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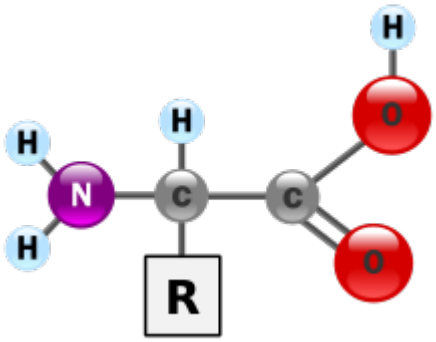
Reading

- lecture09 (OpenStax)
- 3.4 Proteins (CNX OpenStax)
- 3.5 Nucleic Acids (CNX OpenStax)

Learning Objectives

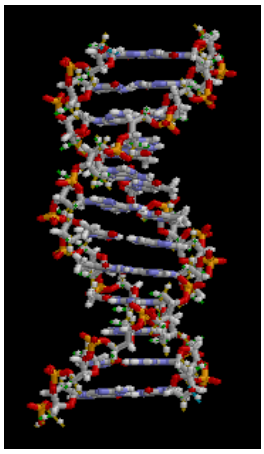
1. Draw the basic structure of an amino acid, and explain the relationships between amino acids, proteins, and peptide bonds.
2. Describe the levels of organization of protein in terms of its primary, secondary, tertiary, and quaternary structures.
3. Define the term nucleic acid, give the subunits of a nucleotide, and name the two main types of nucleic acids found in living organisms.
4. Explain why ATP is important and describe its general structure.

Proteins



Proteins provide much of the structural and functional capacity of cells. Proteins are composed of monomers called amino acids. **Amino Acids** are hydrocarbons that have an **amino group** ($-NH_2$) and an acidic **carboxyl group** (-COOH).The R group represents a hydrocarbon chain with a modification that alters the properties of the amino acid. 20 universal amino acids are used to construct proteins. The variation in functional groups along the amino acid chain gives rise to the functional diversity of proteins.

Diversity of Proteins

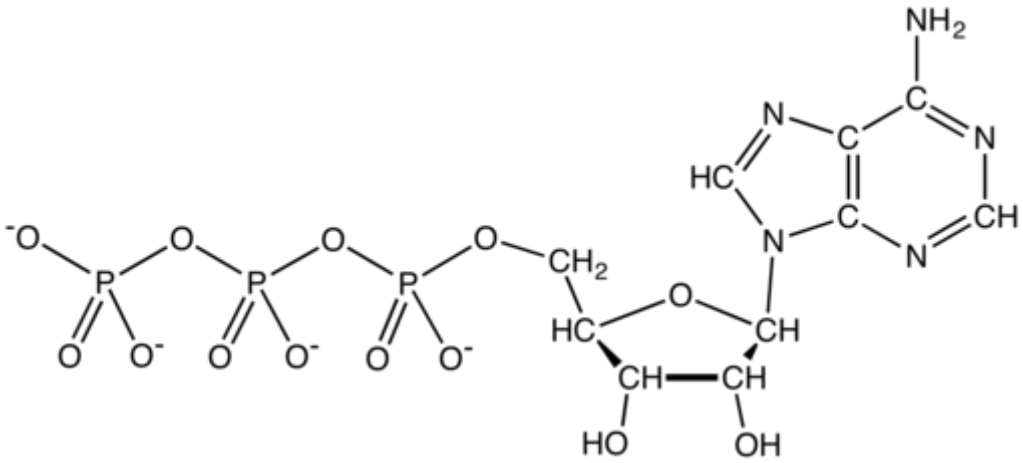


There are 10 bases for every complete turn in the double helix of DNA.

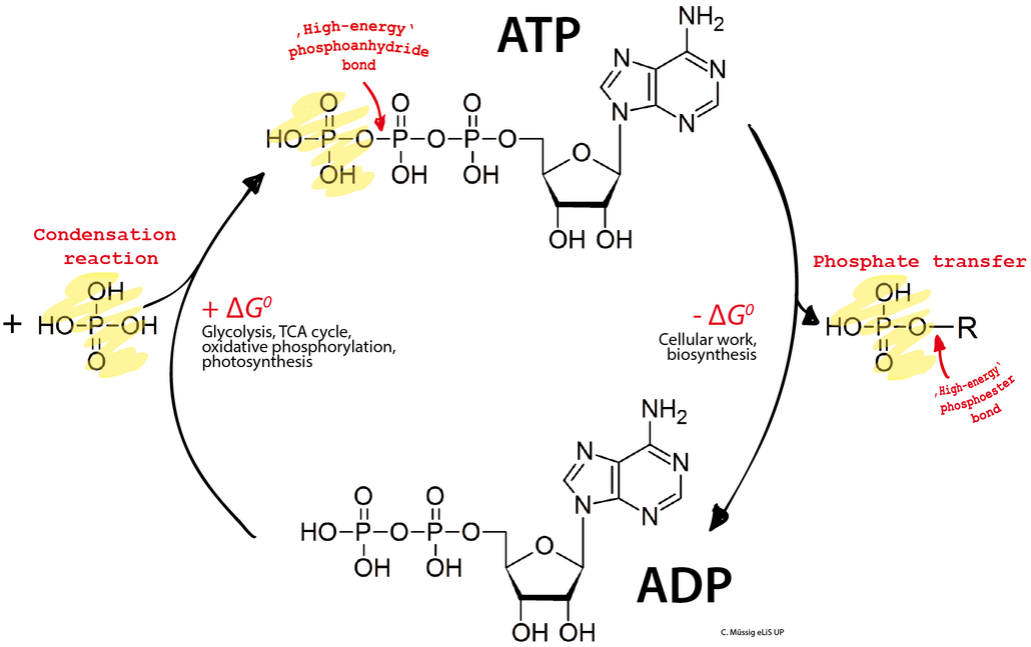
DNA is a double helical molecule. Two anti-parallel strands are bound together by hydrogen bonds. Adenine forms 2 H-bonds with Thymine. Guanine forms 3 H-bonds with Cytosine. This AT & GC matching is referred to as **complementarity**. While the nitrogenous bases are found on the interior of the double helix (like rungs on a ladder), the repeating backbone of pentose sugar and phosphate form the backbone of the molecule. Notice that phosphate has a negative charge. This makes DNA and RNA, overall negatively charged.

ATP

- ATP (adenosine triphosphate) is composed of adenine, ribose, and three phosphates
- In cells, one phosphate bond is hydrolyzed – Yields:
    - The molecule ADP (adenosine diphosphate)
    - An inorganic phosphate molecule
    - Energy used for work in the cell



The structure of ATP. Credit: Smokefoot [CC-BY-SA 4.0]



Energy is released from the hydrolysis of the terminal phosphate.
Credit: Muessig [CC-BY-SA 3.0]

Additional Resources

- Fats and Proteins http://www.visionlearning.com/en/library/Biology/2/Fats-and-Proteins/62

Test Yourself

- Macromolecules Quiz
- Macromolecules Flashcards