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Aminoacids and Proteins

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1. Protein
2. Lipid
3. Carbohydrate
4. Nucleic Acid

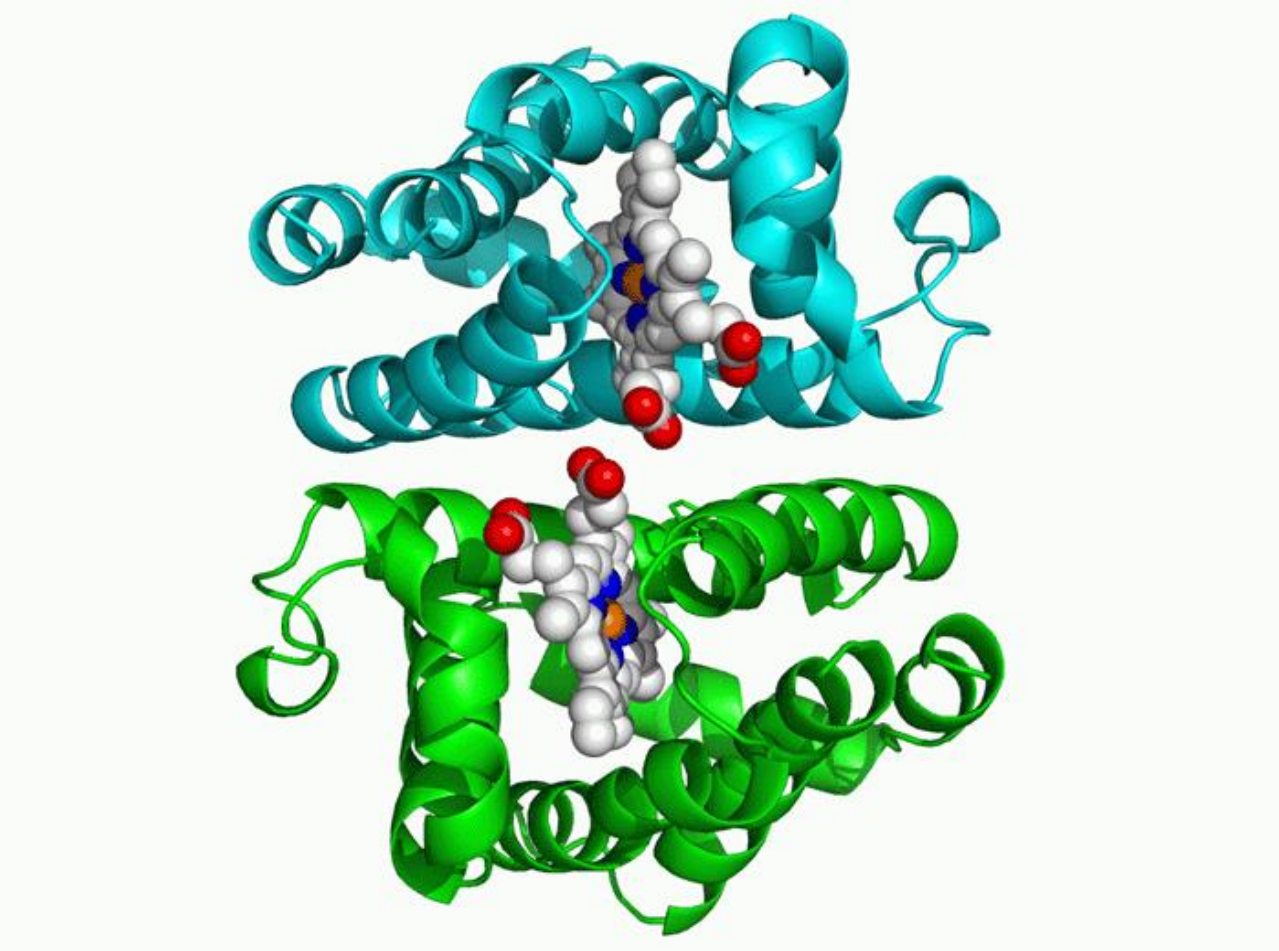
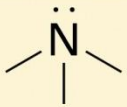
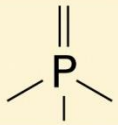
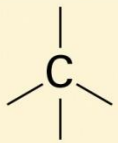
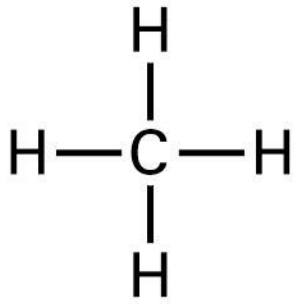
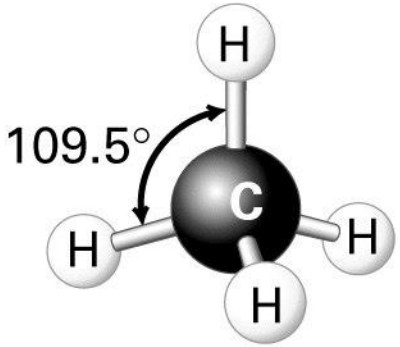


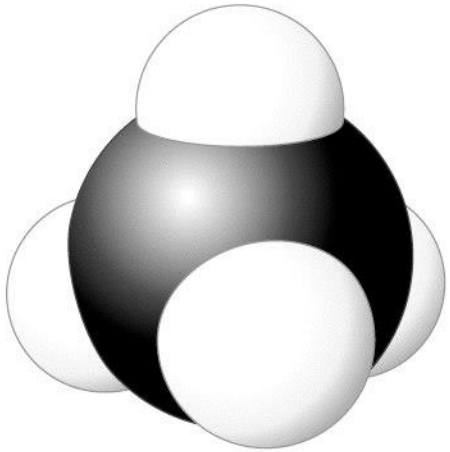
TABLE 2-1 Bonding Properties of Atoms Most Abundant in Biomolecules

Atom and Outer Electrons	Usual Number of Covalent Bonds	Bond Geometry
H	1	
O	2	
S	2, 4, or 6	
N	3 or 4	
P	5	
C	4	

