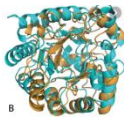
Chapter 3 – Biochemistry, Nutrition, and Water

Section 3: The Molecules of Life – Nutritional Information

1. **Proteins**
   a. Large, 3-D, structures with major binding and structural functions in living organisms.
   b. Globular shape 

The average protein is 500-600 amino acids

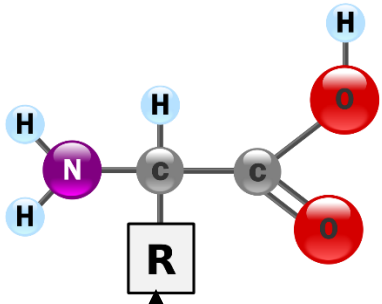
   c. **Monomer Unit:** amino acids; there are 20 different amino acids used in life.

Keystone Exam Note:

The Keystone Exam uses the term **Polypeptide Chain**…

this means you are dealing with Proteins and aminio acids!

i. **Structure**

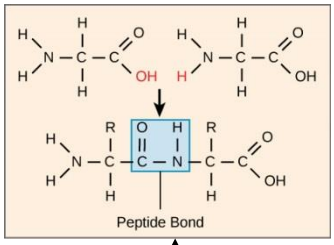


Remember: The structure of the protein tells us how it functions! The R-Group is the key!

R-Group is the only part of the structure that changes

ii. **R-Groups**
   1. Side chains which give amino acids their properties
   2. May be polar or non-polar
   3. The **R-Group** is the one part of the amino acid structure that **changes**. The rest of the structure is the same!

iii. **Peptide Bonds**
   1. Covalent bond formed between 2 amino acids



Dipeptide

   d. **Functions / Types of Proteins**

i. **Structural**
   1. Make up many of the structural components of animals
   2. ***Examples***: hair, nails, muscle, tendons, ligaments
   3. ***Example Types***: Collagen (nails), Keratin (hair)

ii. **Binding**
   1. Can bind to other molecules
   2. ***Examples***: **Hemoglobin** binds to Oxygen, **Enzymes** bind to organic molecules

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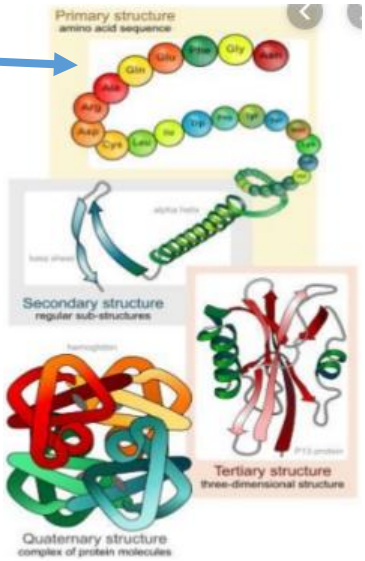
iii. Levels of Structure

- Proteins range in shape/structure; from **straight** chains **to** complex **globular**, 3-D structures
- It's all about STRUCTURE and FUNCTION; the structure allows it to function

Straight chain →



- Globular Structures (extra info)
  1. Primary
  2. Secondary
  3. Tertiary
  4. Quaternary

Globular, 3-D →

iv. Denaturation

1. Breaking proteins out of the 3-D **(natural)** structure causing them to not function.
   a. **If they lose their structure, they lose their function**
2. ***Examples***: Heat, shaking, pH - acids/bases, detergents

Other Information: Food High in Protein

Link – Biochemistry Foldable – Proteins

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What characteristics do proteins possess that enable them to function in living organisms and support life?

Answer: **Proteins** are the most diverse biomolecules on Earth, performing many functions required for life. Protein **enzymes** are biological catalysts, maintaining life by regulating where and when cellular reactions occur. Structural proteins provide internal and external support to protect and maintain cell shape. For example, keratins are an important class of structural proteins found in the hair, skin, nails, and feathers of animals. Motility proteins provide the basis for cellular and whole organism movement, including muscle motor proteins that can move entire animals! Membrane proteins transmit signals during cell-to-cell communication, transport molecules into and out of cells, and protect living organisms by identifying and flagging invaders.

Protein functions are so diverse because of the many unique three-dimensional structures protein polymers form. Despite such variety, proteins also share several specific structural characteristics in their monomers, the **amino acids**. Structural similarities among amino acids make protein synthesis a uniform and regulated process; however, each amino acid contains a unique structural component as well. Specific differences between each amino acid interact to create unique three-dimensional protein structures. Combined, the similarities and differences between amino acids explain how cells can build a diverse pool of proteins from the same set of building blocks.

https://dlc.dcccd.edu/biology1-3/proteins