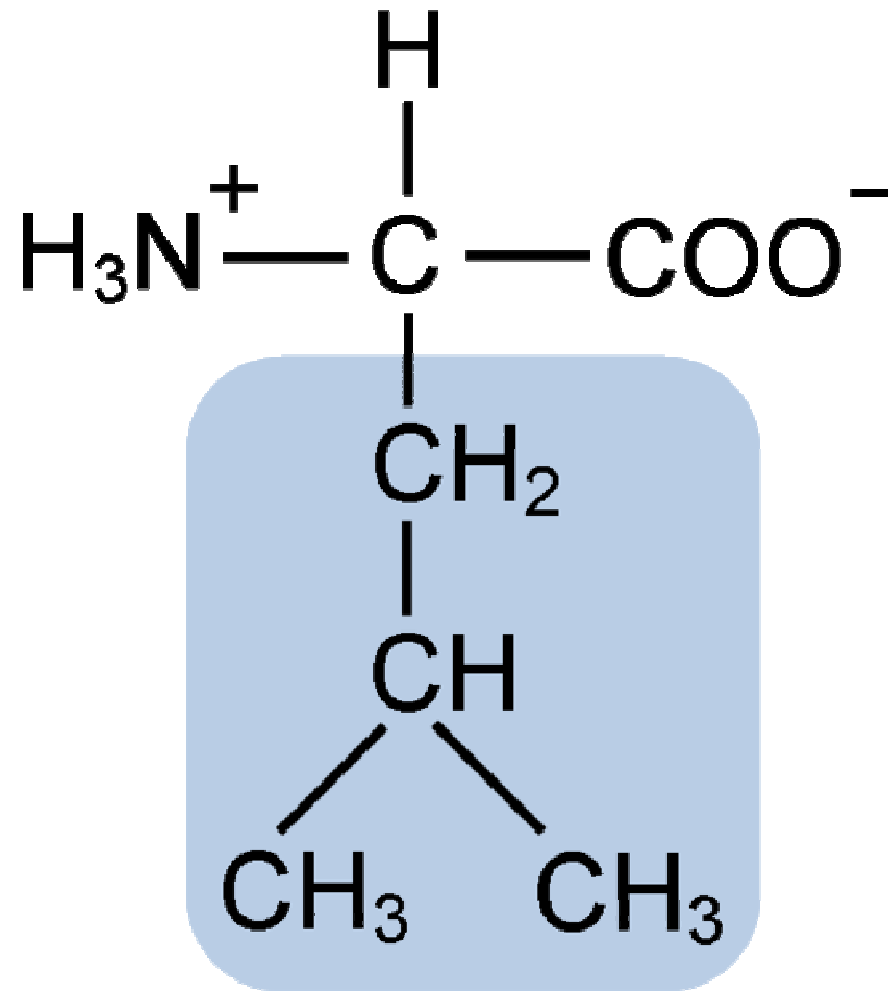
Glycine



Alanine

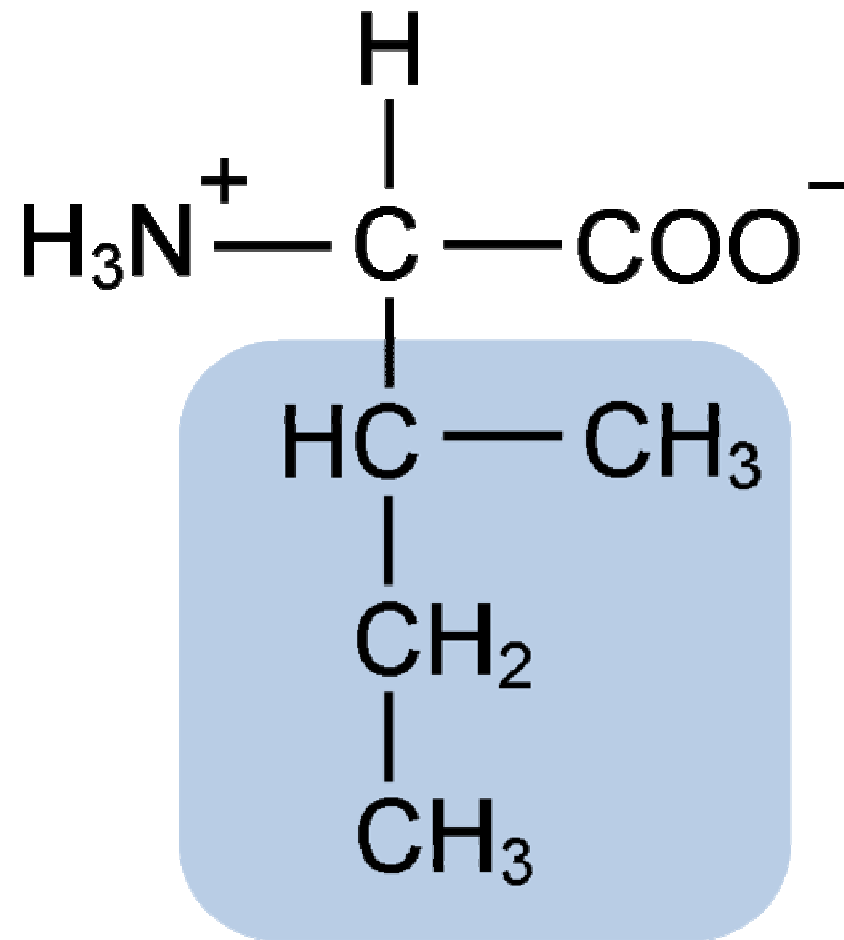


Valine

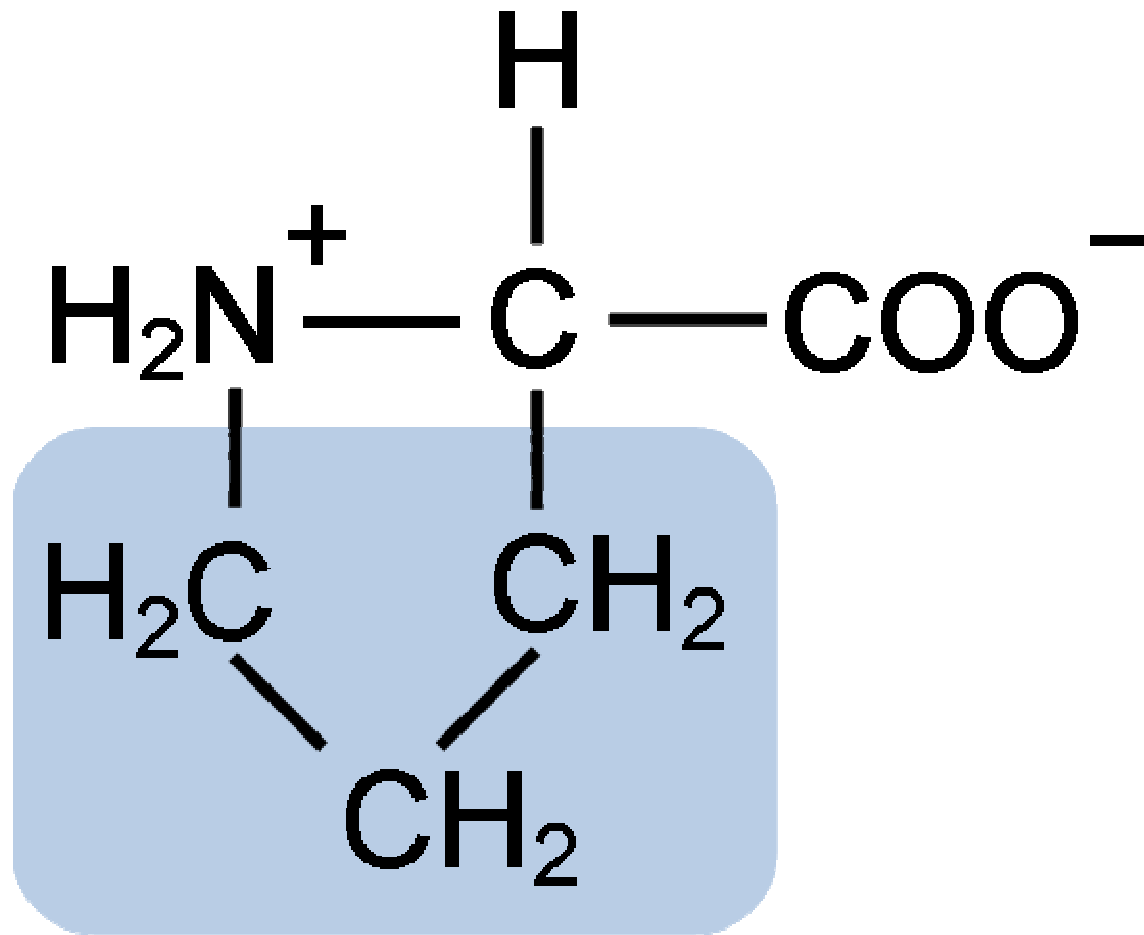


Leucine

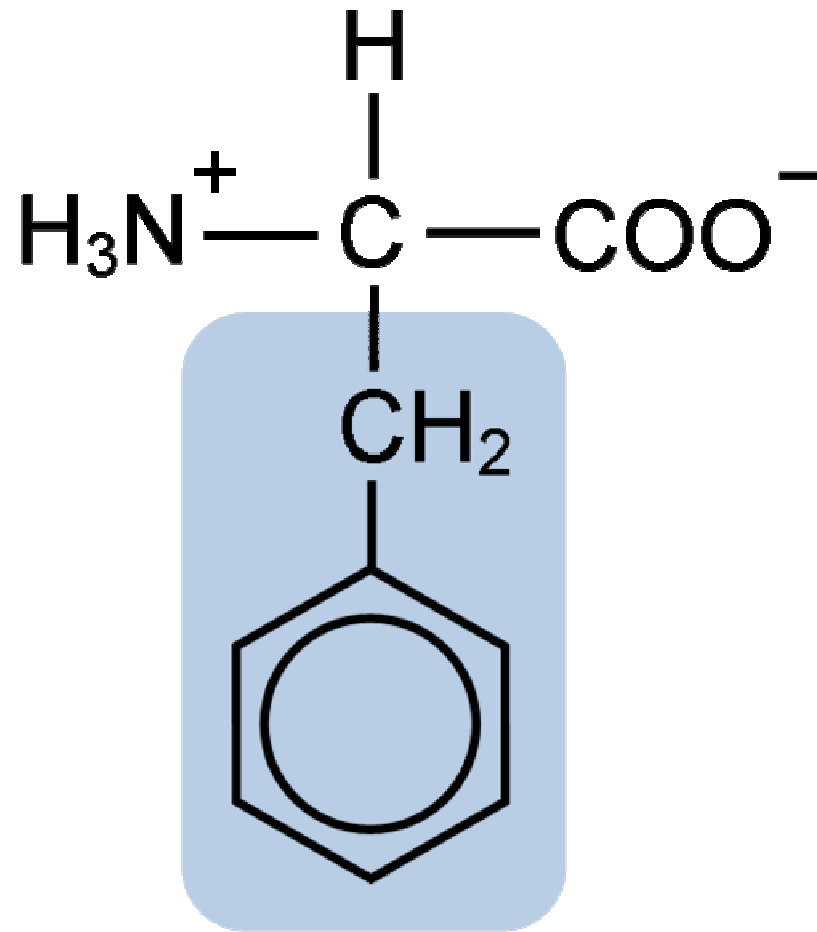




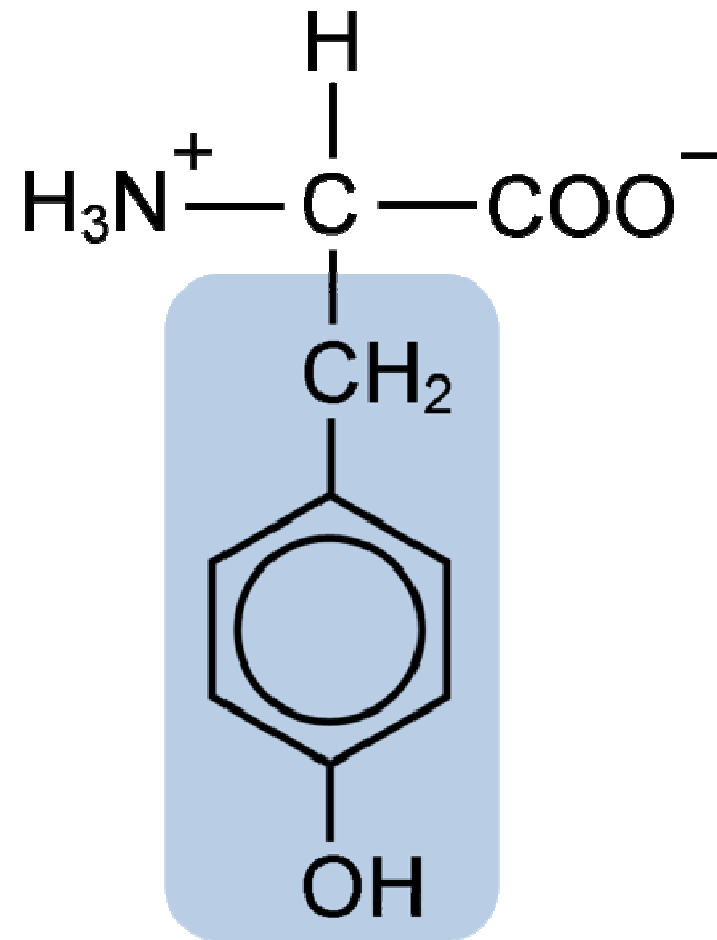
Isoleucine



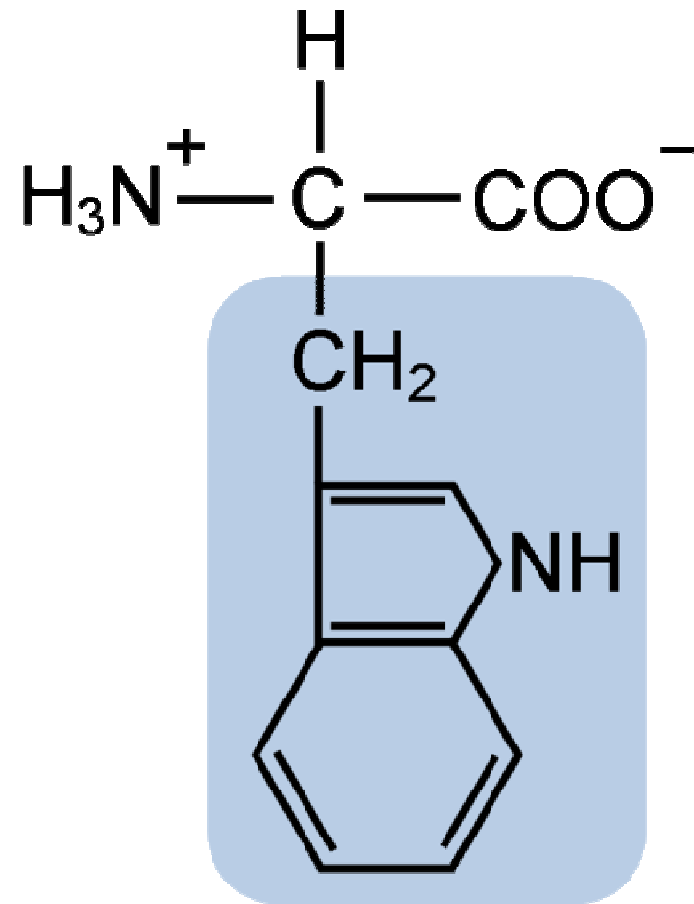
Proline



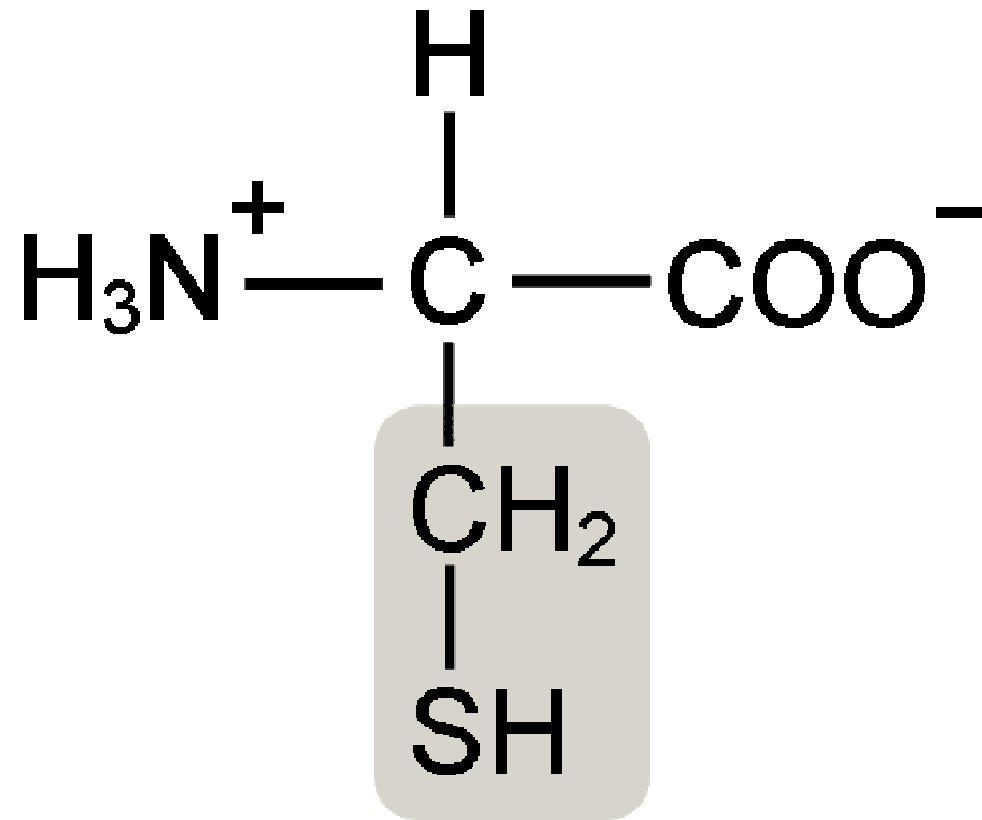
Phenylalanine



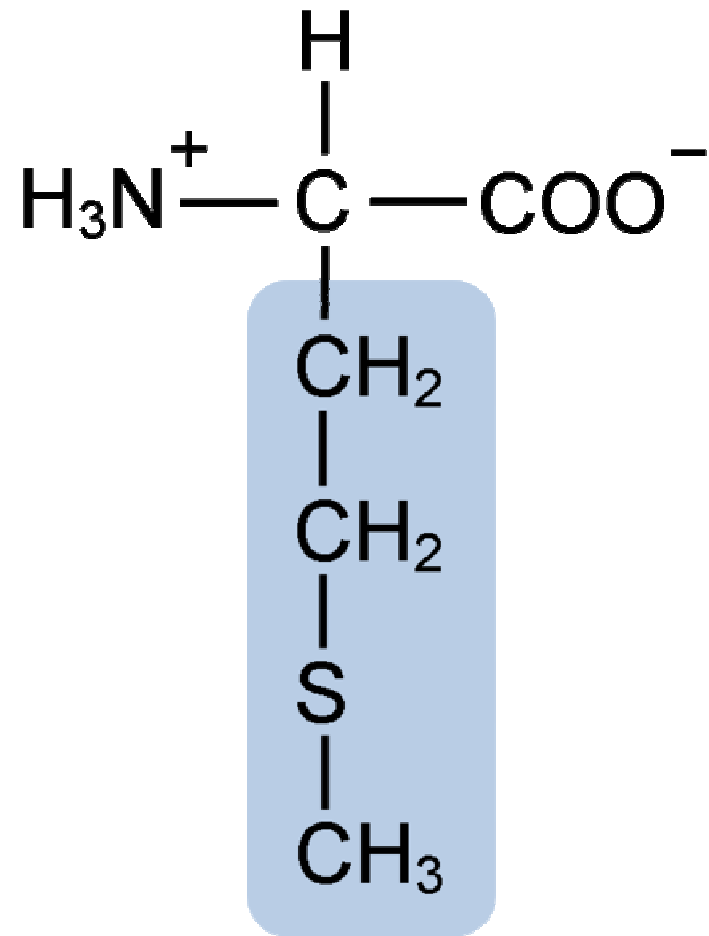