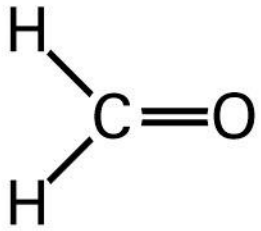
(a) Methane

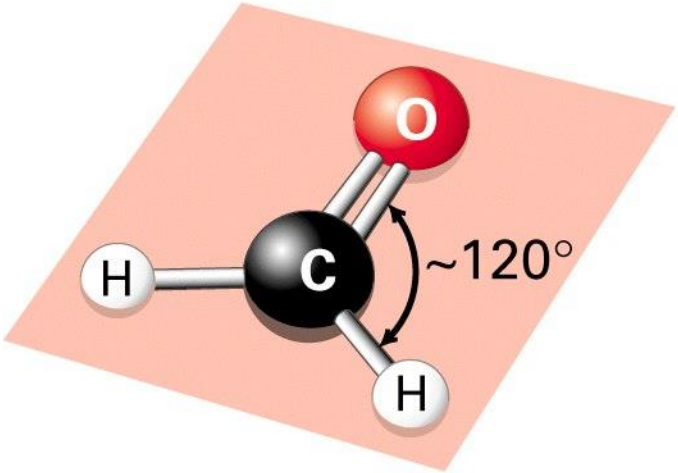


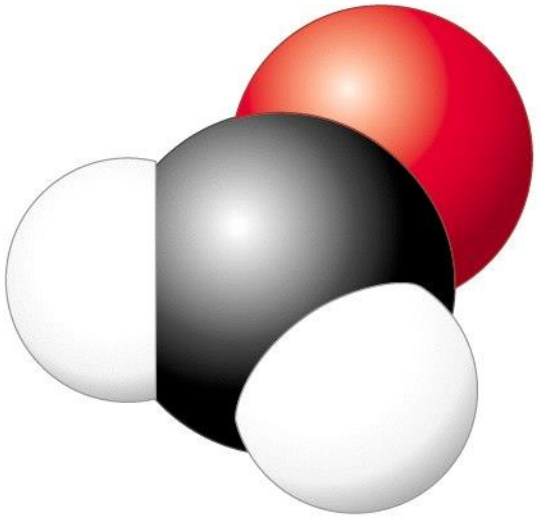




(b) Formaldehyde



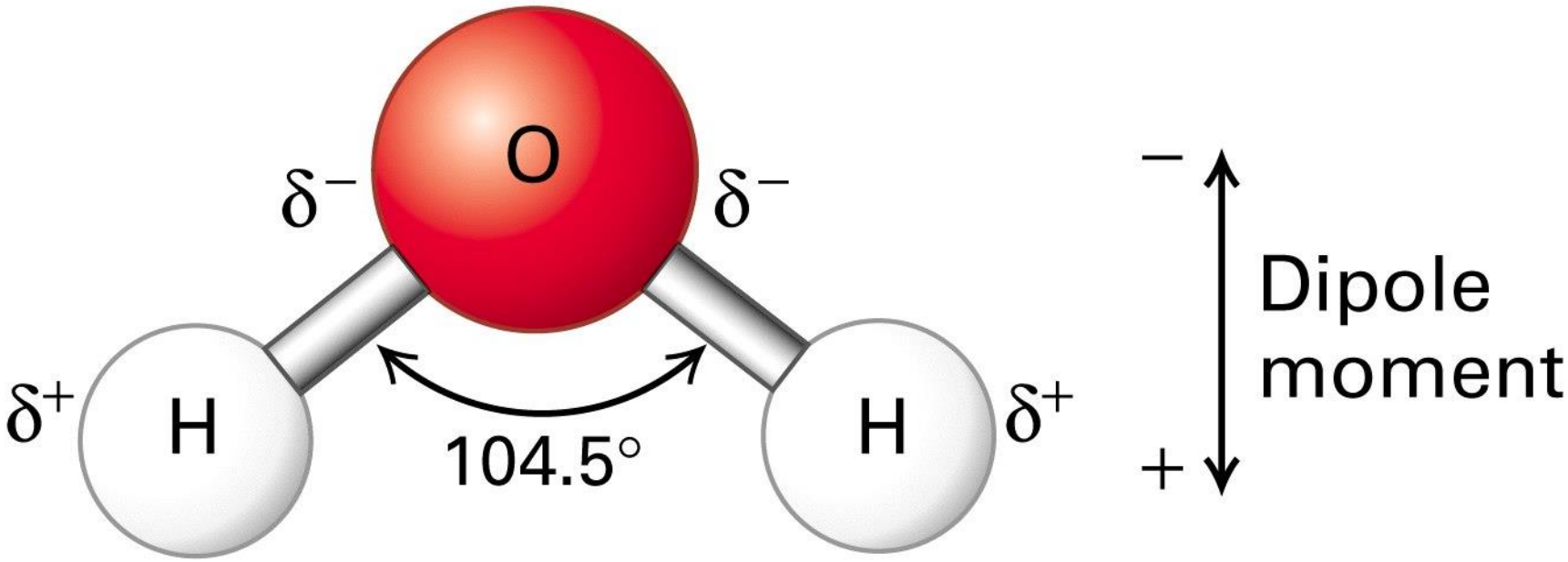




Chemical structure

Ball-and-stick model

Space-filling model



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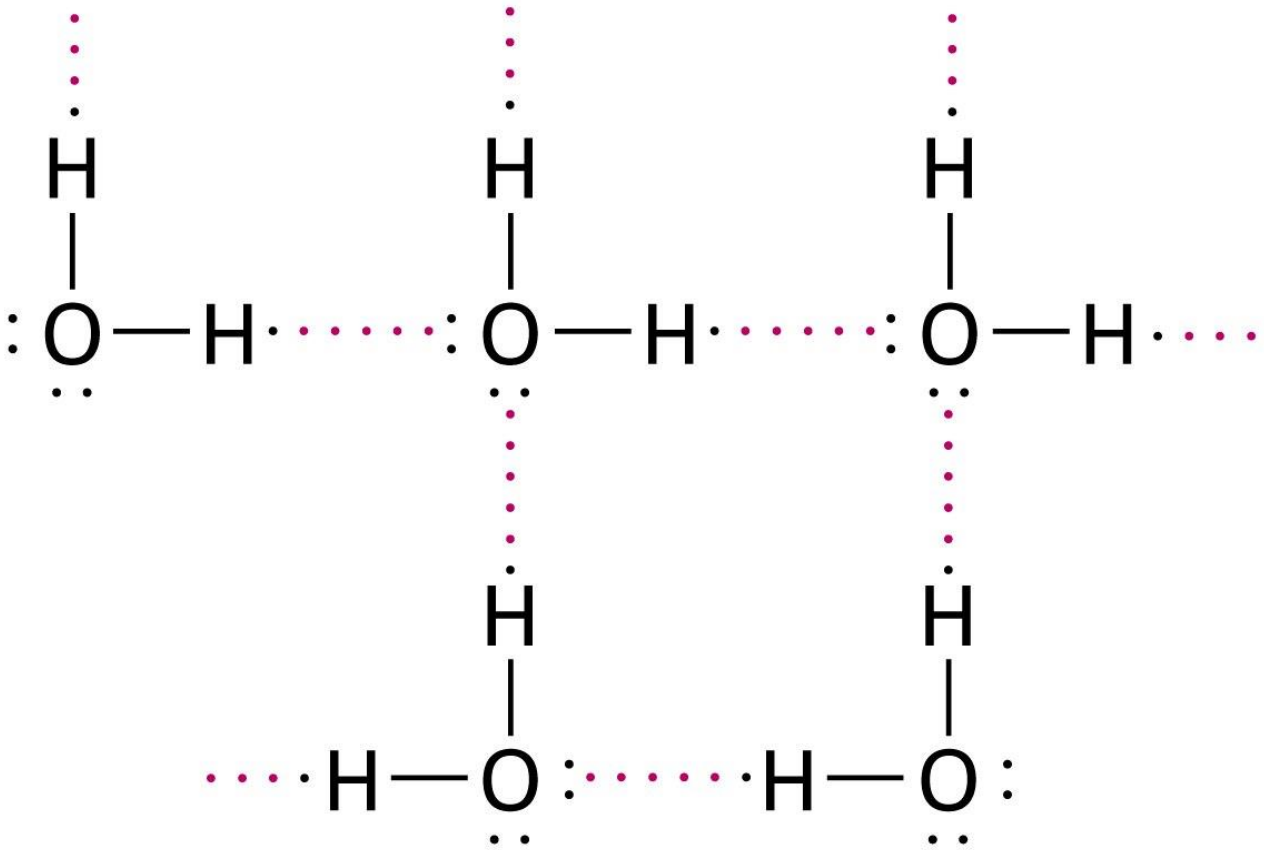
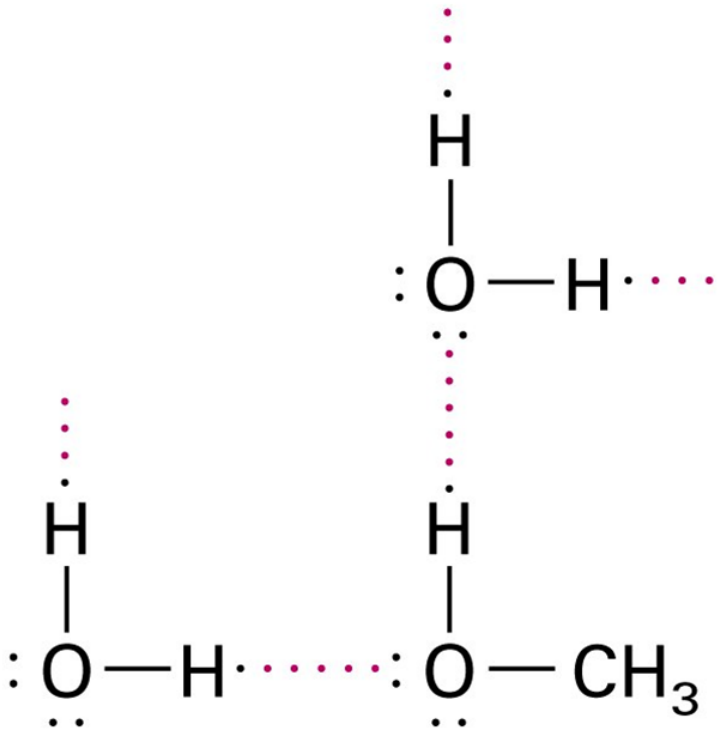
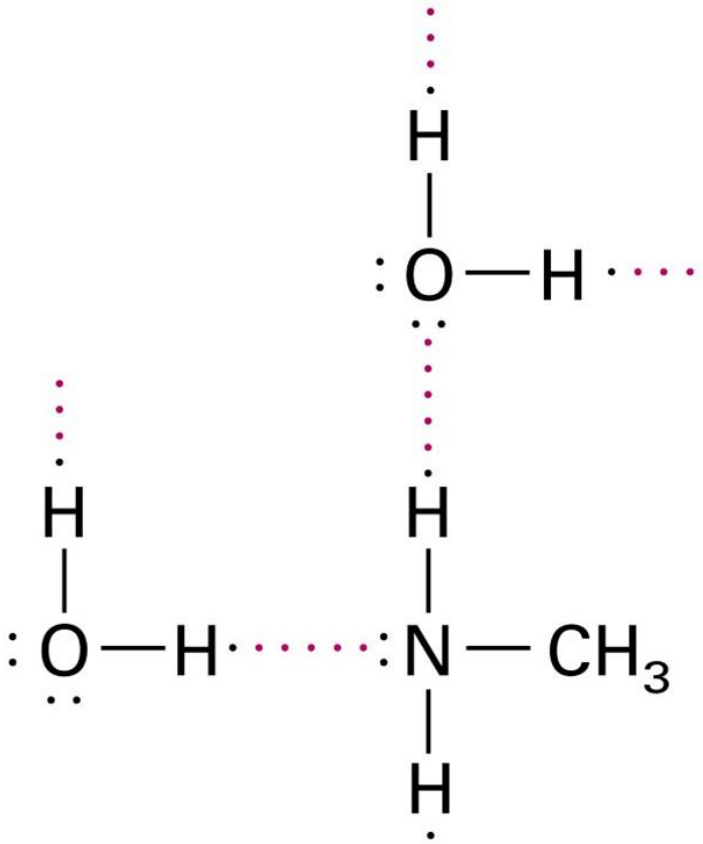


