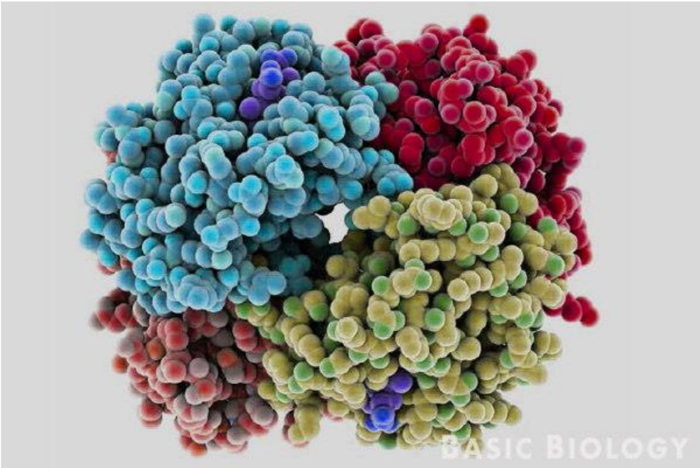
L1: Molecule of life

All life on Earth is built from four different types of molecules. These four types of molecules are often referred to as the **molecules of life**.

The four molecules of life are **proteins, carbohydrates, lipids and nucleic acids**.

Each of the four groups is vital for every single organism on Earth. Without any of these four molecules, a cell and organism would not be able to live. All of the four molecules of life are important either structurally or functionally for cells and, in most cases, they are important in both ways.

(I) PROTEINS



Proteins are the first of the molecules of life and they are really the building blocks of life. Proteins are the most common molecules found in cells.

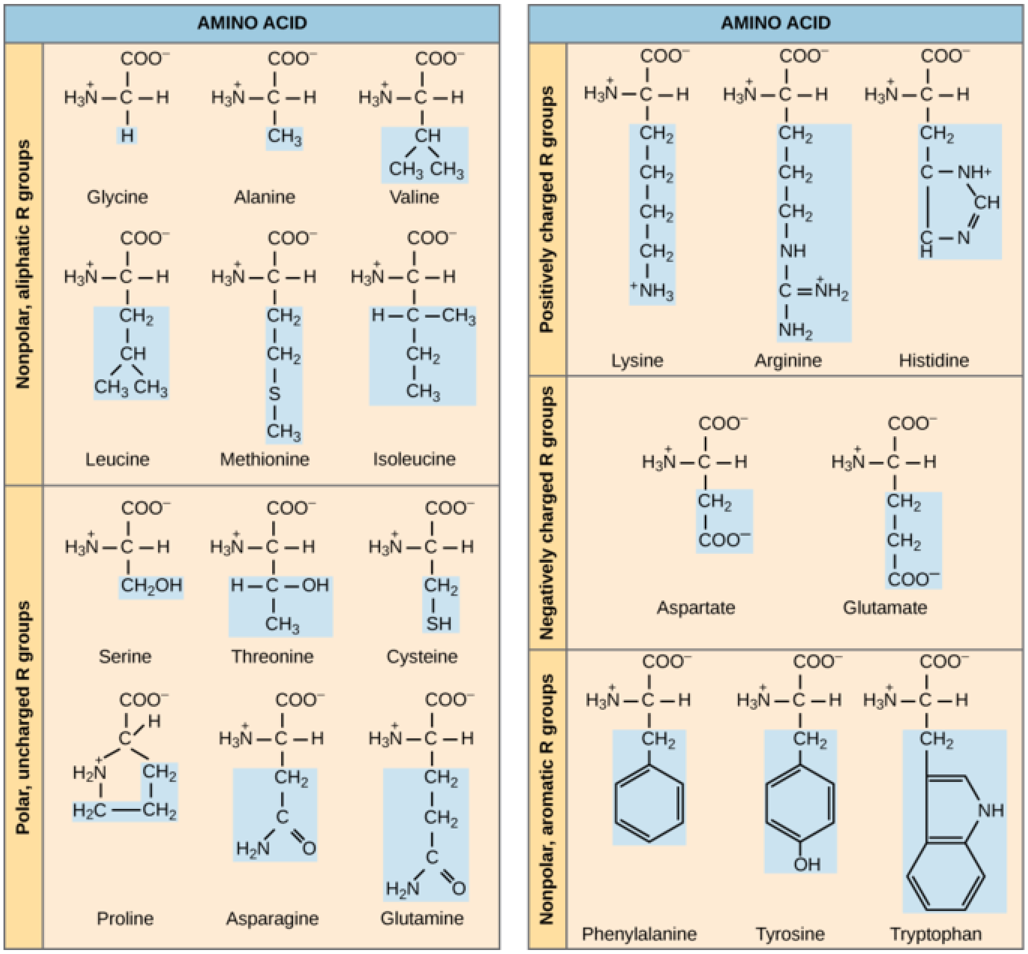
Protein molecules are involved in a range of aspects of a cell's biology. They come in a huge variety of forms and perform a massive range of functions.