Tyrosine



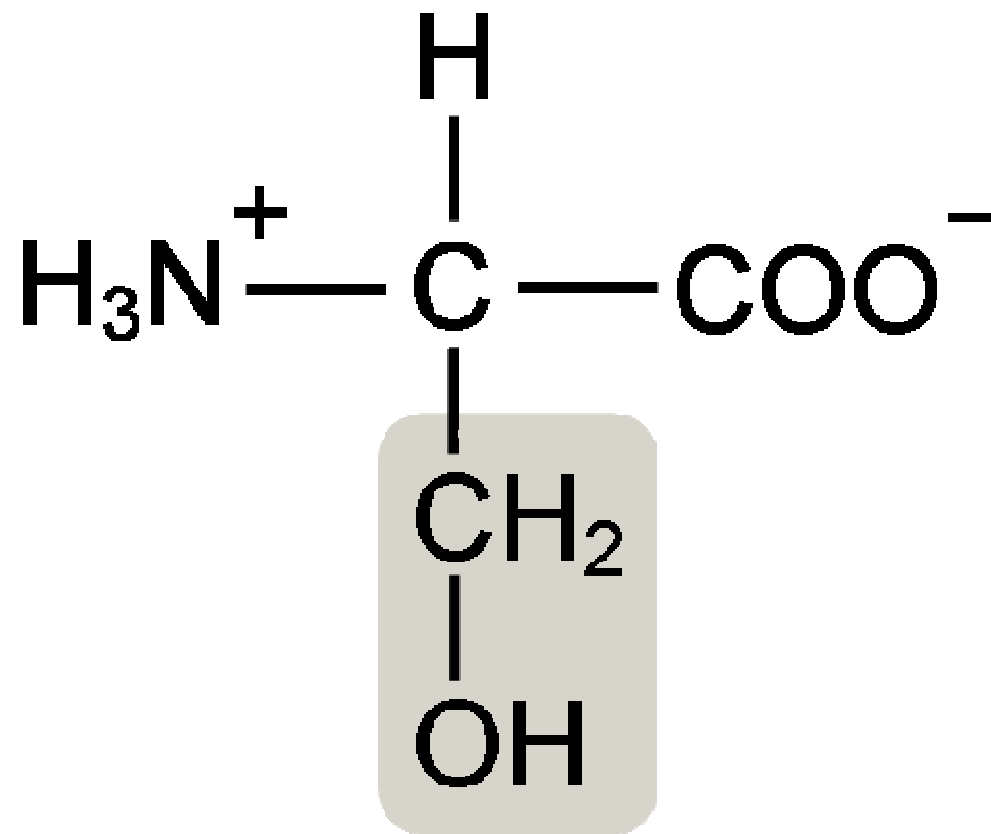
Tryptophan



Cysteine

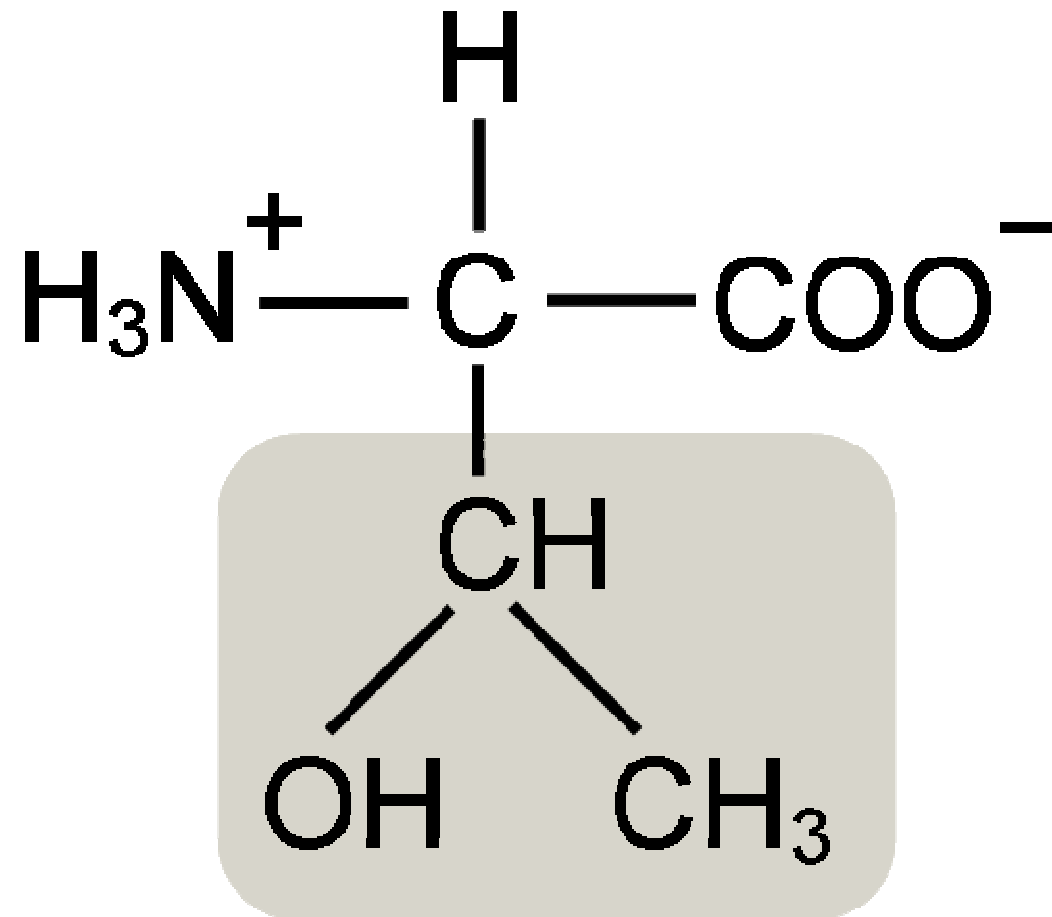


Methionine

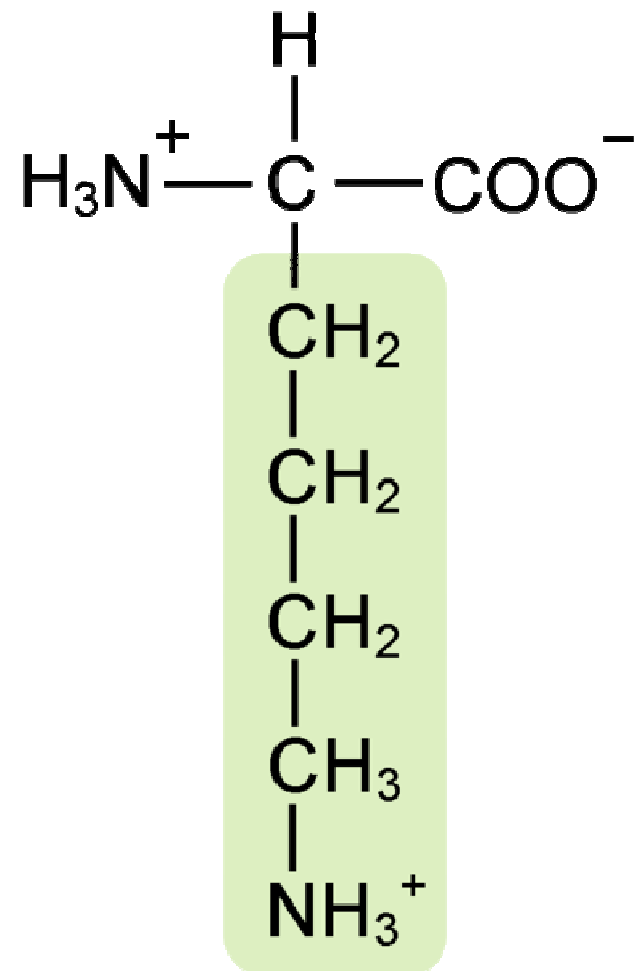


Serine

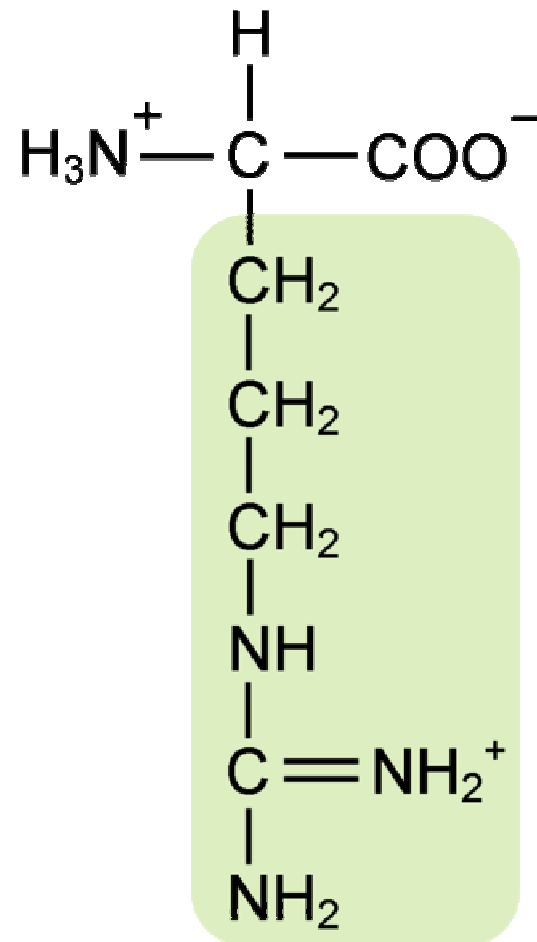




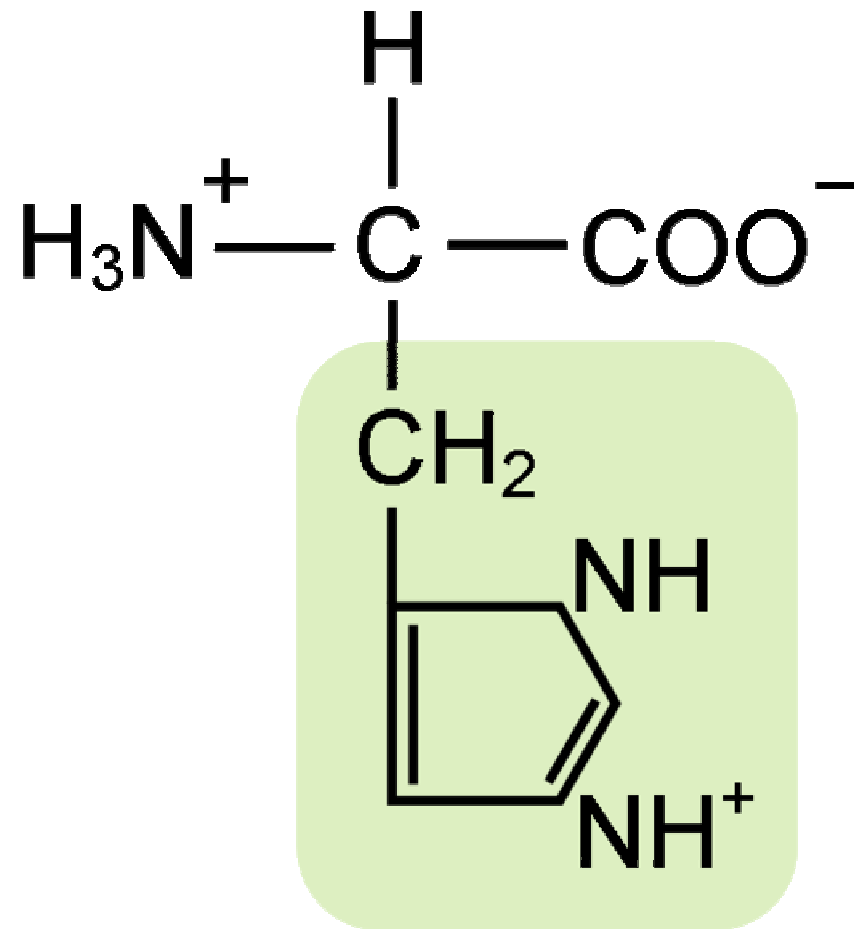
Threonine



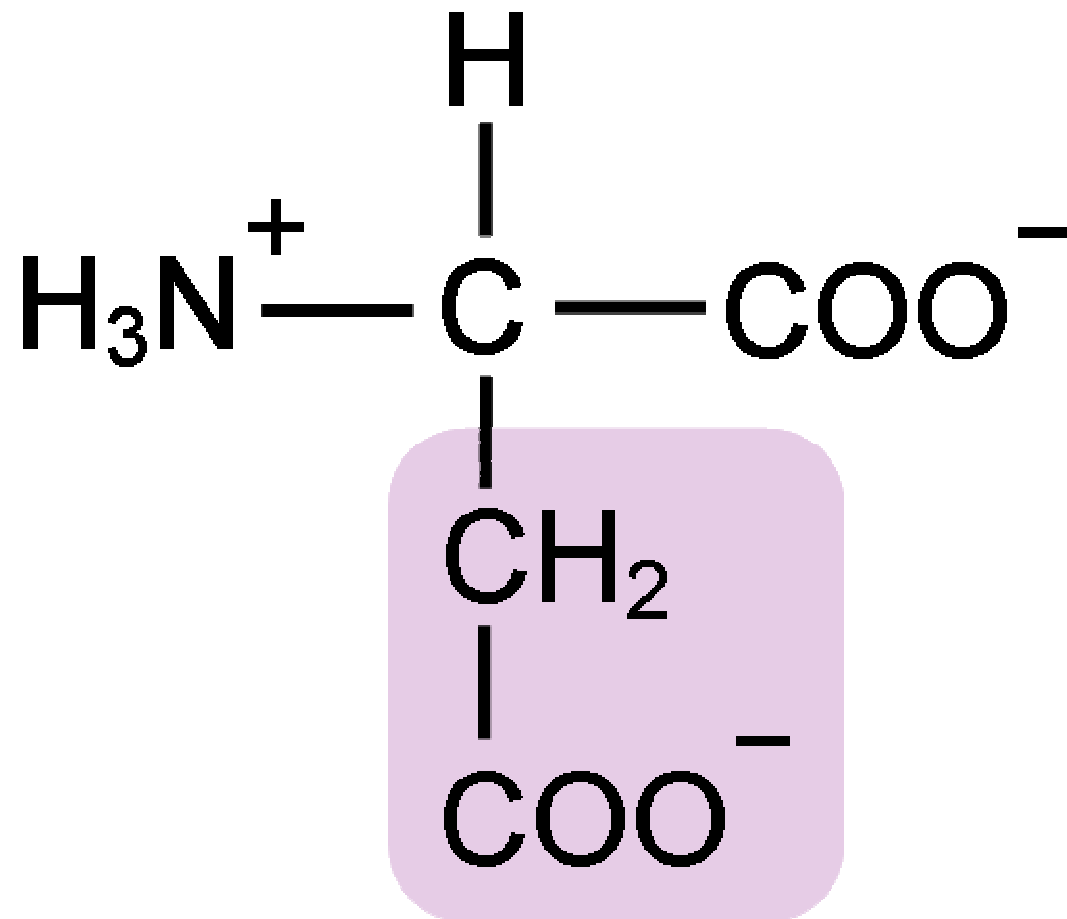
Lysine



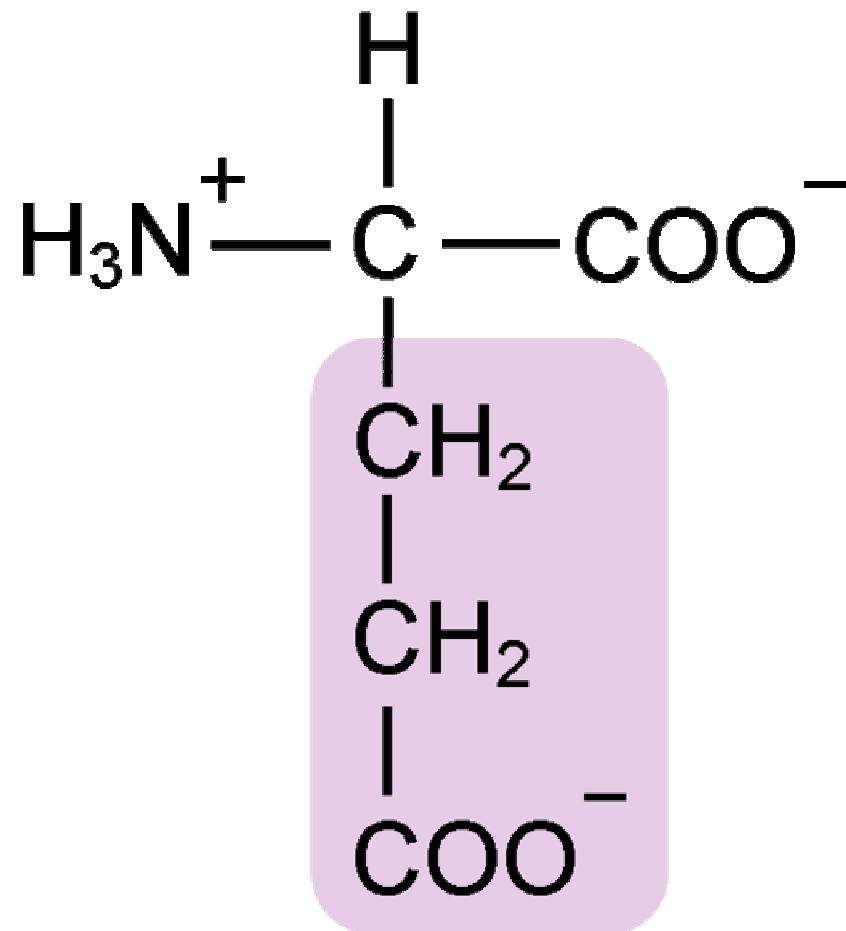
Arginine



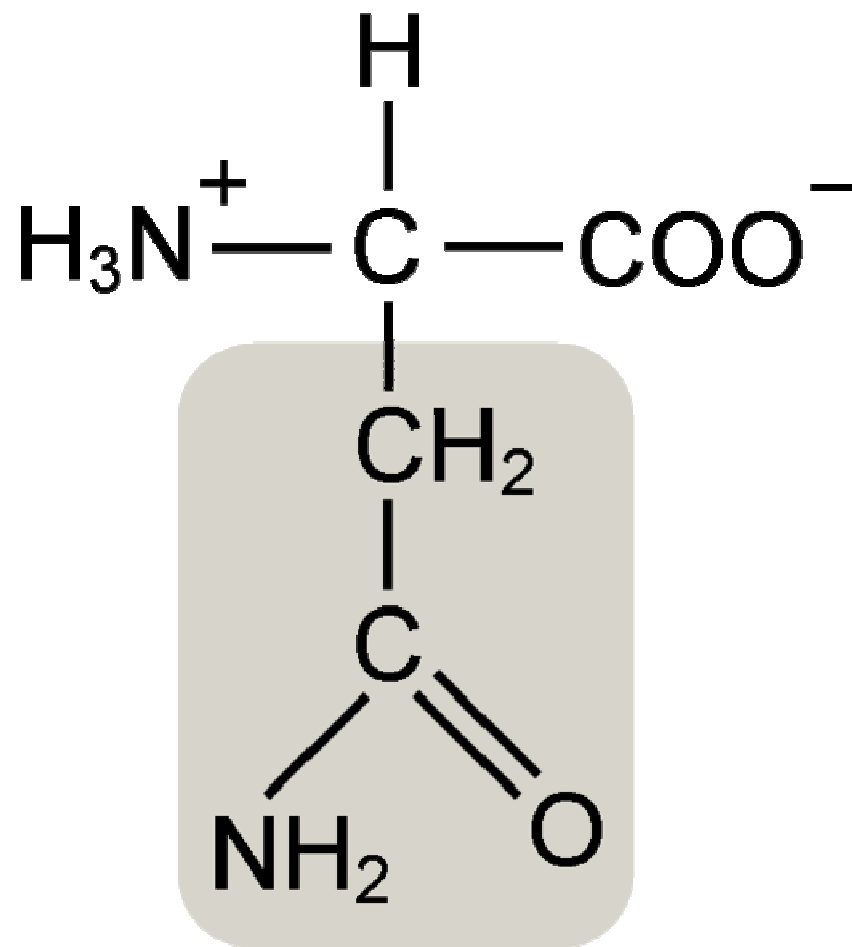