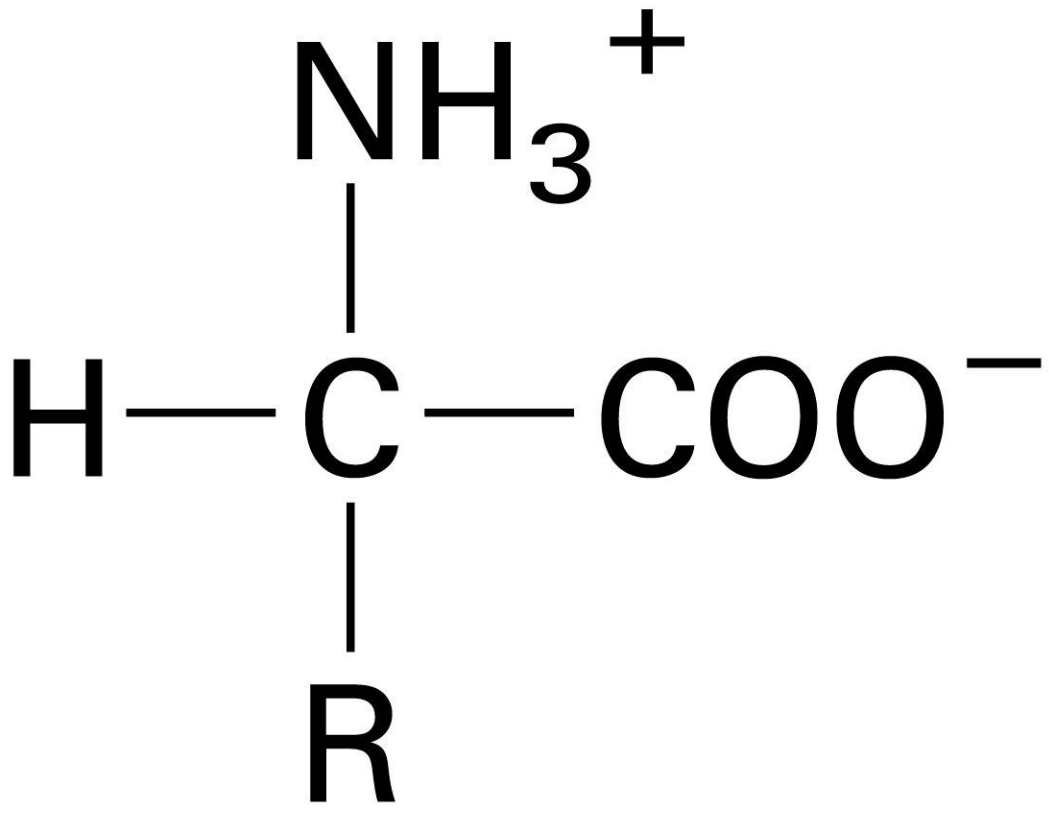
Water-water

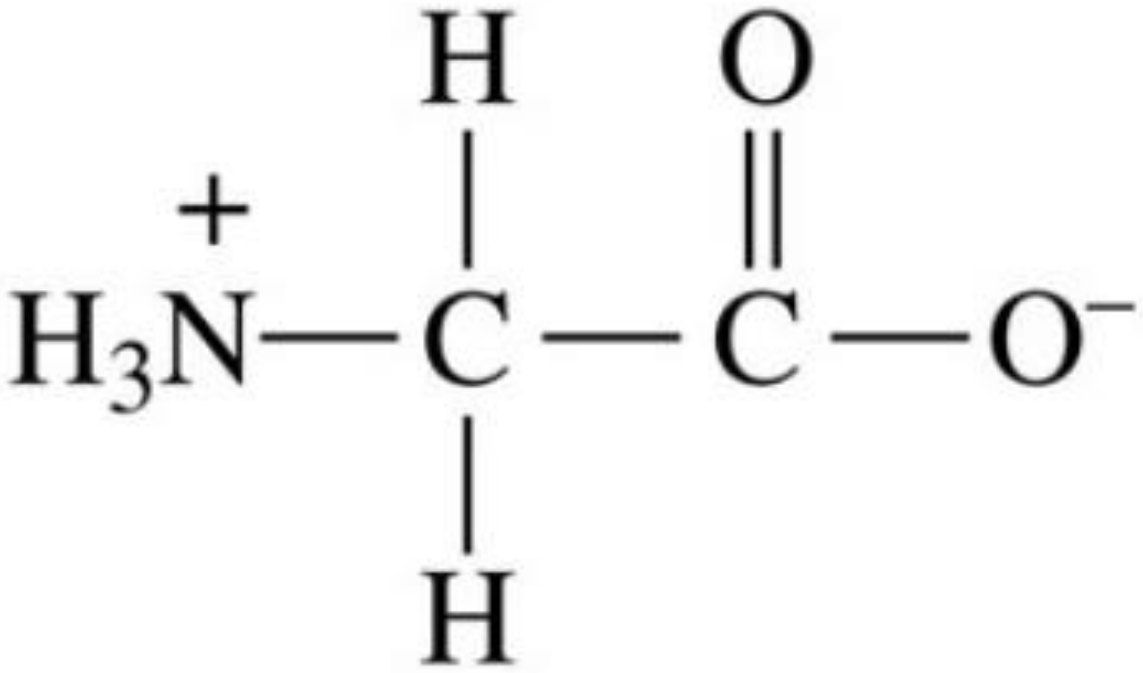


Methanol-water

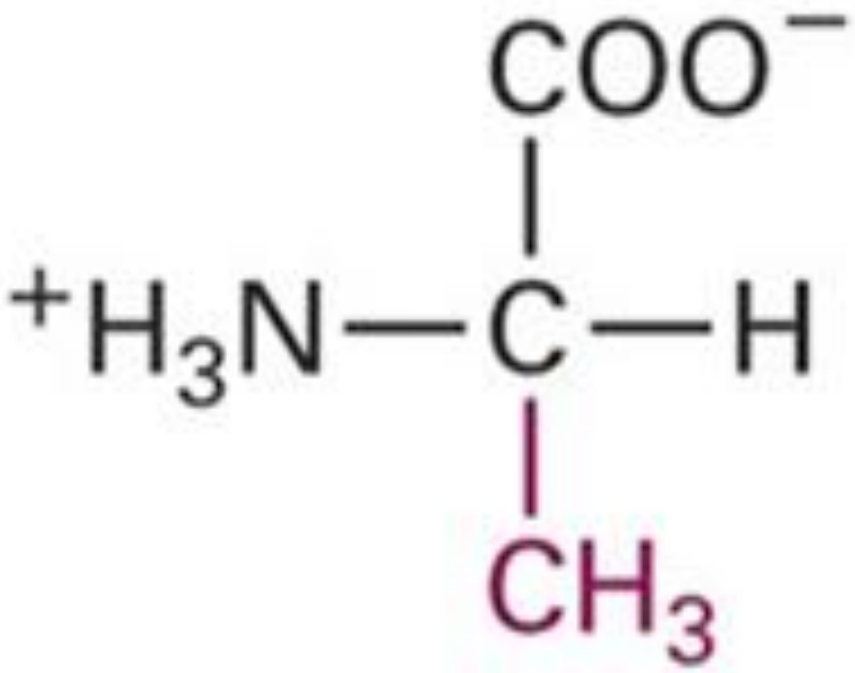


Methylamine-water

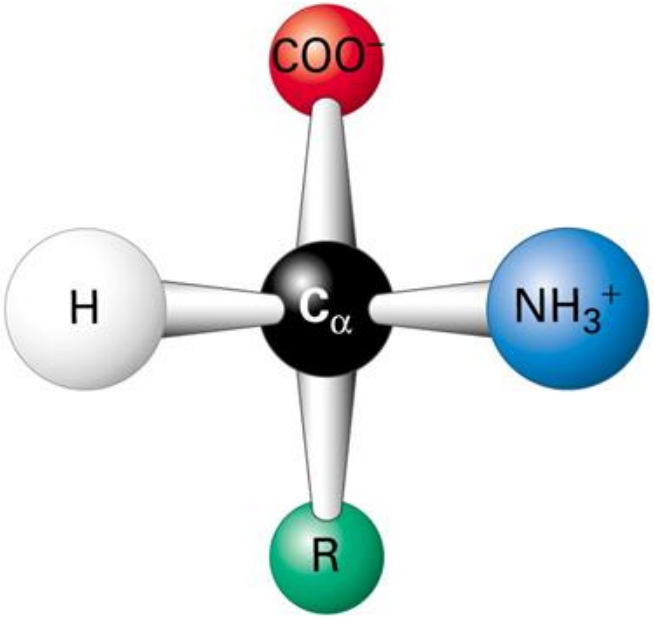

NH3+
H
C
COO−
R



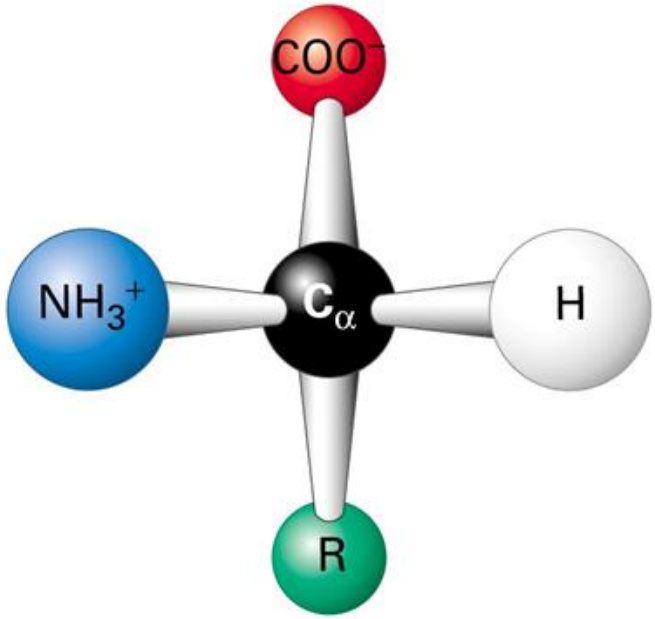
Glycine



Alanine



D isomer



L isomer

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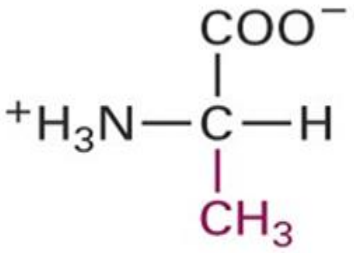
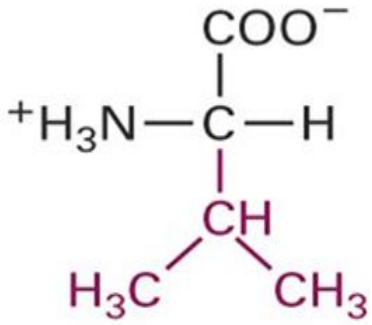
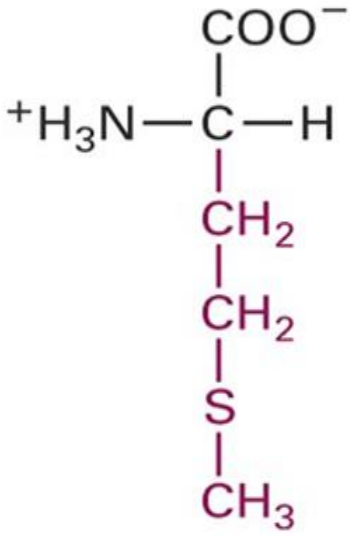
HYDROPHOBIC AMINO ACIDS



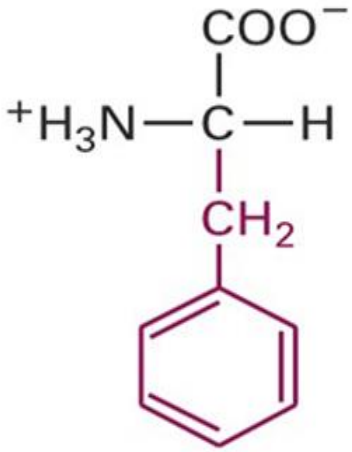
Alanine



Valine



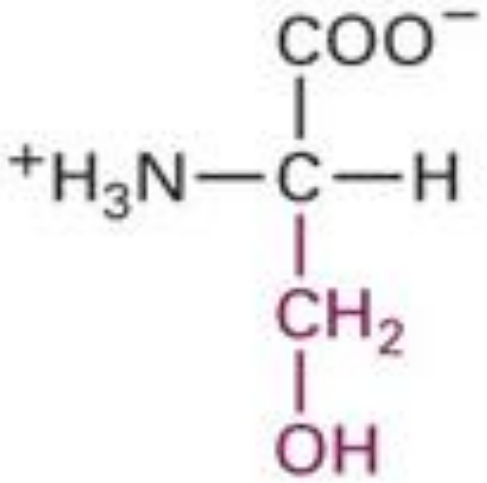
Methionine



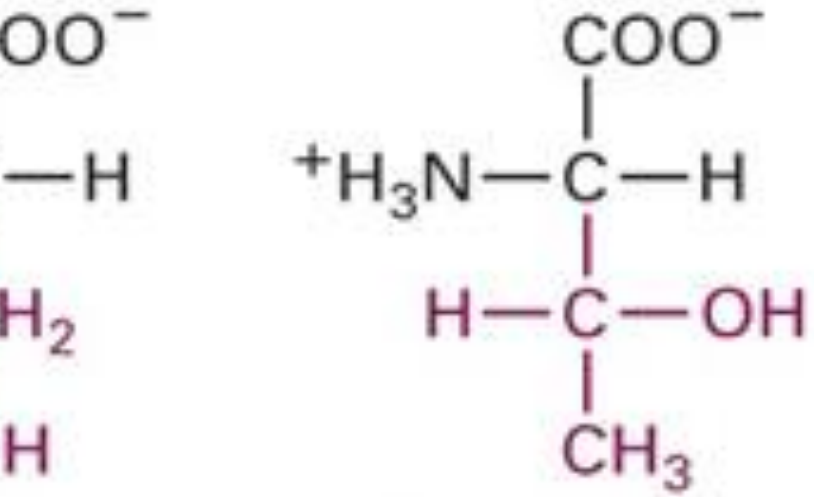
Phenylalanine

HYDROPHILIC AMINO ACIDS

Polar amino acids with uncharged R groups



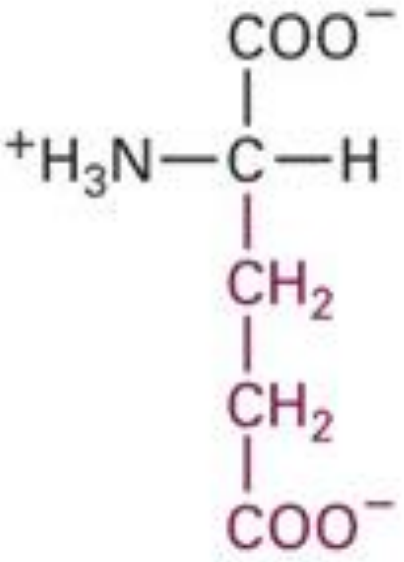
Serine
(Ser or S)