They are involved in muscle **movement, storage of energy, digestion, immune defence** and much more.

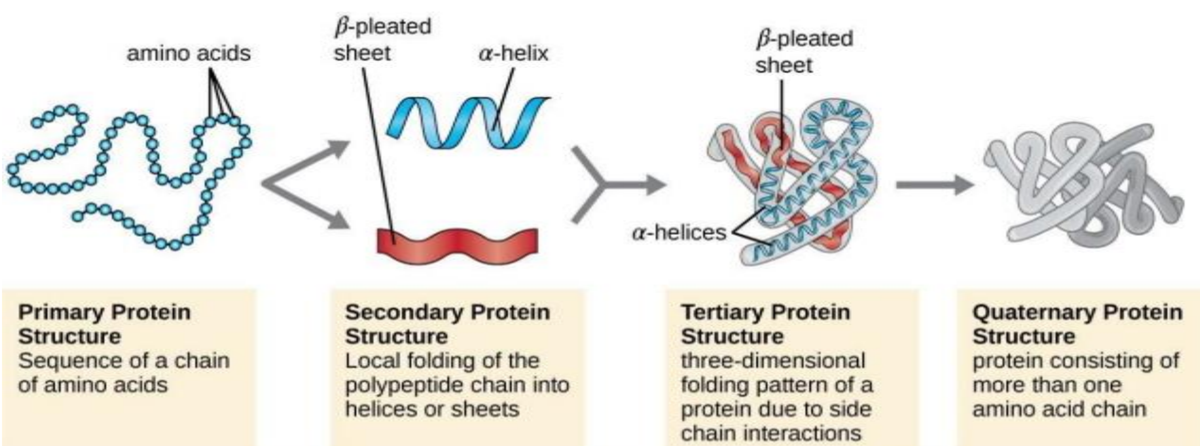
The primary structure of a protein is a long chain made of many smaller molecules called **amino acids.** There are 20 different amino acids that are used to build proteins.

The different amino acids can be arranged into trillions of different sequences that each creates a unique protein. The long chain of amino acids twists and folds on itself to produce the final shape of a protein.

Amino acids contain nitrogen. Nitrogen-based compounds are an essential part of the diet of all organism so they can produce new proteins for their cells. This is why farmers often add nitrogen-based fertilisers to help their crops grow and why it is important for humans to eat foods that contain proteins.

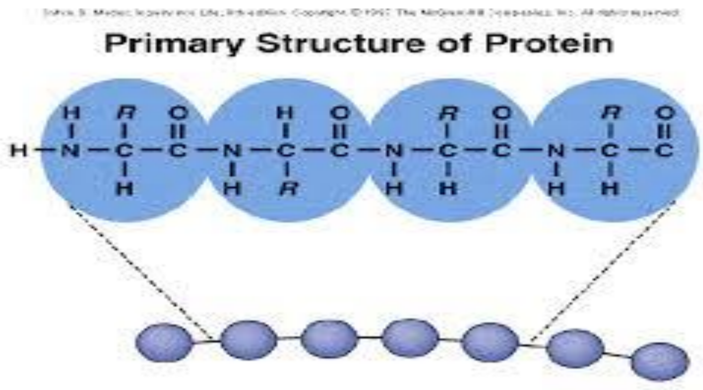


Structure and Shape of Protein



Primary structure

The simplest level of protein structure, **primary structure**, is simply the sequence of amino acids in a polypeptide chain.



The sequence of a protein is determined by the DNA of the gene that encodes the protein (or that encodes a portion of the protein, for multi-subunit proteins). A change in the gene's DNA sequence may lead to a change in the amino acid sequence of the protein.

Secondary Structure of Protein

Secondary Structure refers to the coiling or folding of a polypeptide chain that gives the protein its 3-D shape. There are two types of secondary structures observed in proteins.

One type is the **alpha (α) helix** structure. This structure resembles a coiled spring and is secured by hydrogen bonding in the polypeptide chain.

The second type of secondary structure in proteins is the **beta (β) pleated sheet**.