Histidine



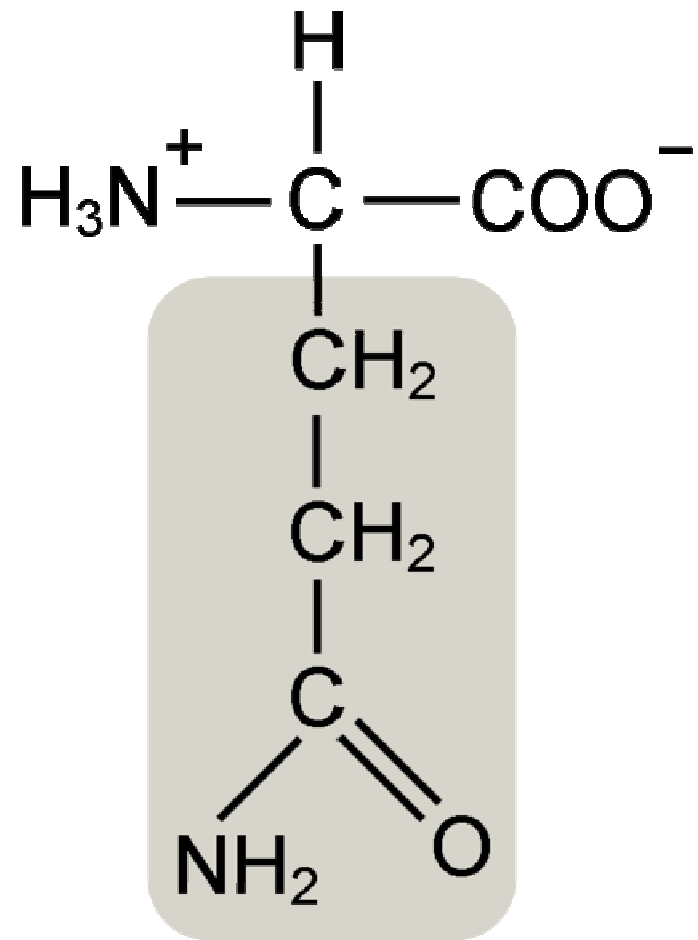
Aspartate



Glutamate

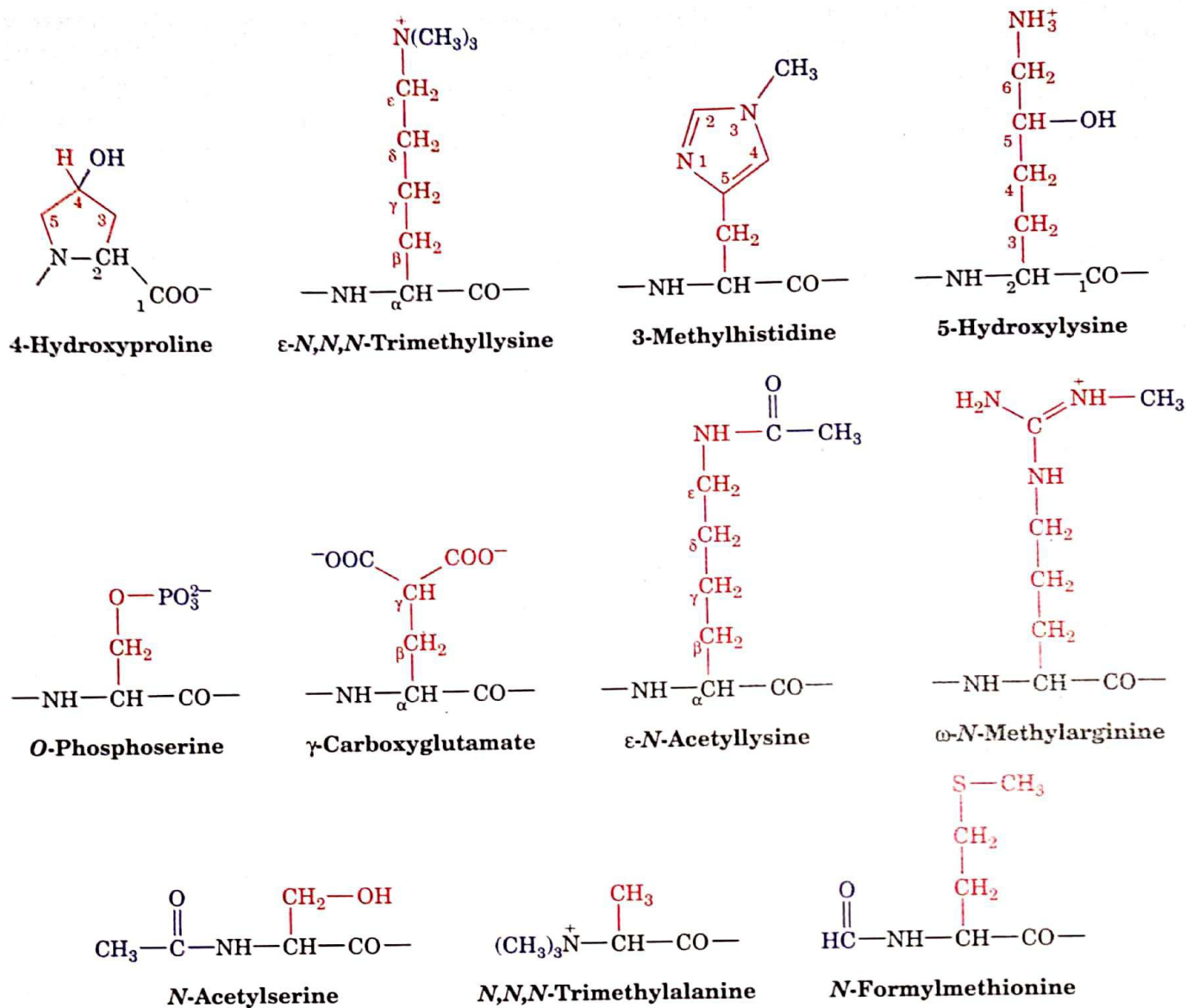


Asparagine



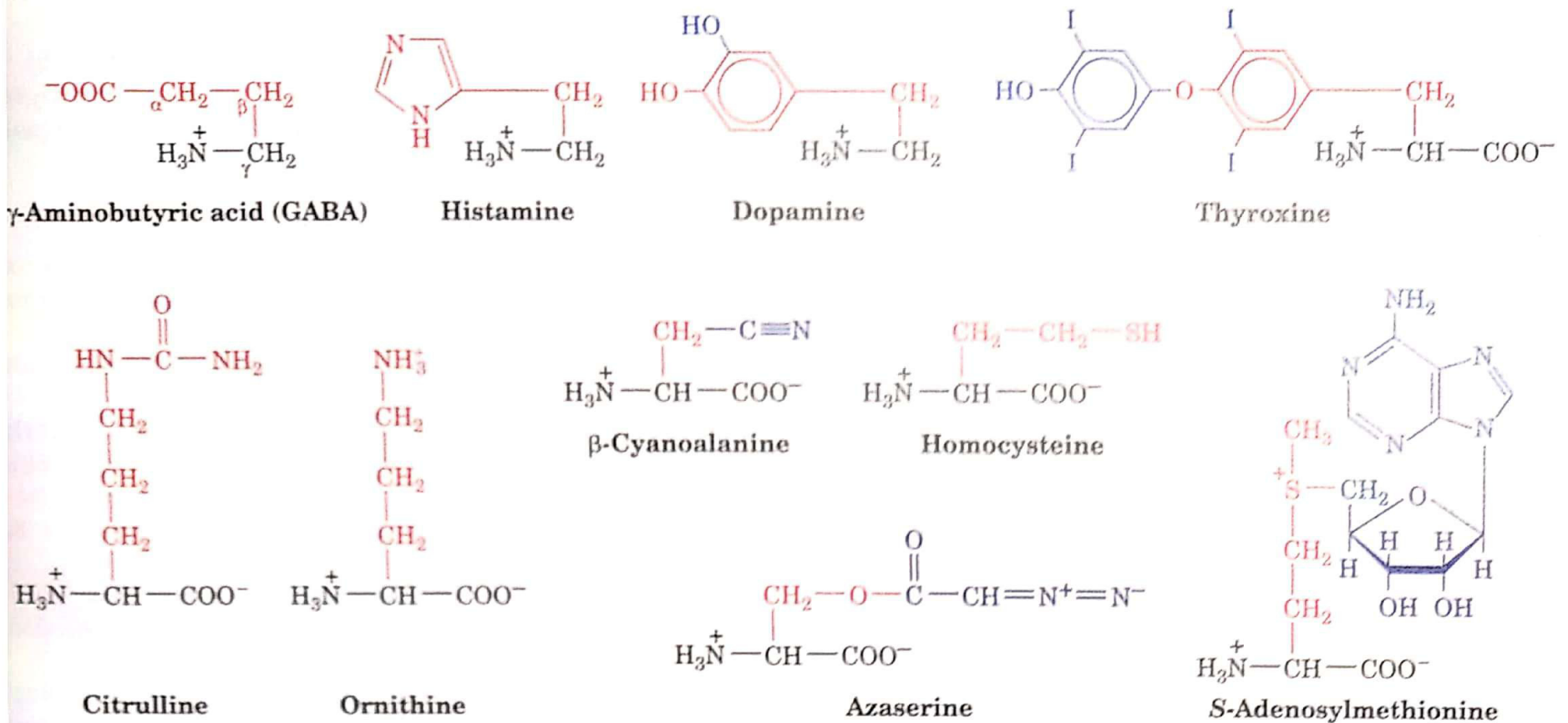
Glutamine





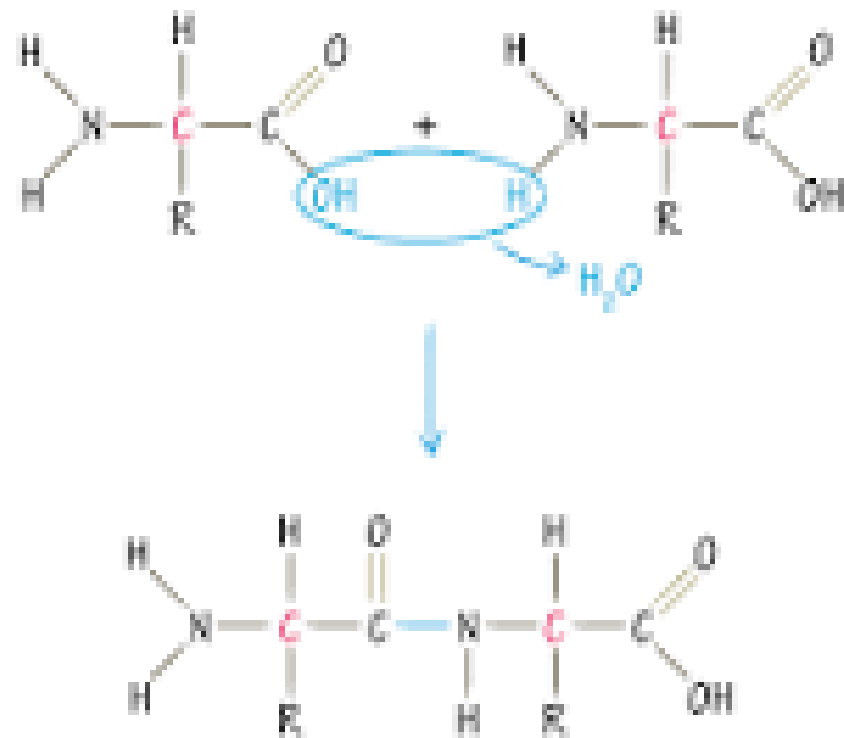
**FIGURE 4-22** Some uncommon amino acid residues that are components of certain proteins. All of these residues are modified from one of the 20 “standard” amino acids after polypep-

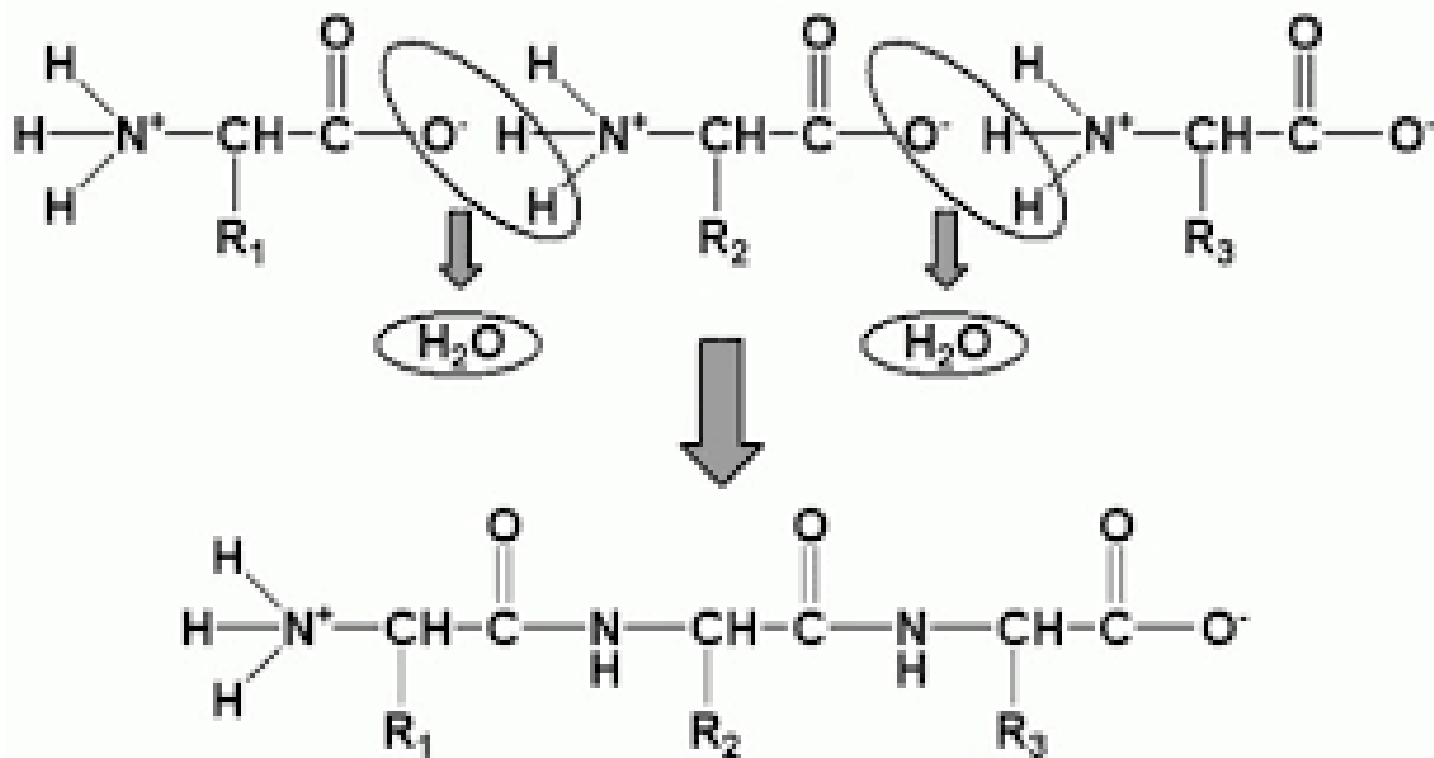