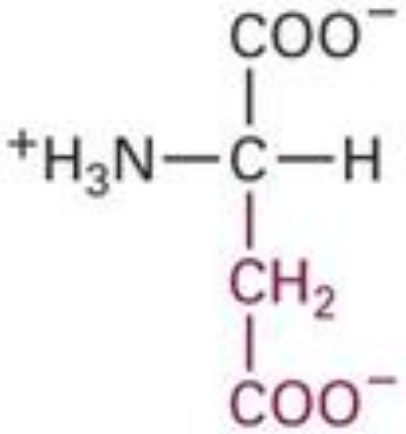
Threonine
(Thr or T)

HYDROPHILIC AMINO ACIDS

Acidic amino acids



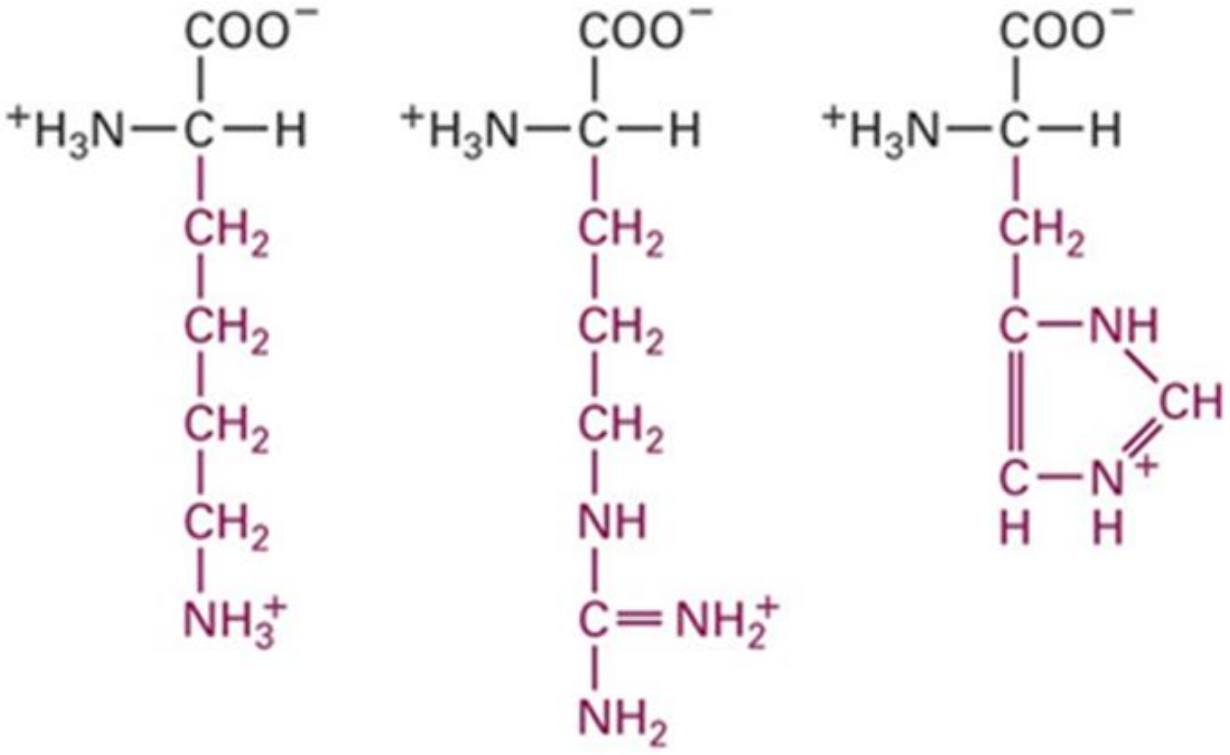
Glutamate
(Glu or E)



Aspartate
(Asp or D)

HYDROPHILIC AMINO ACIDS

Basic amino acids



Lysine (Lys or K) | **Arginine (Arg or R)** | **Histidine (His or H)**

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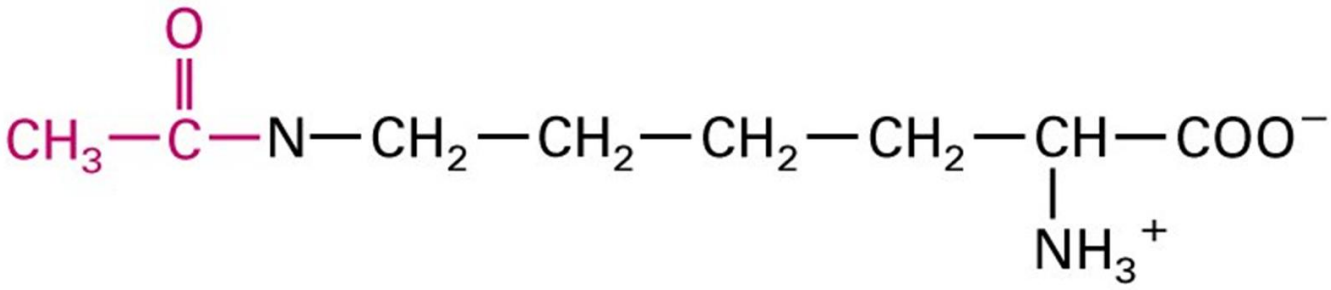
Abbreviations and Codes

Alanine **A, Ala**
Arginine **R, Arg**
Asparagine **N, Asn**
Aspartic acid **D, Asp**
Cysteine **C, Cys**
Glutamine **Q, Gln**
Glutamic Acid **E, Glu**
Glycine **G, Gly**
Histidine **H, His**
Isoleucine **I, Ile**
Leucine **L, Leu**
Lysine **K, Lys**
Methionine **M, Met**
Phenylalanine **F, Phe**
Proline **P, Pro**
Serine **S, Ser**
Threonine **T, Thr**
Tryptophan **W, Trp**
Tyrosine **Y, Tyr**
Valine **V, Val**