ptide chain biosynthesis. Those amino acid residues that are derivatized at their  $N_{\alpha}$  position occur at the N-termini of proteins.

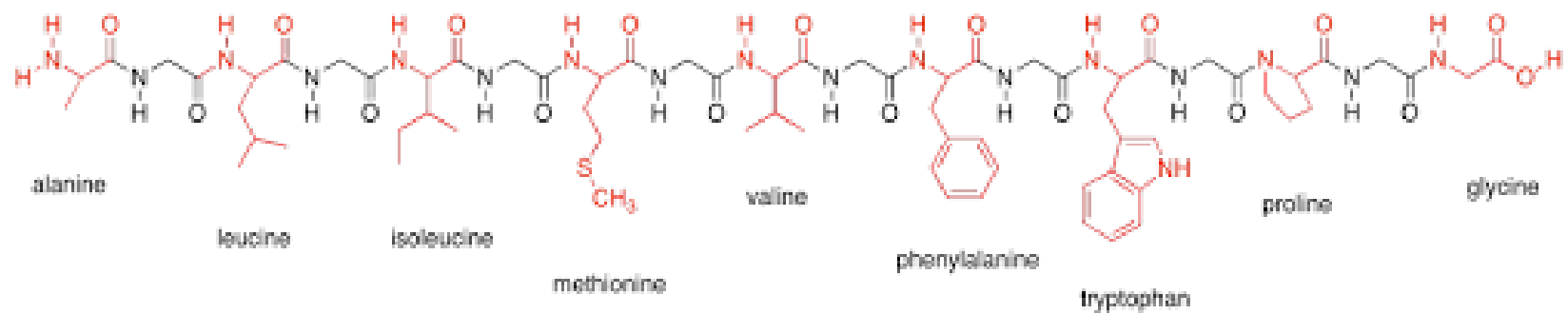


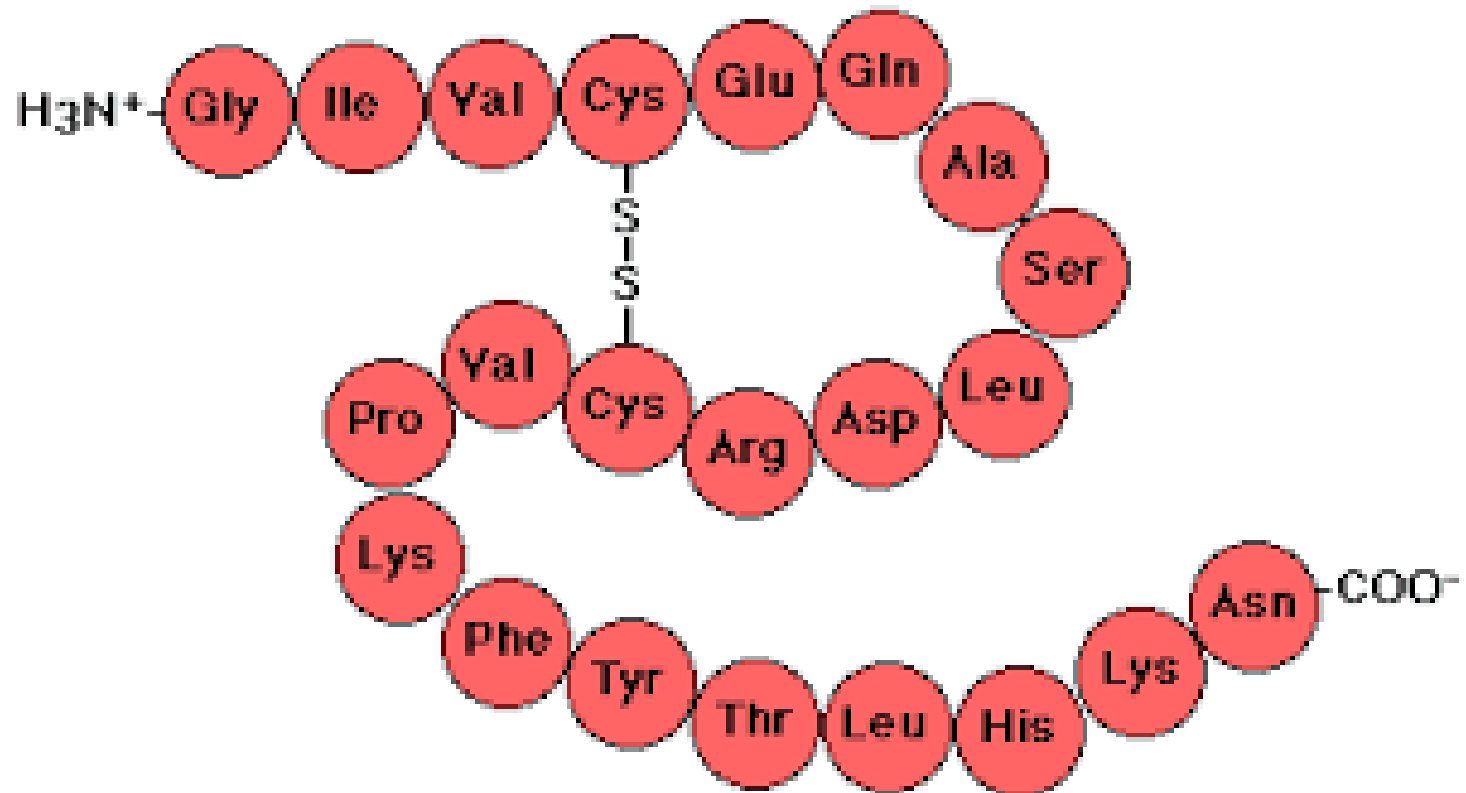
**FIGURE 4-23** Some biologically produced derivatives of “standard” amino acids and amino acids that are not components of proteins.

## Peptide Bond Formation

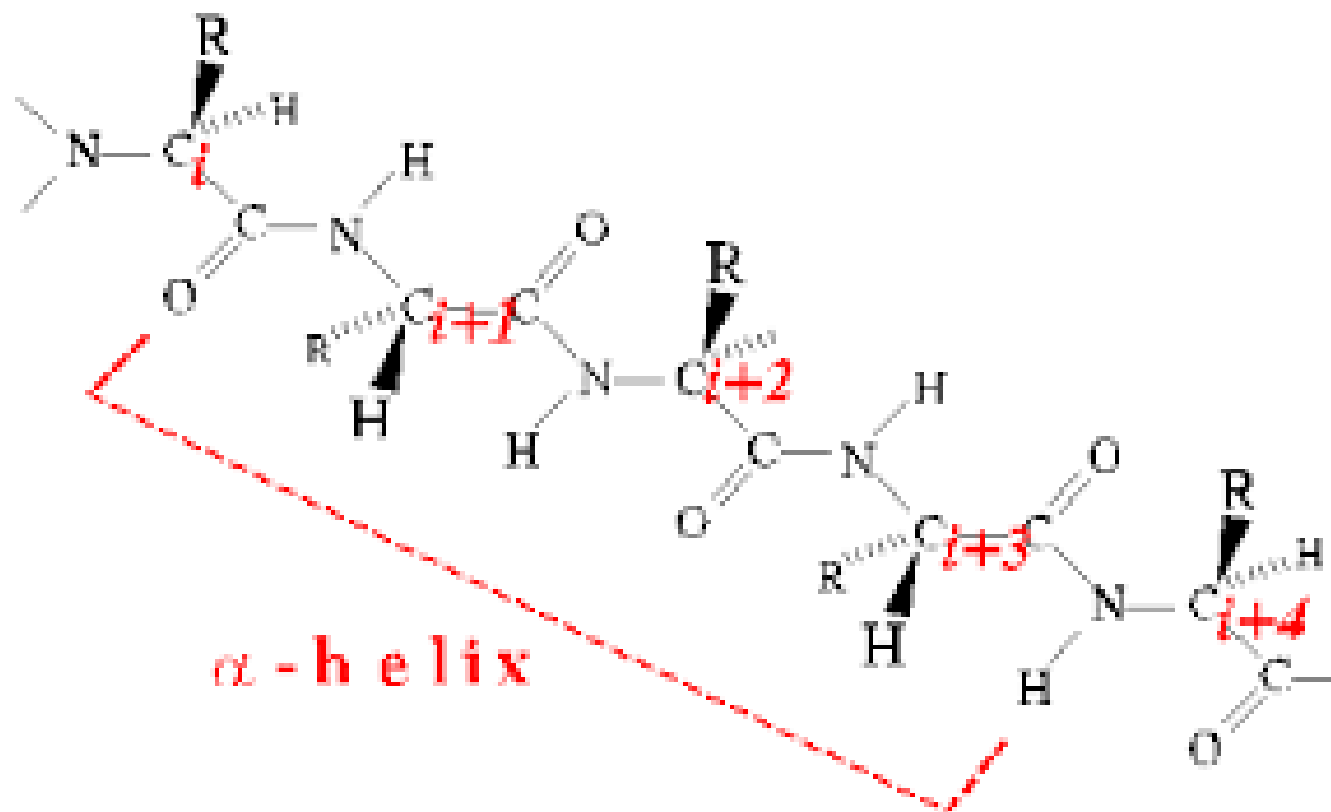




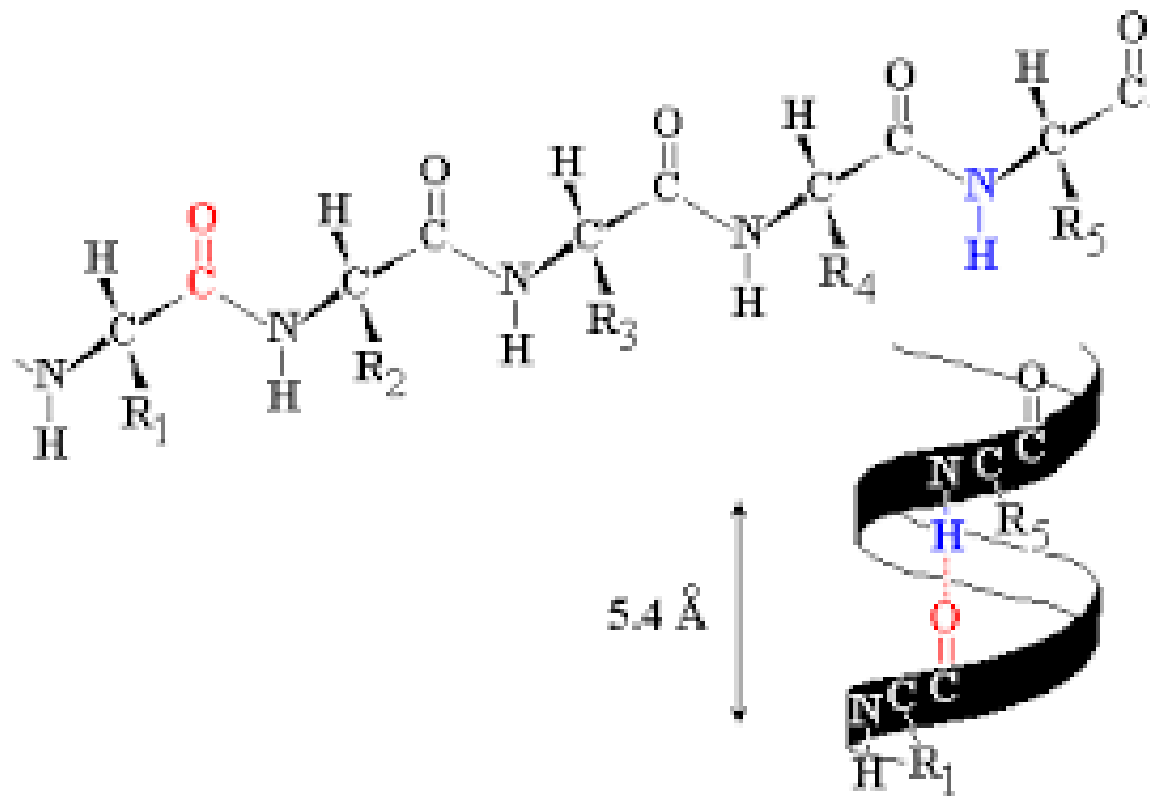


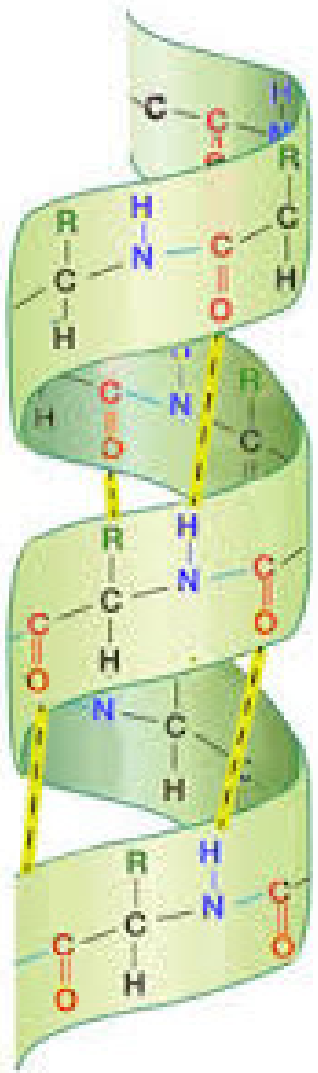


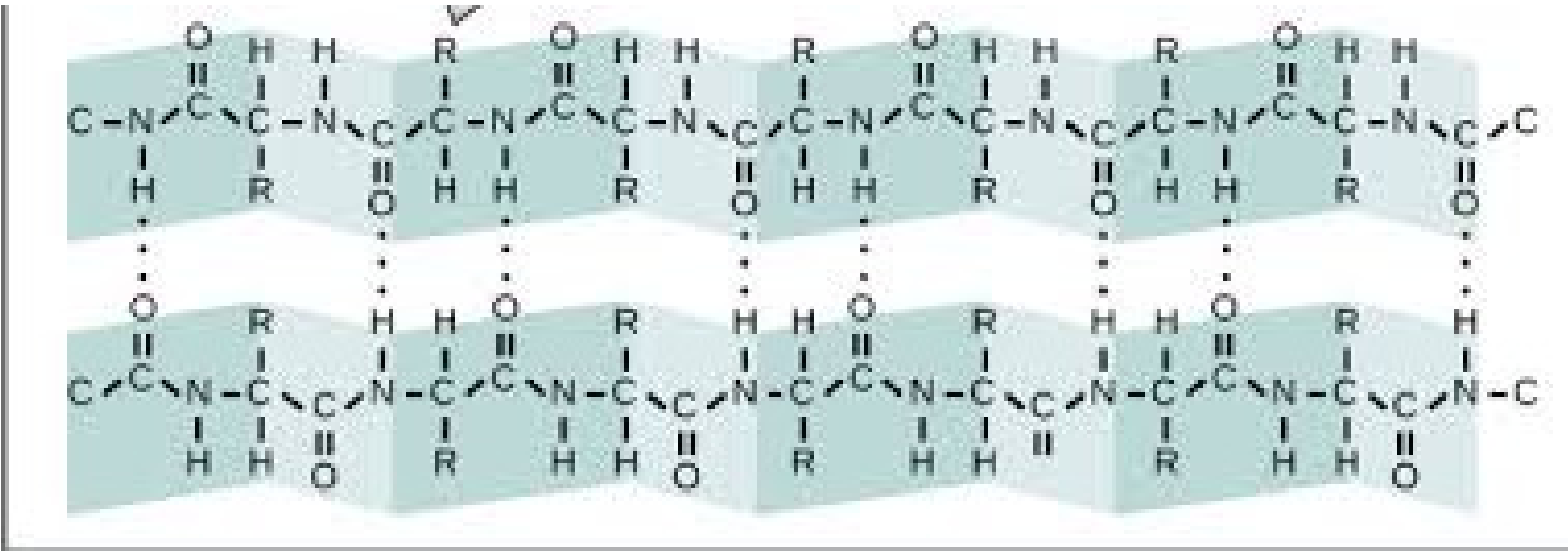


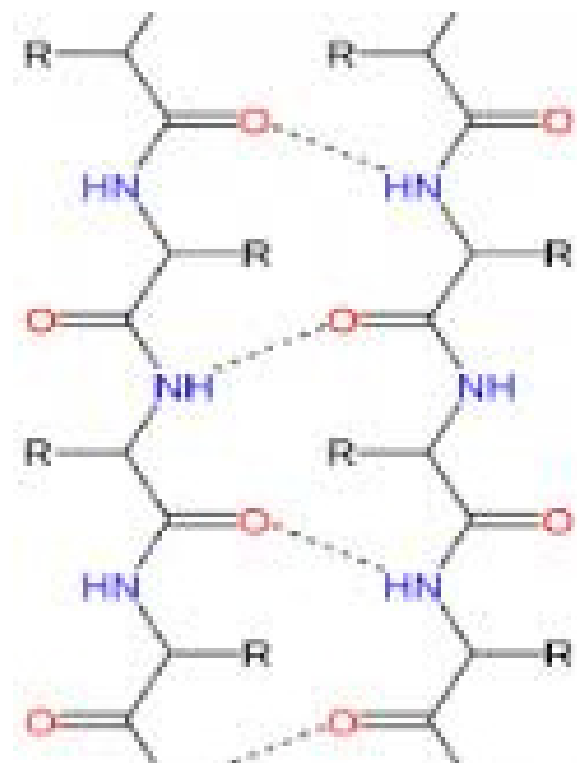
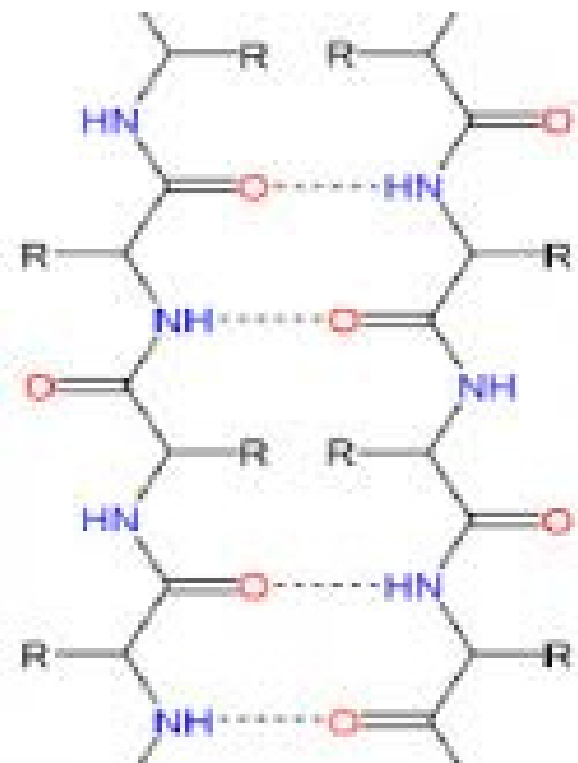