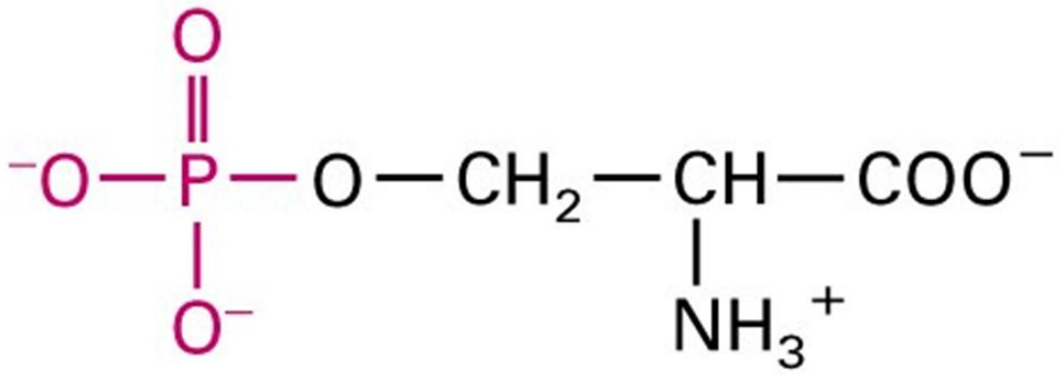
Amino Acid Derivates

Acetyl lysine



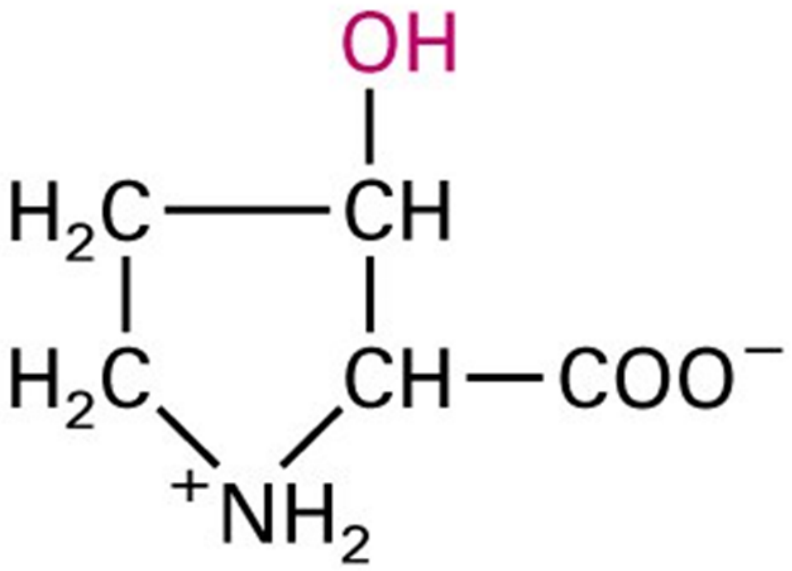
Amino Acid Derivates

Phosphoserine



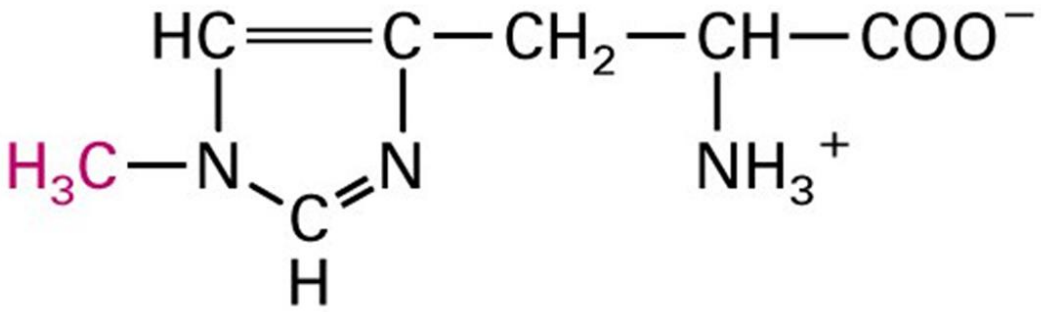
Amino Acid Derivates

3-Hydroxyproline



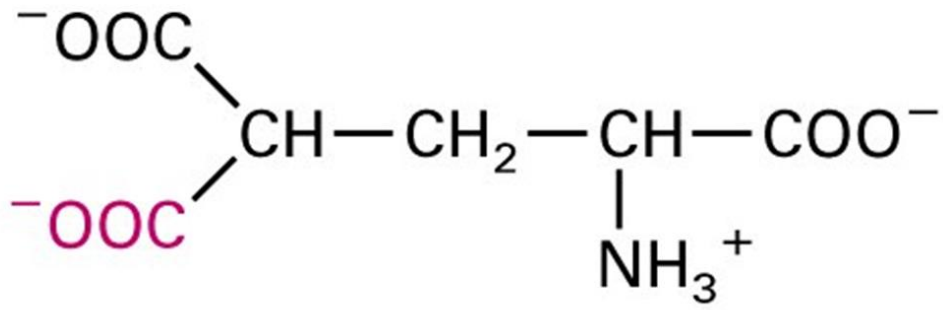
Amino Acid Derivates

3-Methylhistidine



Amino Acid Derivates

γ-Carboxyglutamate



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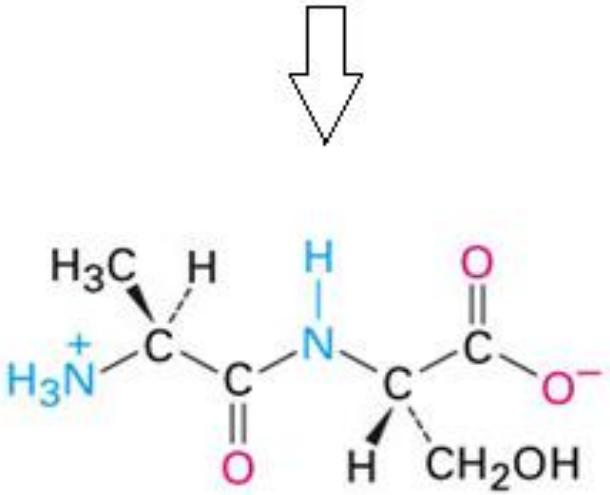
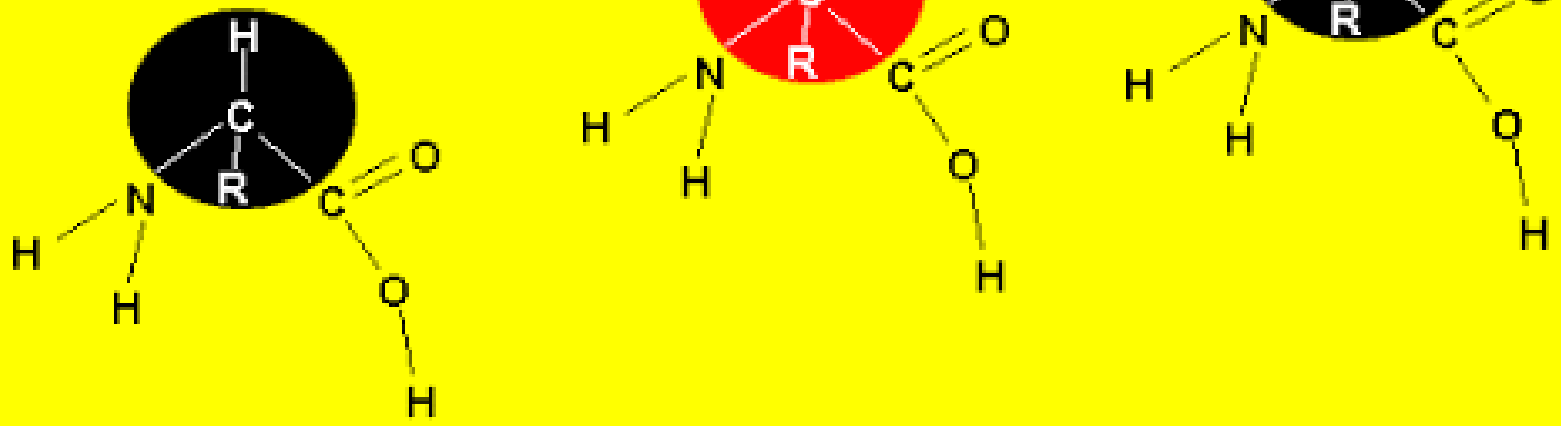
Peptides and Proteins

Alanine (Ala) + Serine (Ser)



Alanylserine (Ala-Ser)



amino acids

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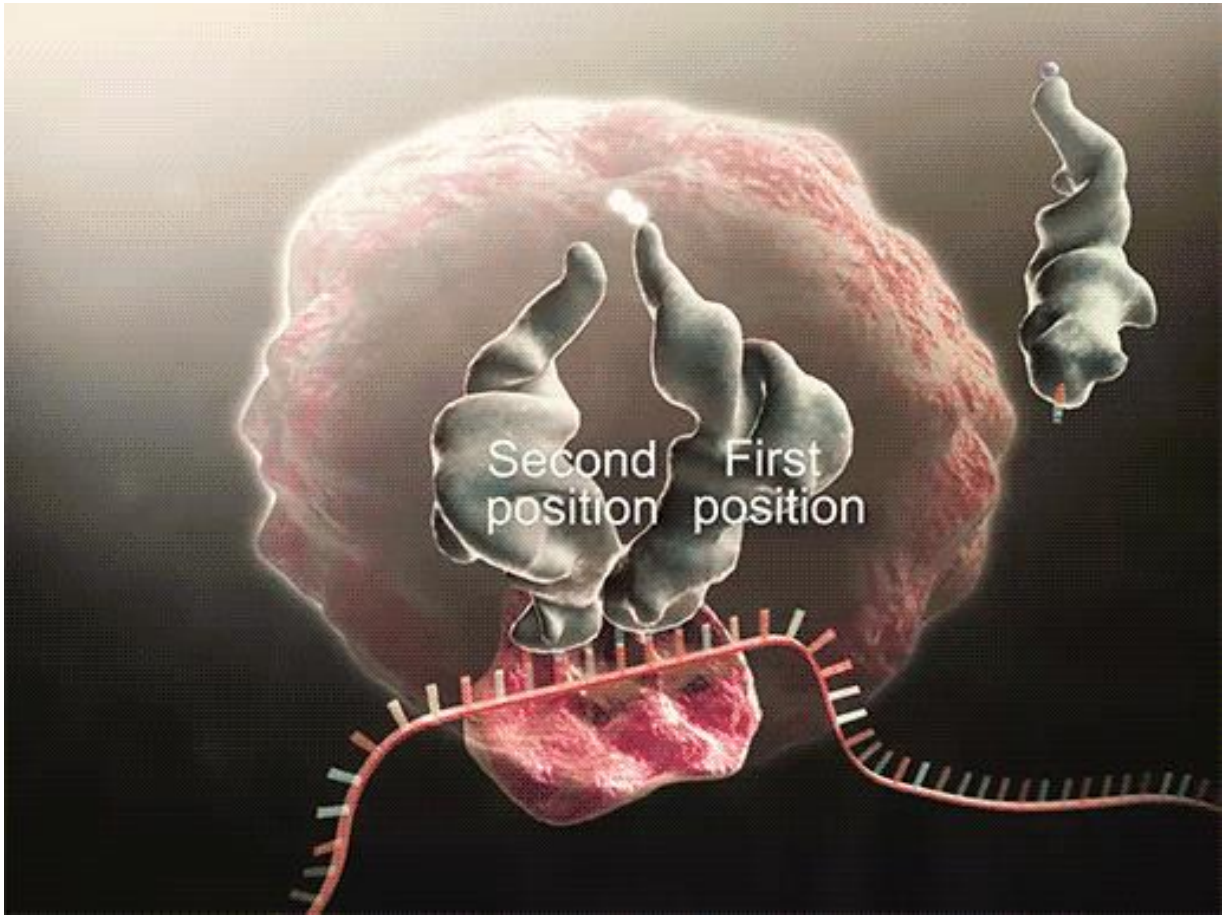
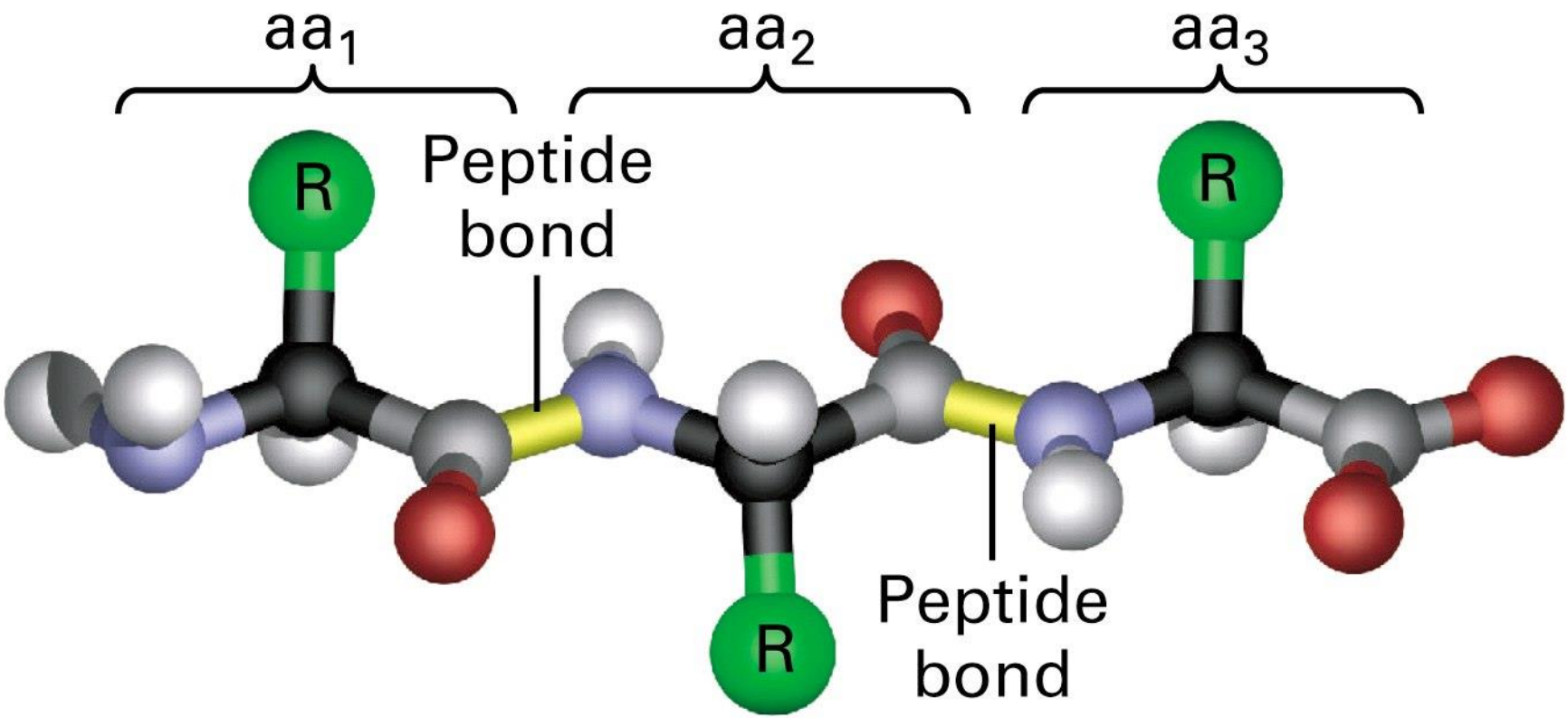
https://nucleicacidmage.wordpress.com/