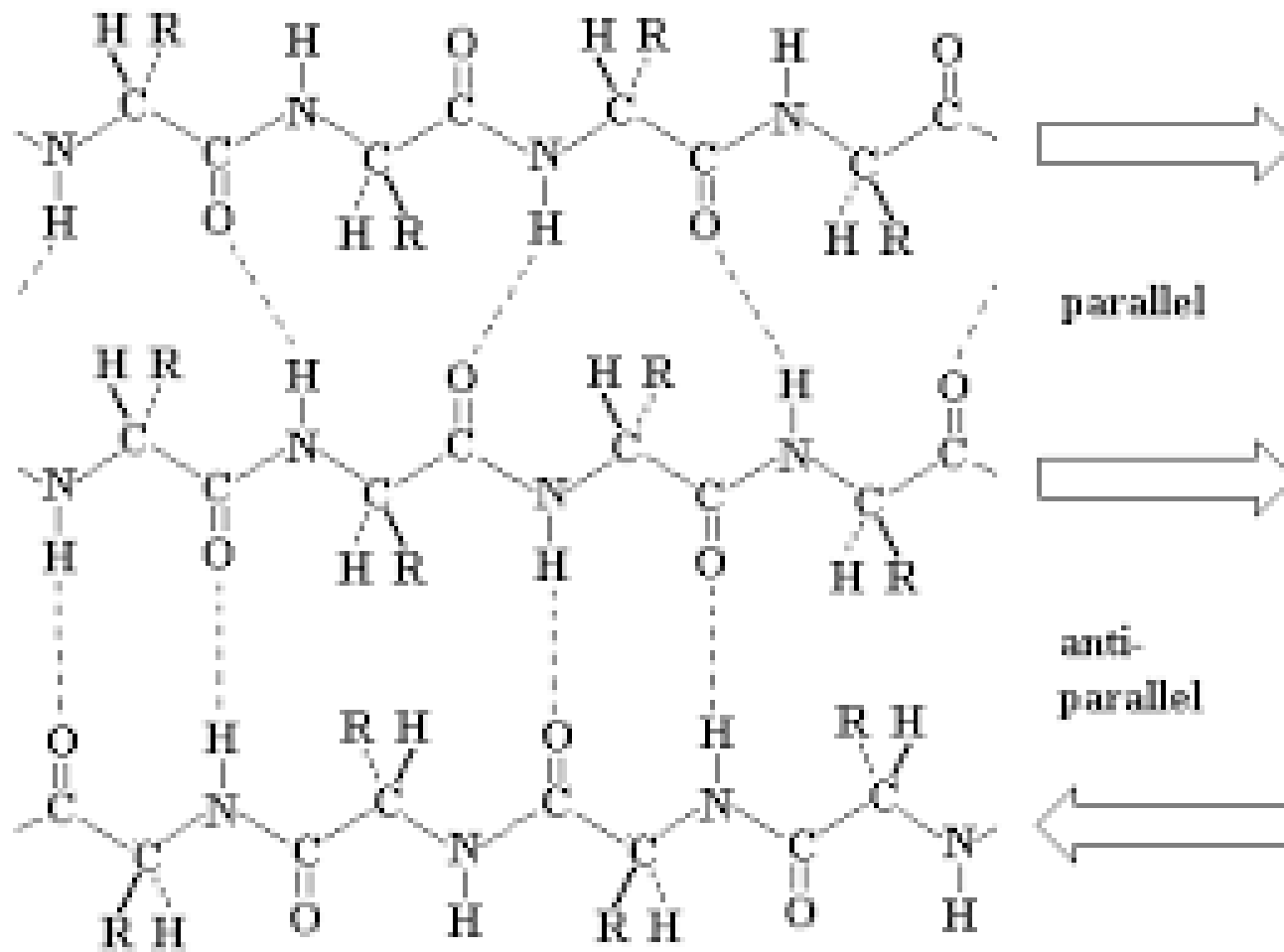


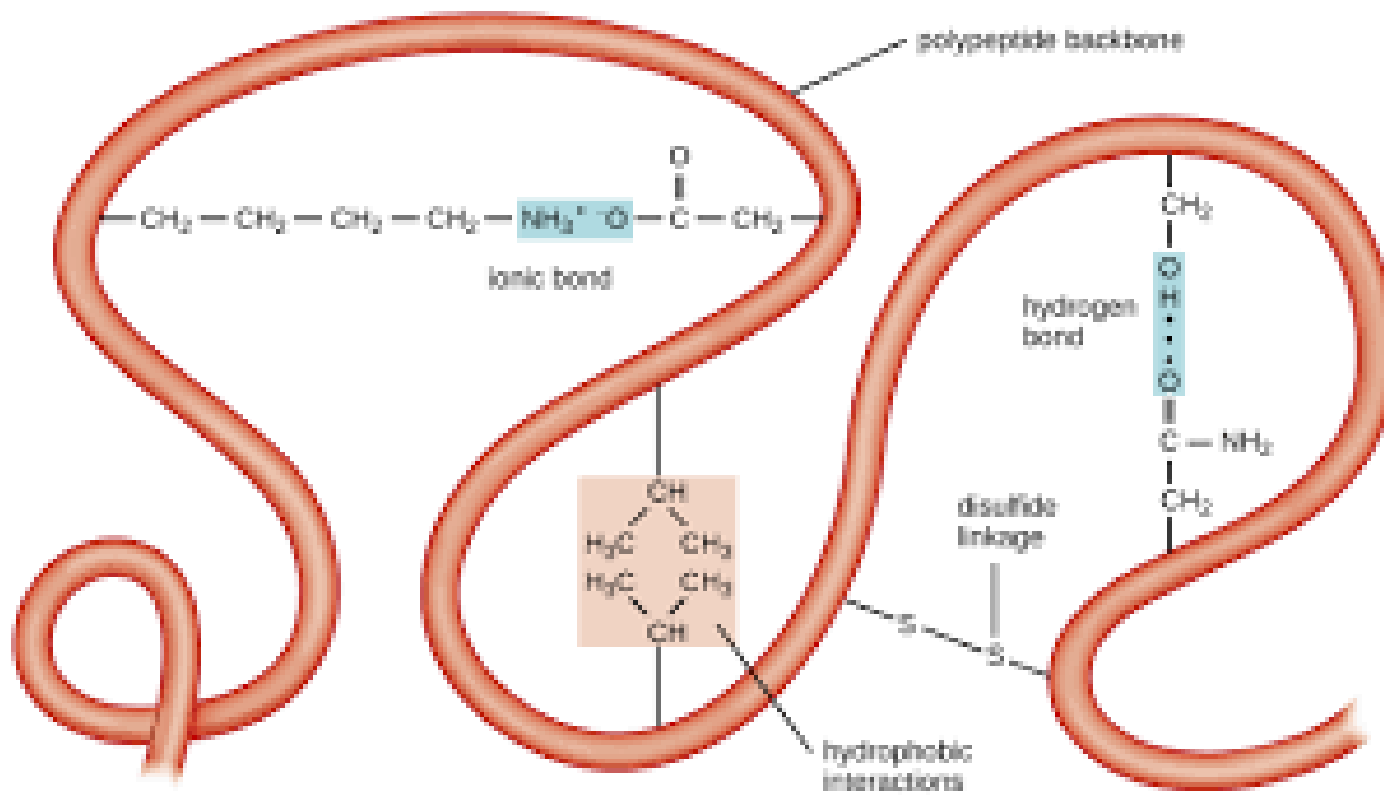




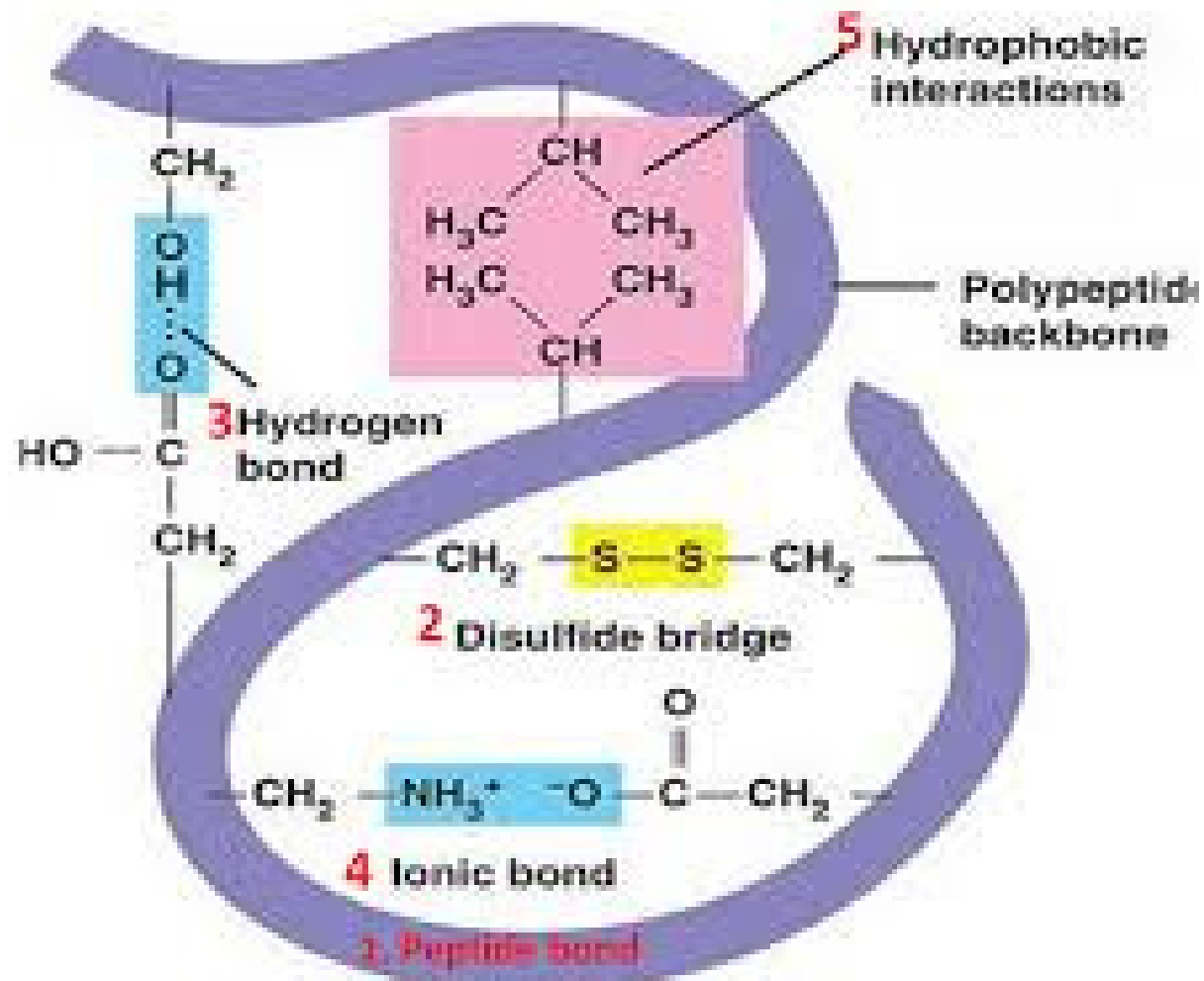


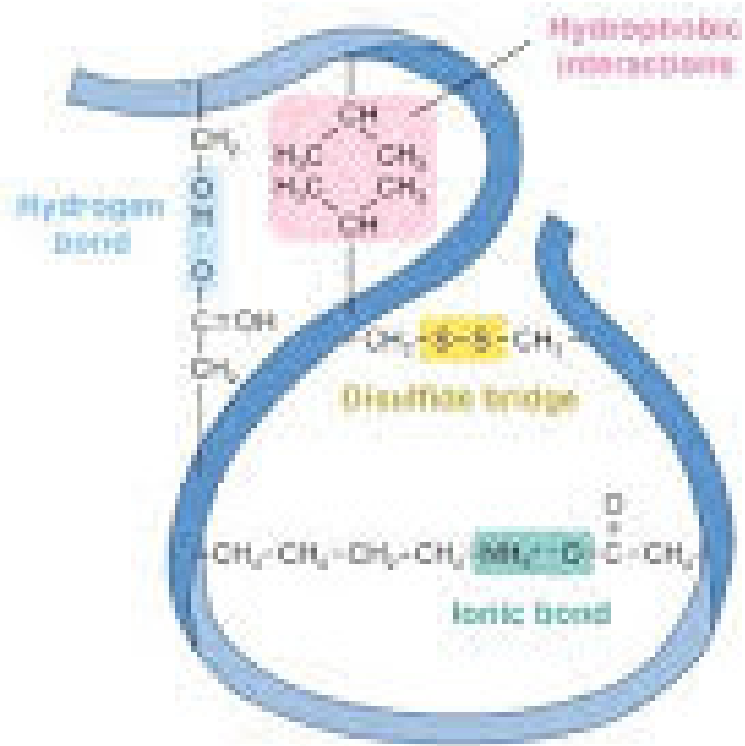






# PROTEIN STRUCTURE



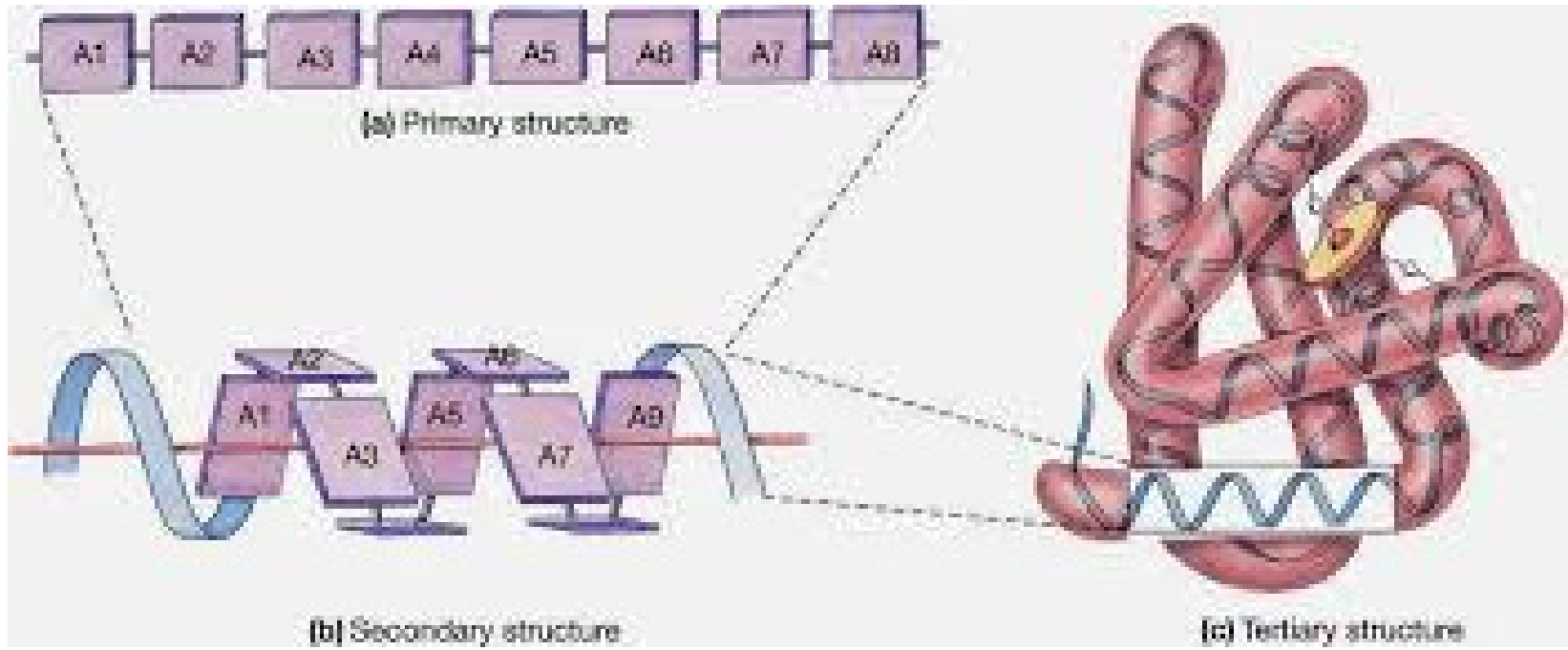


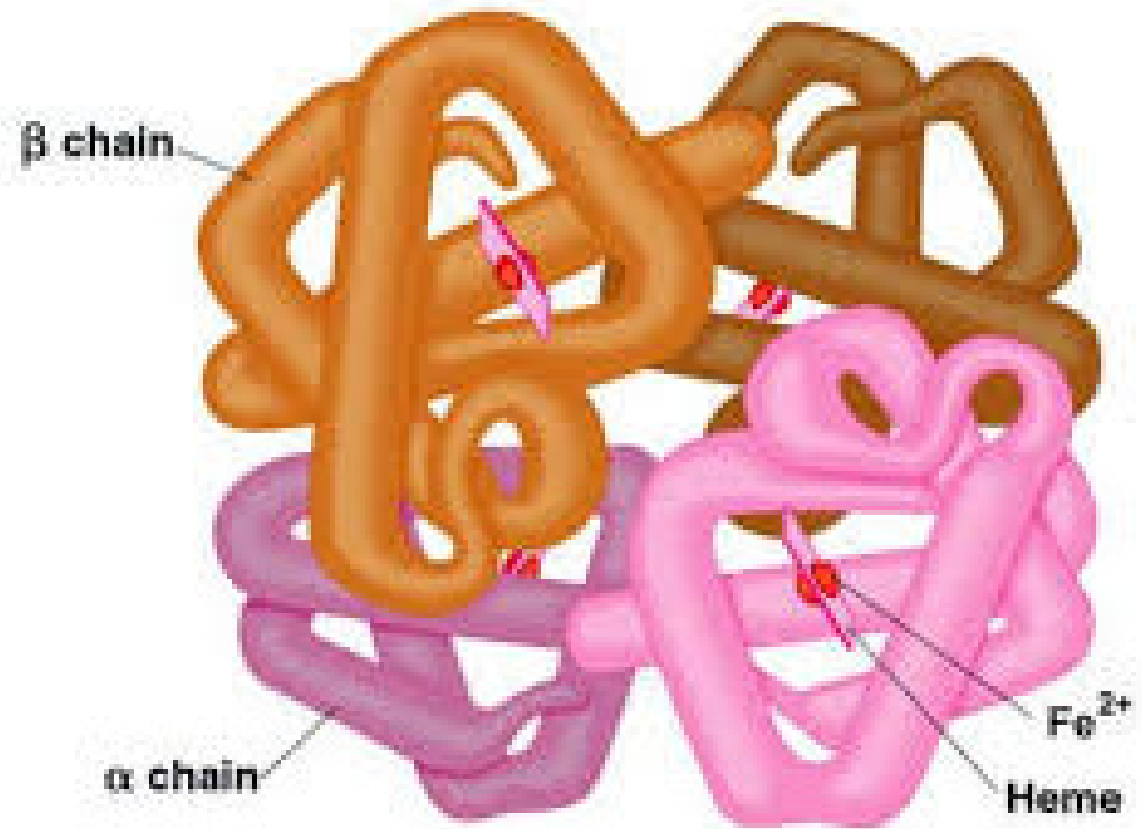
Types of side chain interactions

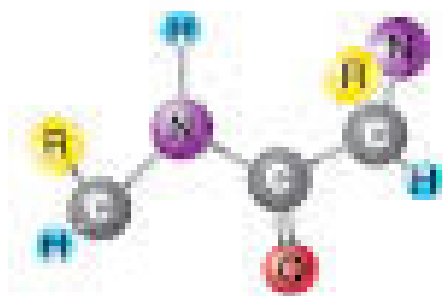


Overall 3D shape (3<sup>o</sup> Structure)

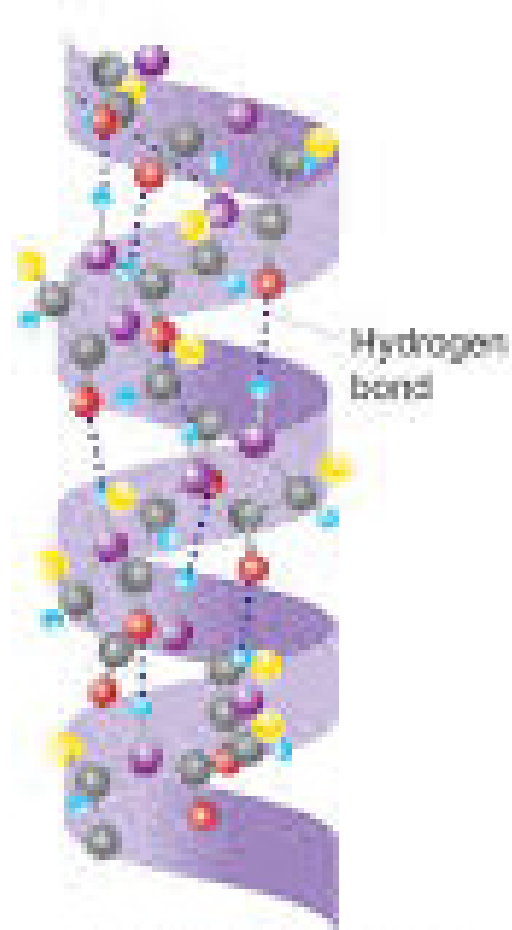




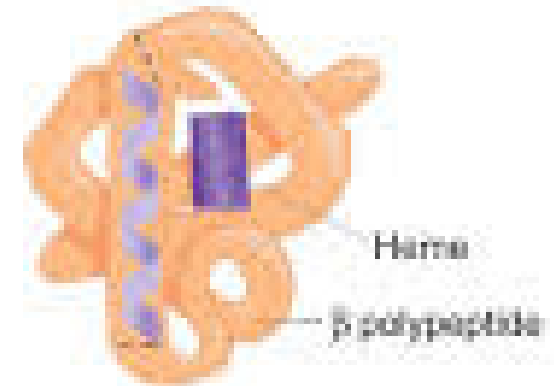




(a) Primary structure



(b) Secondary structure



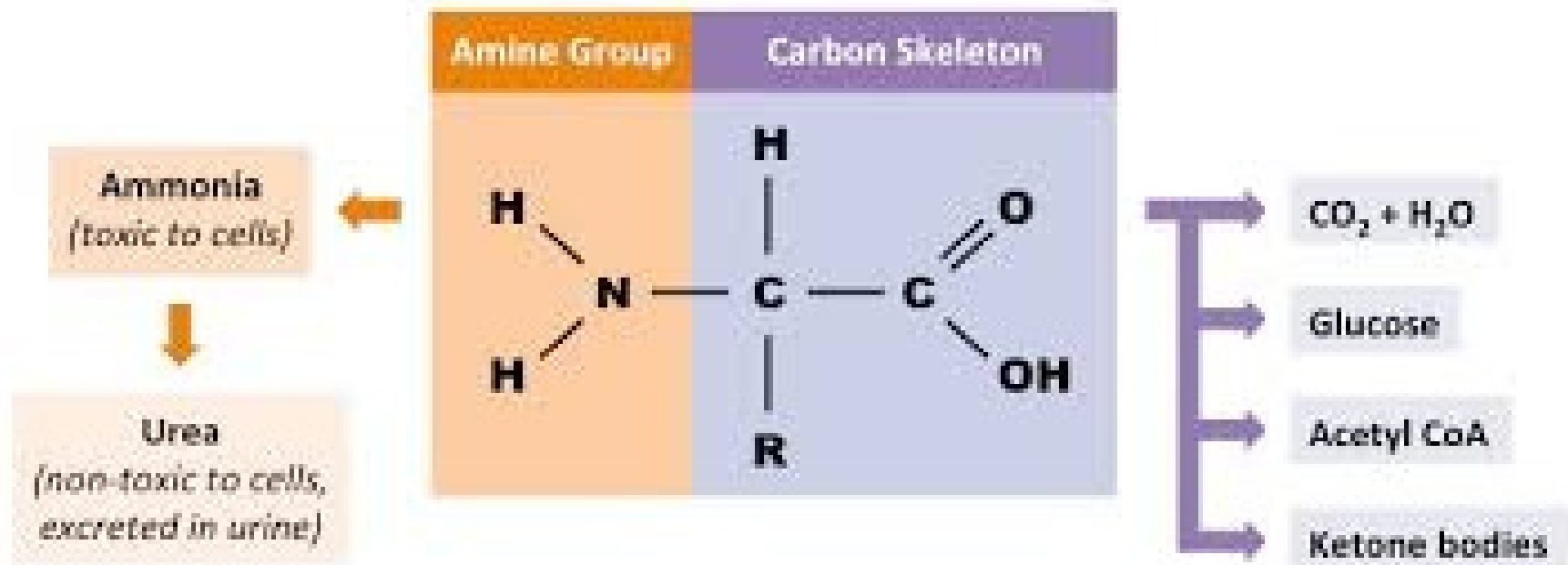
(c) Tertiary structure

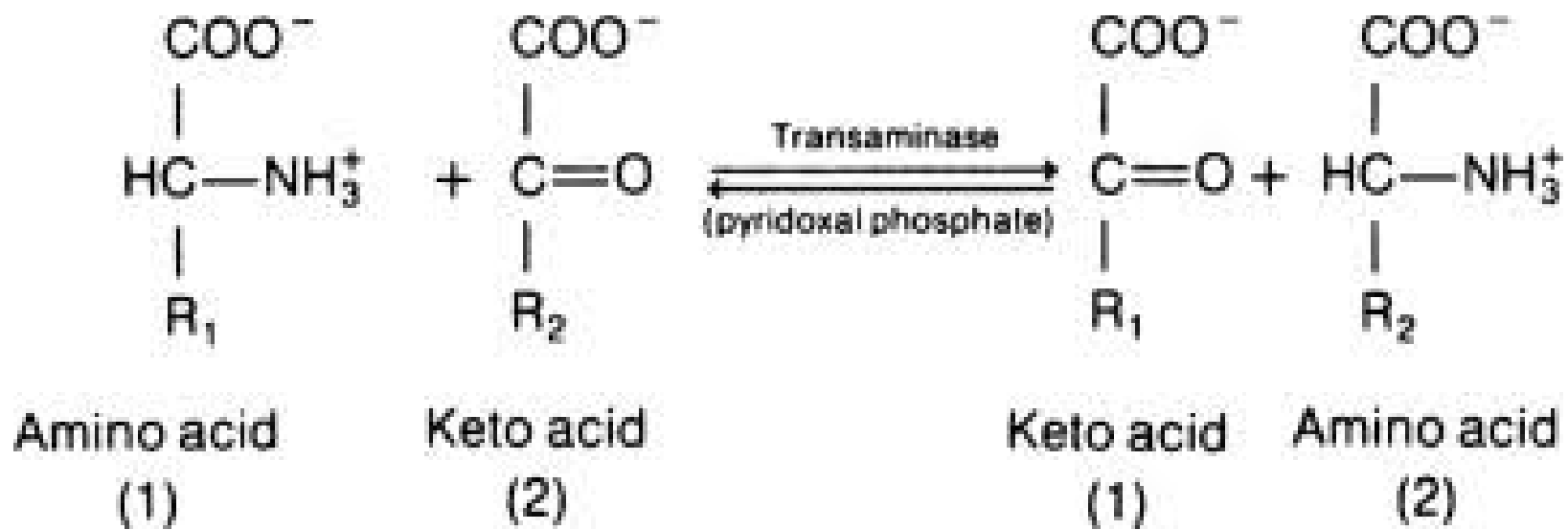


(d) Quaternary structure

# Metabolism

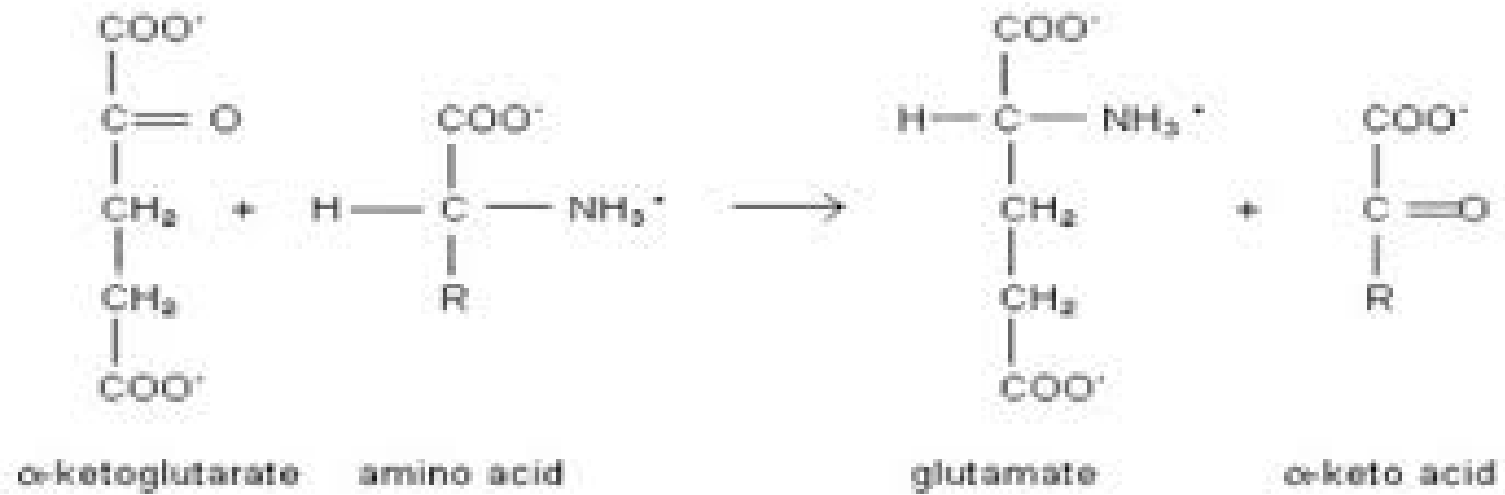
- Transamination
- Deamination
- Urea cycle