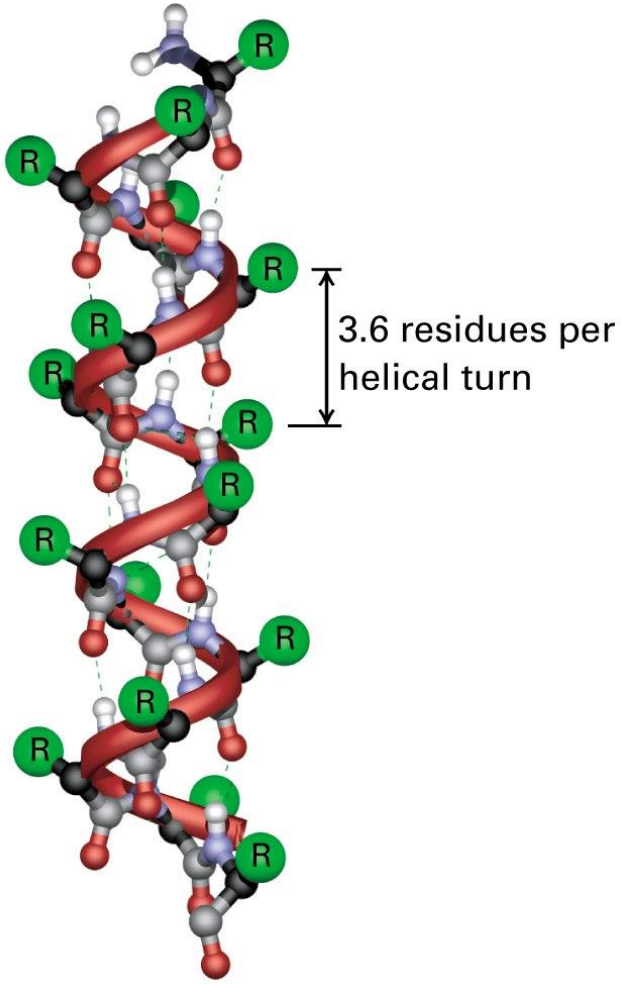


Primary Structure



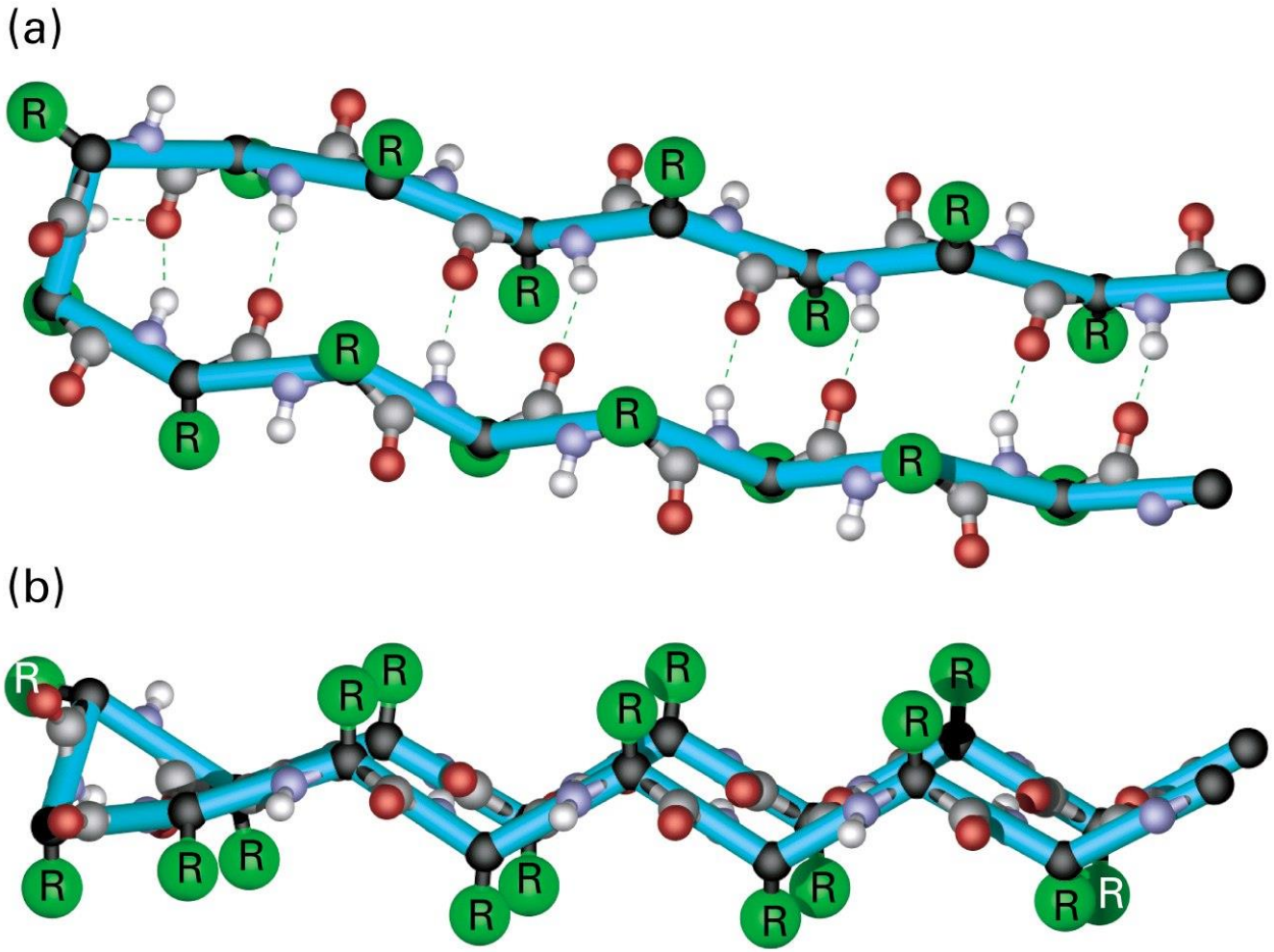
Secondary Structure

α- Helix

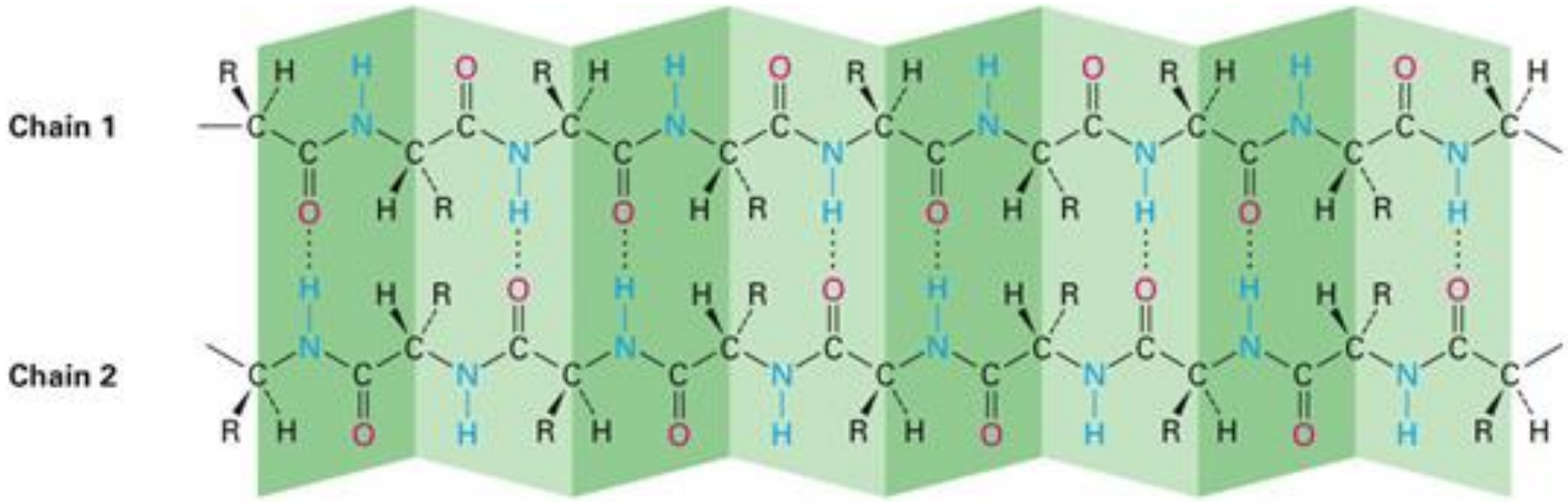


Secondary Structure

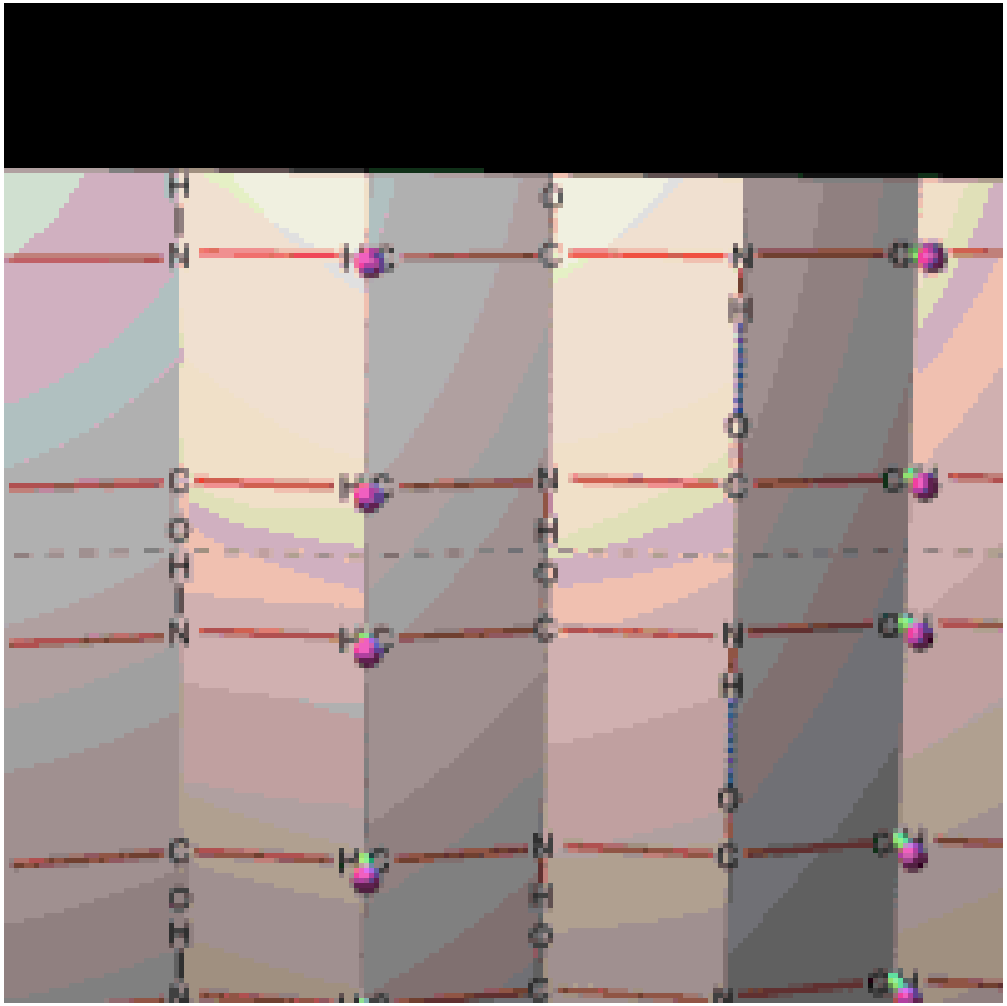
β-Pleated Sheet



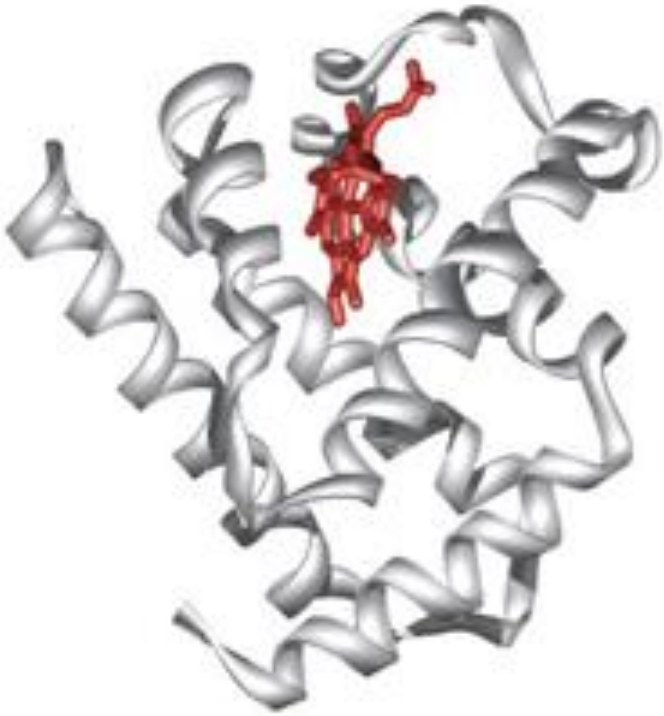