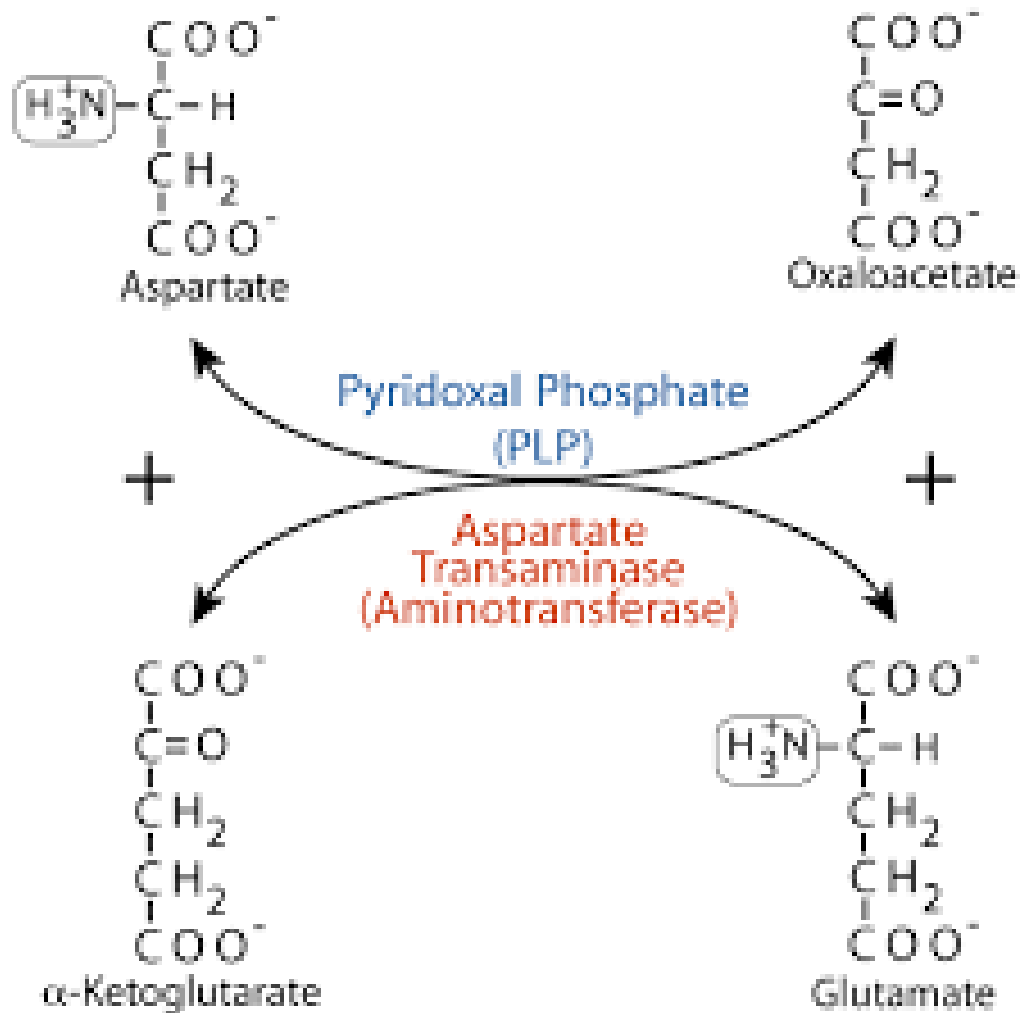


- Amino acid +  $\alpha$ -ketoglutarate =  $\alpha$ -keto acid + glutamate
- Glutamate + oxaloacetate =  $\alpha$ -ketoglutarate + aspartate

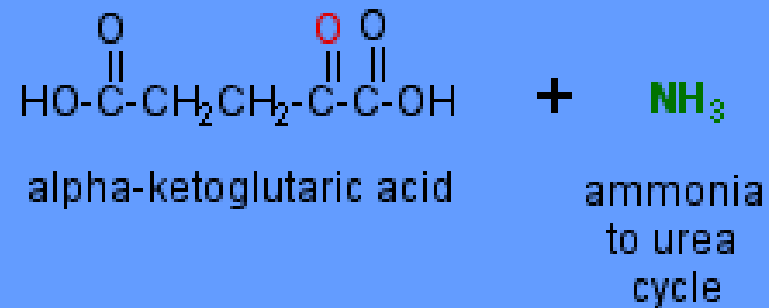
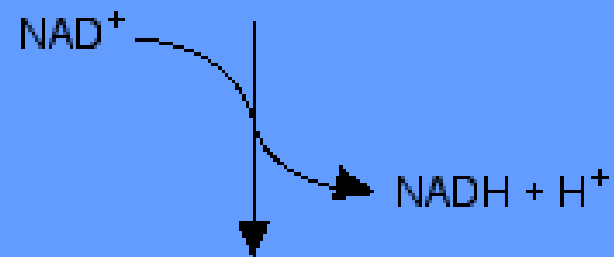
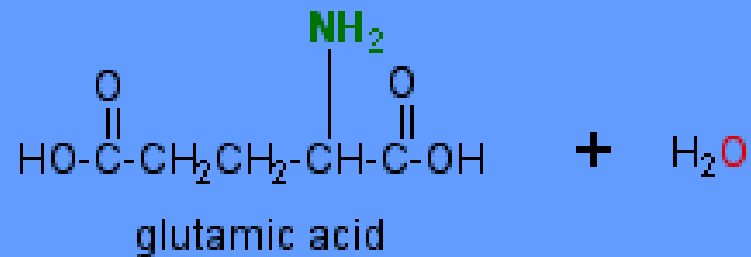
### TRANSAMINATION

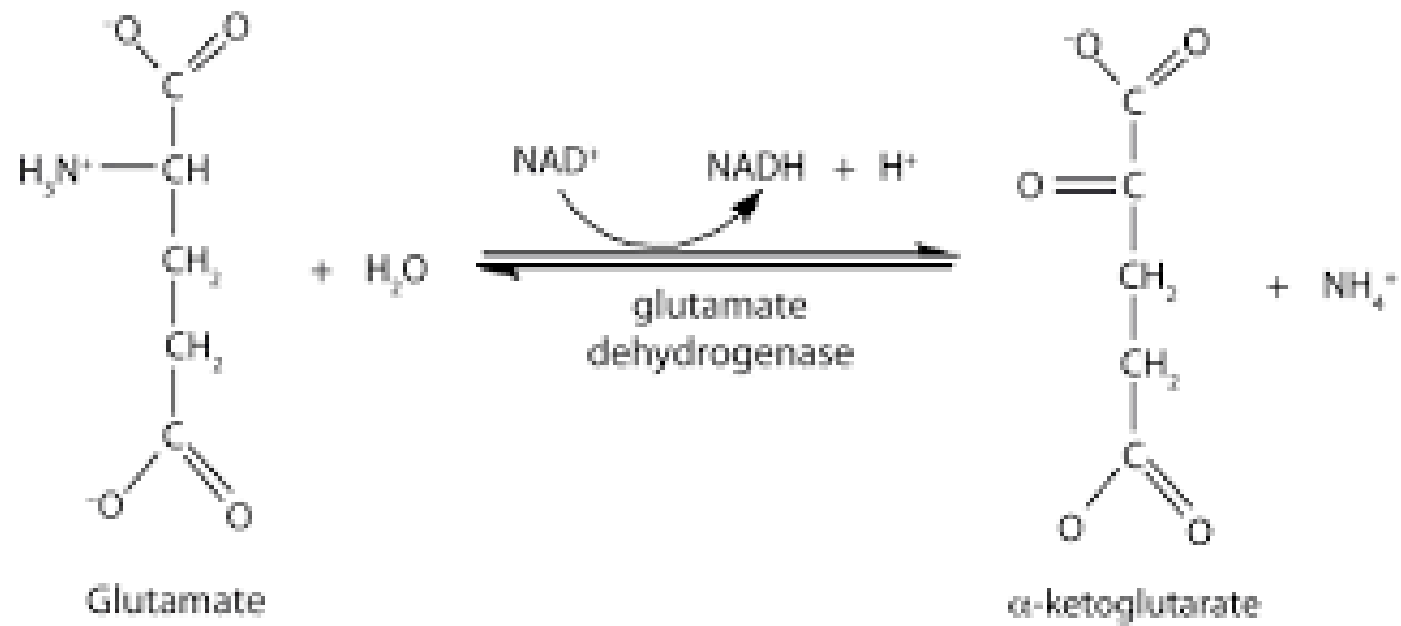




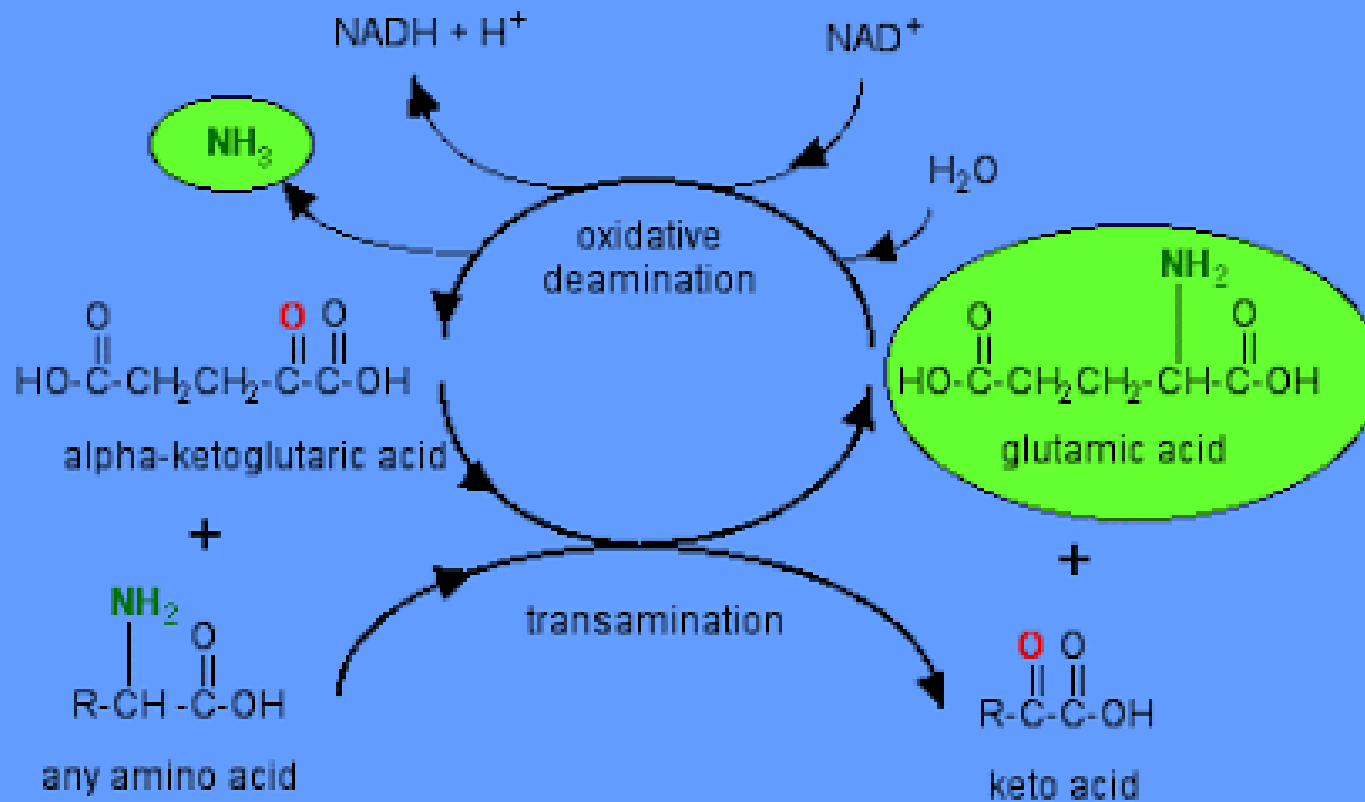


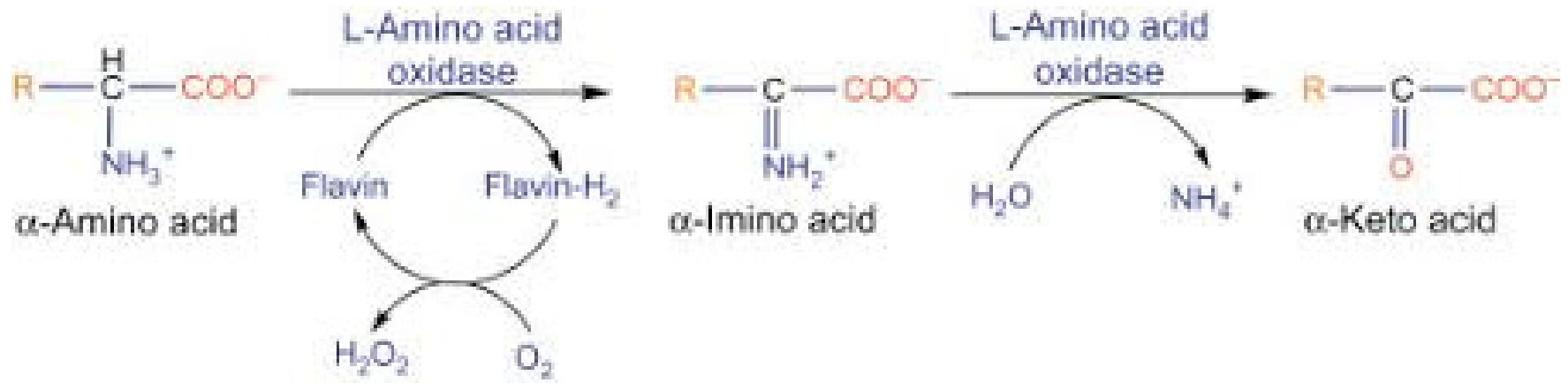
## Oxidative Deamination





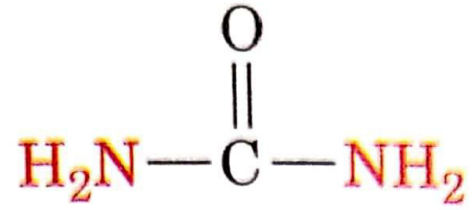
## Glutamic Acid and Oxidative Deamination



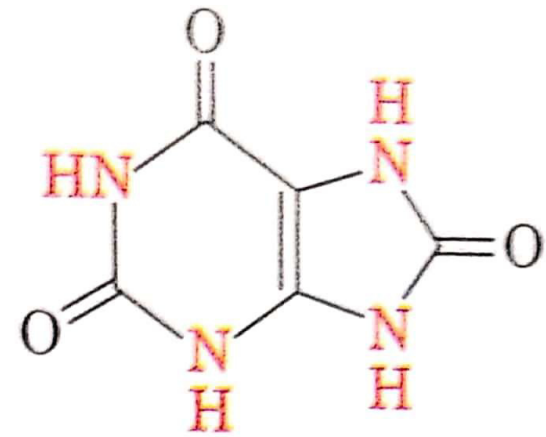




**Ammonia**



**Urea**



**Uric acid**