Secondary Structure



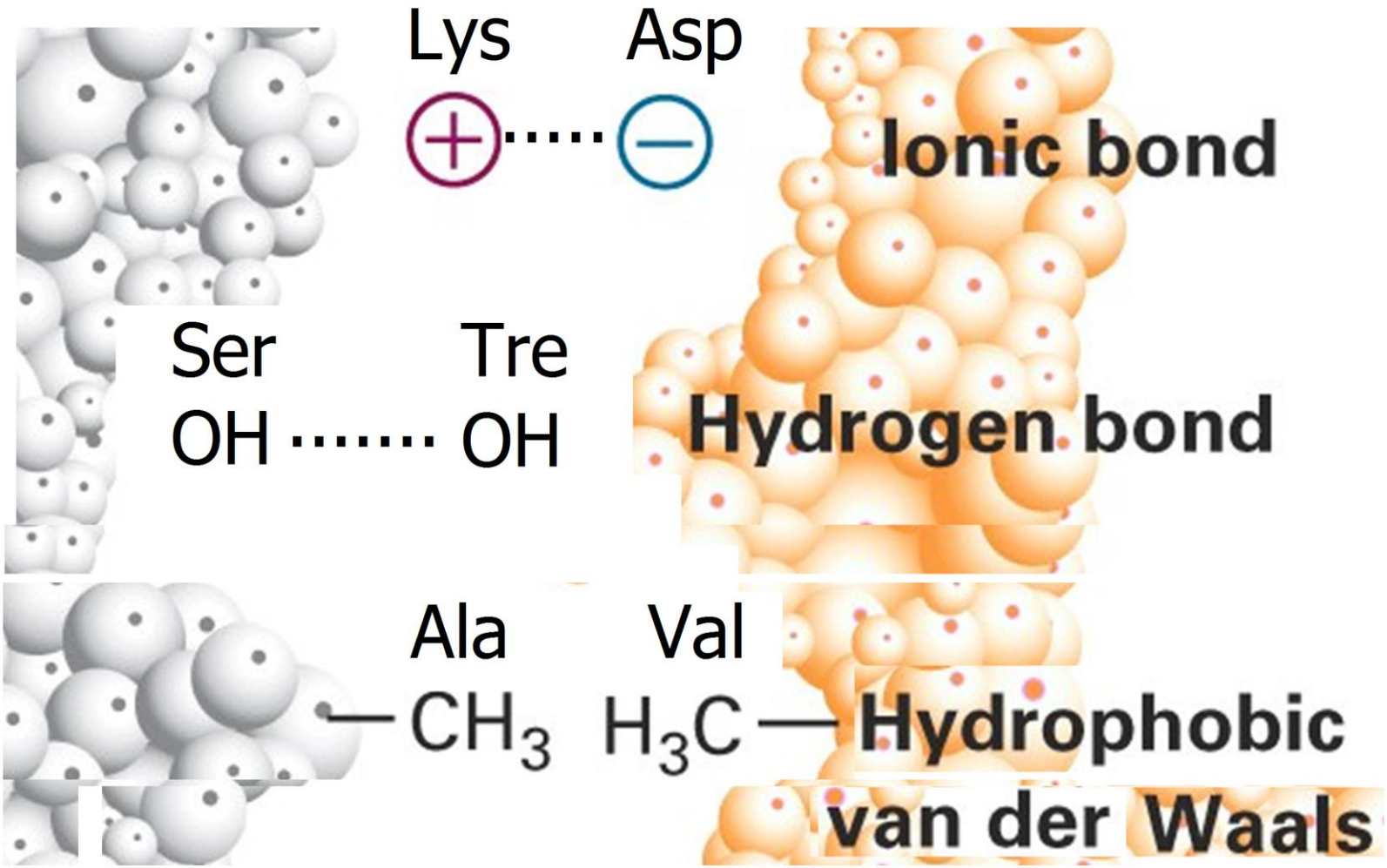
Secondary Structure

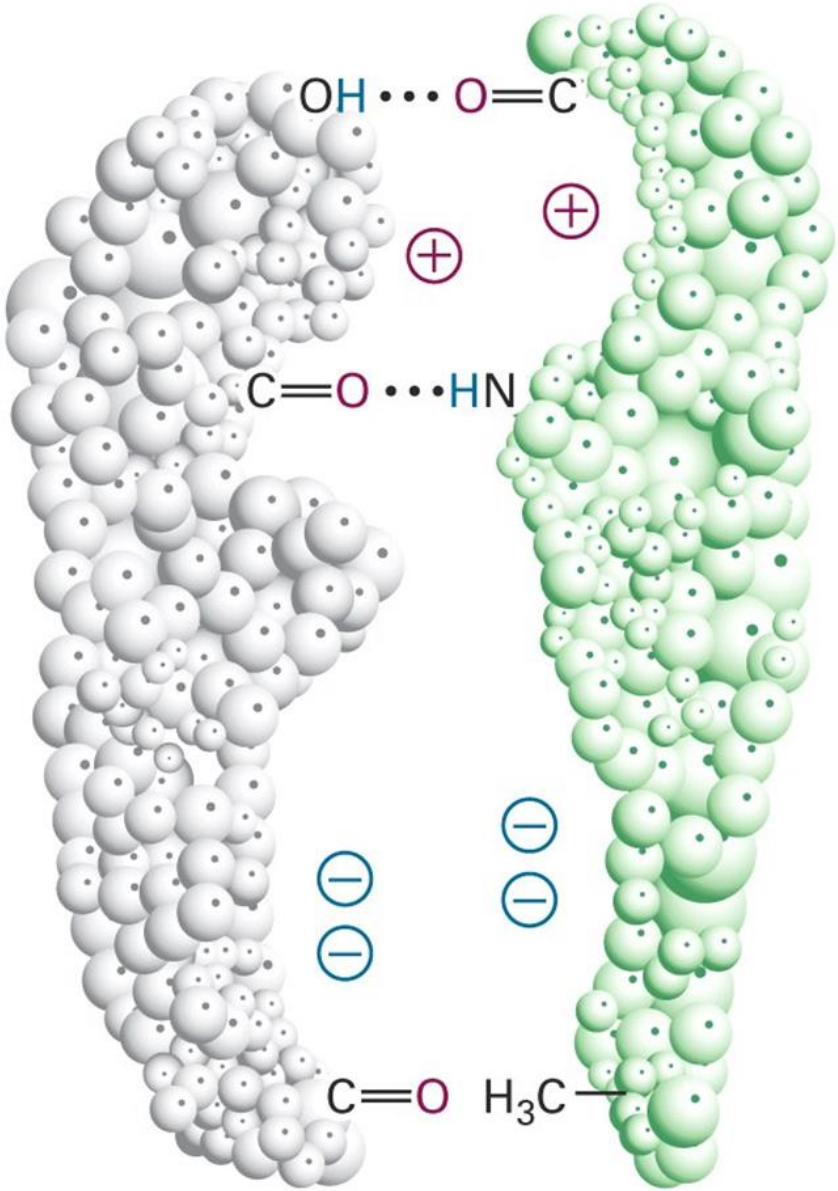


Tertiary Structure



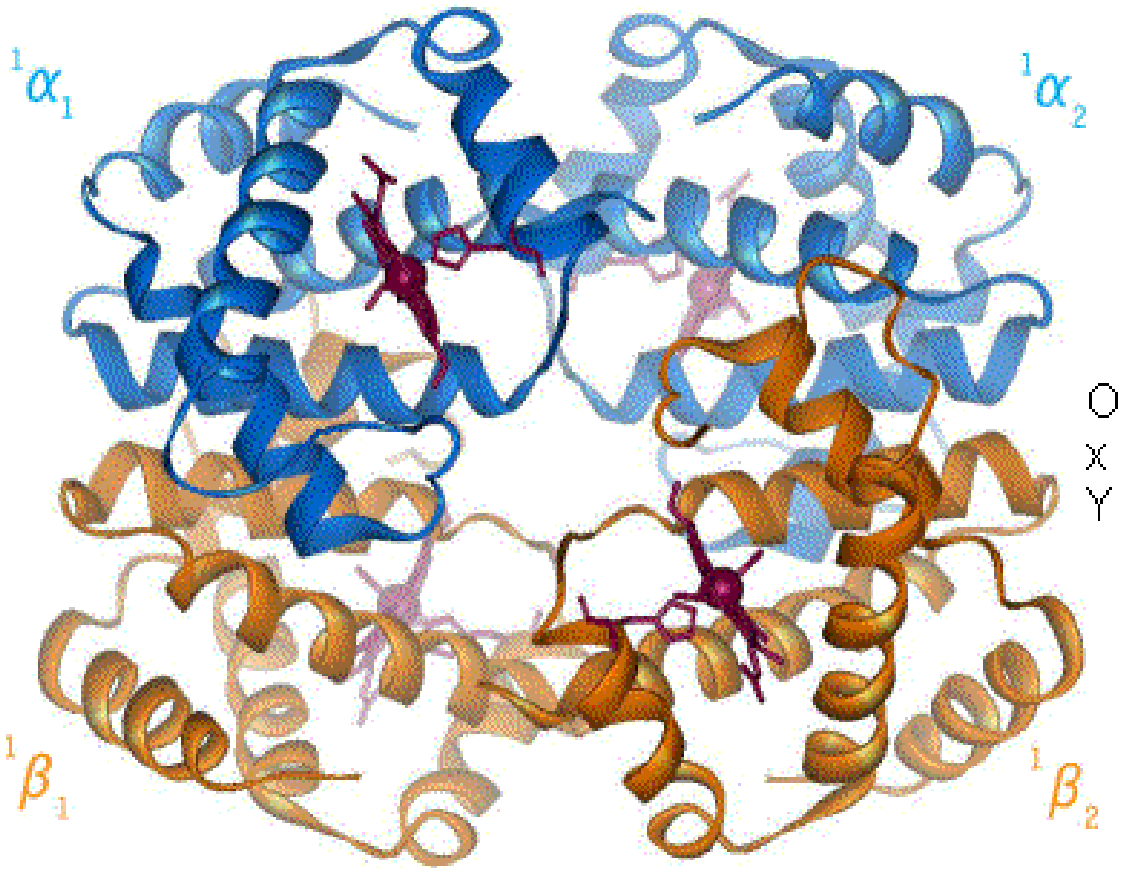
Myoglobin


Lys
Asp
Ionic bond
Ser
OH
Tre
OH
Hydrogen bond
Ala
CH3
Val
H3C
Hydrophobic
van der Waals

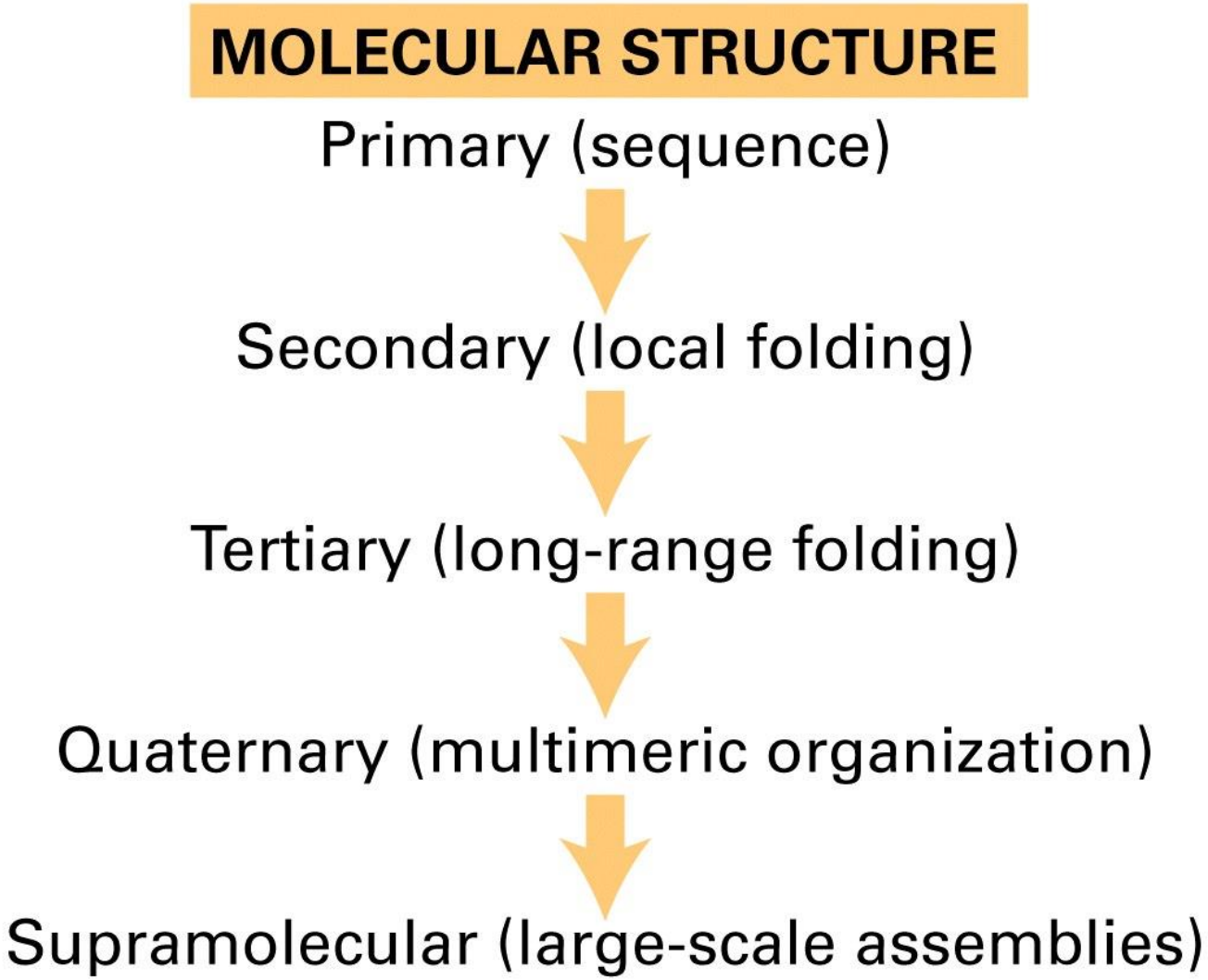

OH • • • O=C
C=O • • • HN
C=O
H3C

Quaternary Structure

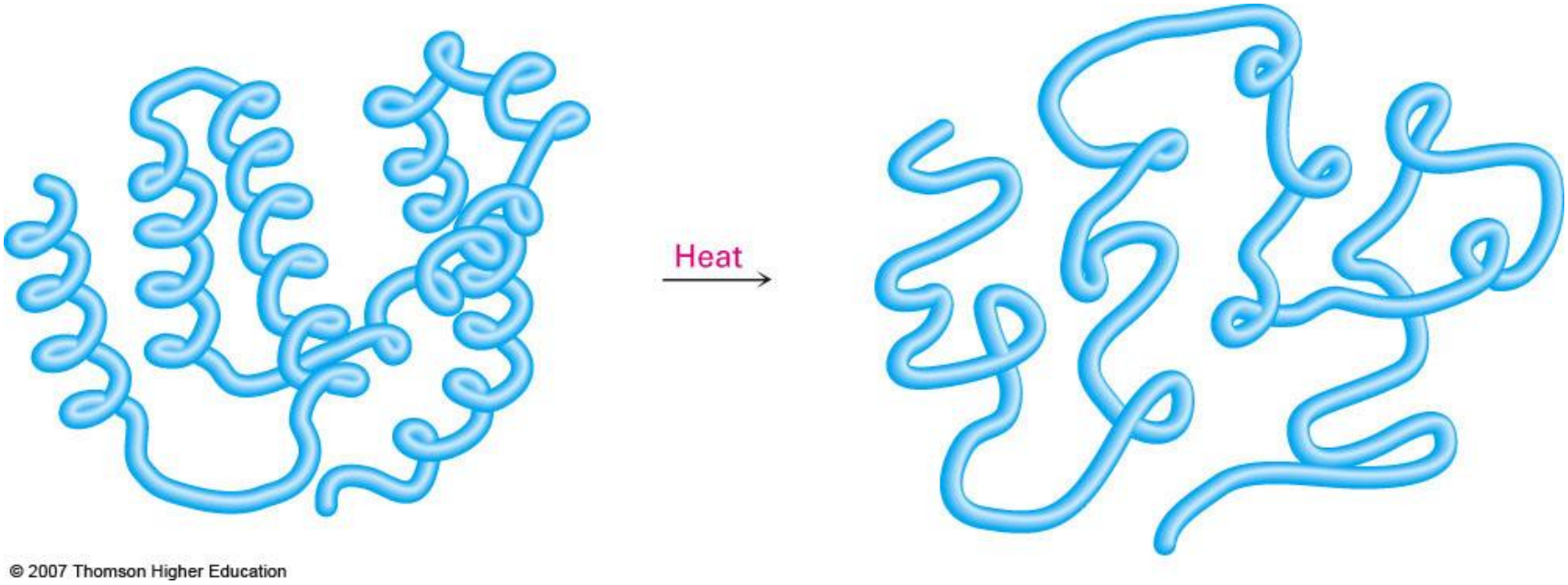
Hb A (α2β2) is the major adult Hb and Hb A_2 (α2δ2) is the minor one.



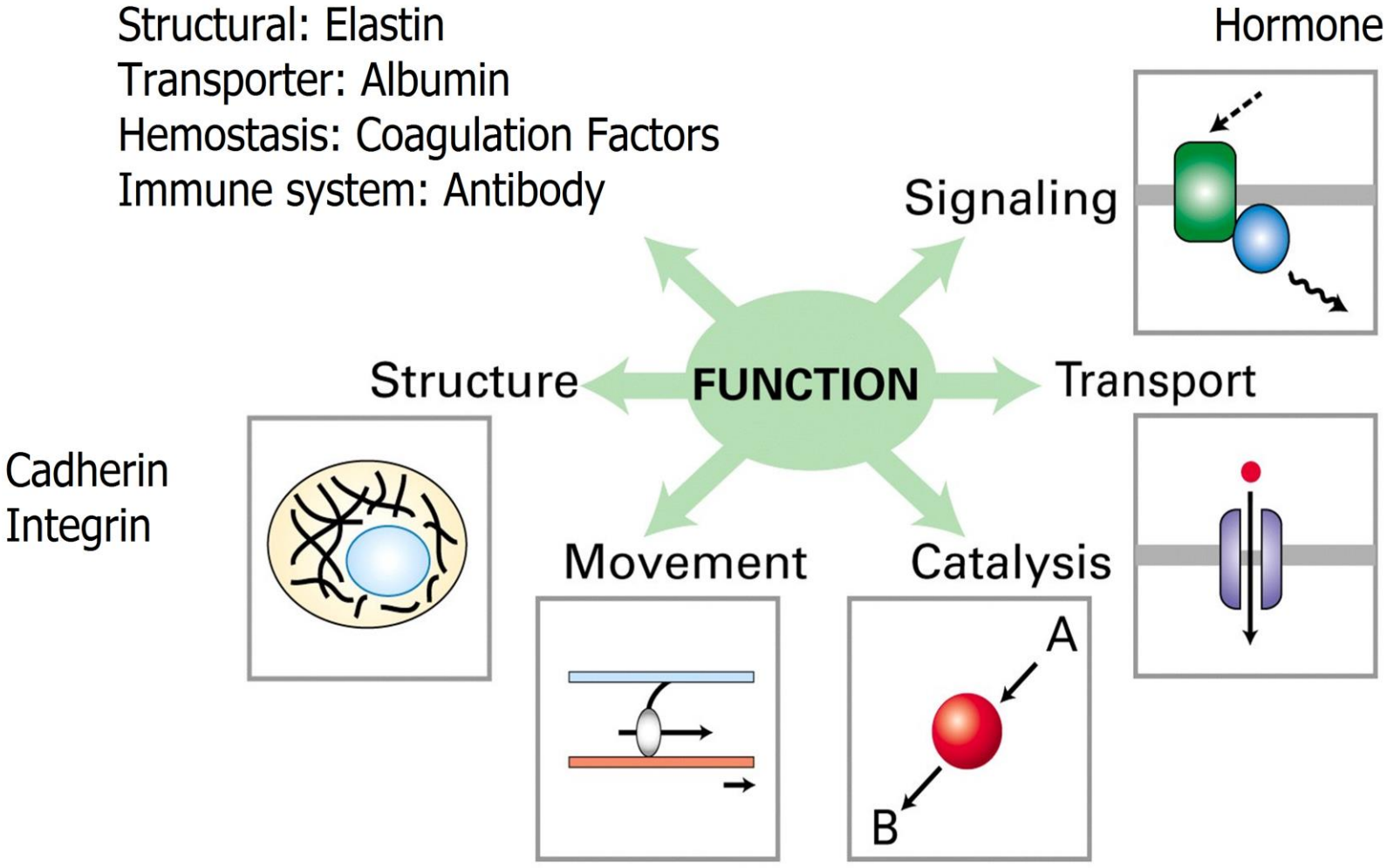
(a)


MOLECULAR STRUCTURE
Primary (sequence)
Secondary (local folding)
Tertiary (long-range folding)
Quaternary (multimeric organization)
Supramolecular (large-scale assemblies)

Denaturation of Proteins



Structural: Collagen
Structural: Elastin
Transporter: Albumin
Hemostasis: Coagulation Factors
Immune system: Antibody



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