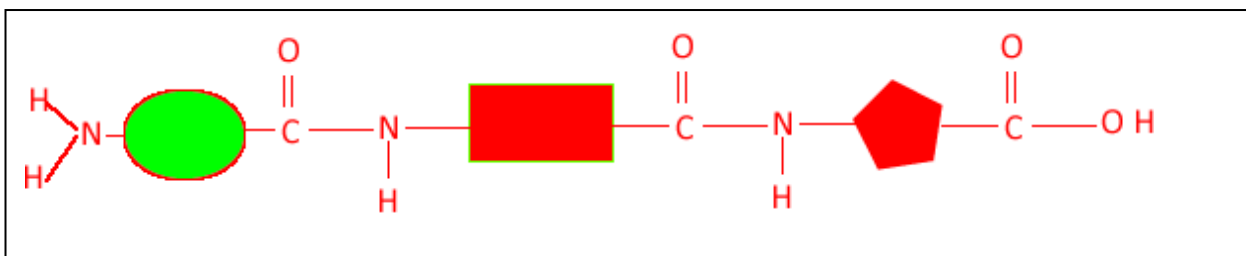
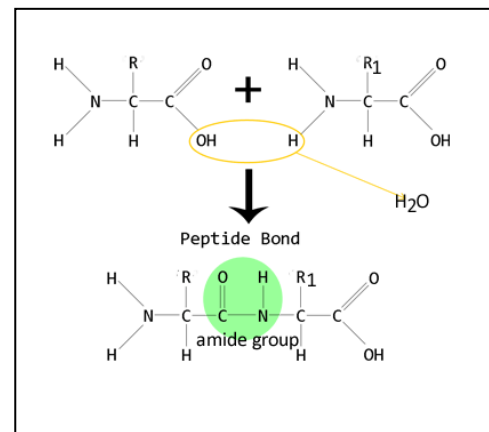


Lesson 2 –proteins

[Click](#) to revise amino acids and protein structure.

Proteins are formed during condensation polymerisation reactions between amino acids. Amino acids react in a condensation reaction to form an amide link which results in the expulsion of one water molecule for every amide group formed.

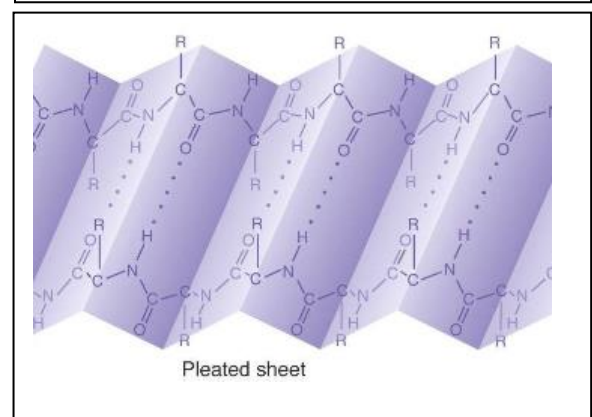
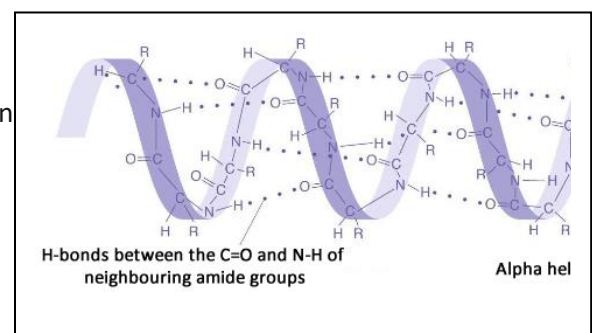
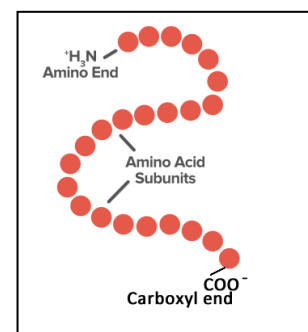
The resulting peptide structure consists of amino acids covalently linked by amide groups to each other, as shown below.



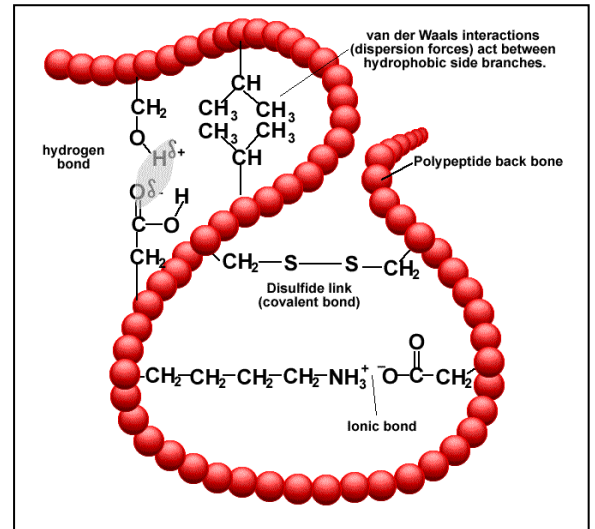
Proteins are complex molecules with unique structures and functions. The shape of the molecule is critical to its role in the body and it is the sequence of amino acids in the protein chain that determine how the protein folds.

Proteins have a number of levels of structure.

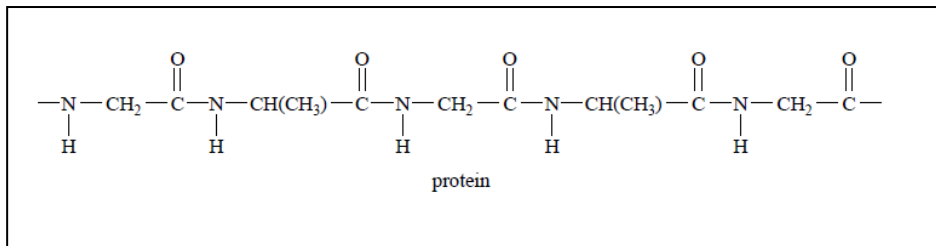
- The primary structure- the sequence of covalently bonded amino acids.
- The secondary structure- which is formed by hydrogen bonding between amide groups along sections of the primary structure. On average it is every fourth amide group that undergoes hydrogen bonding. This results in two types of structures known as an alpha helix or beta pleated sheet.



- c) Further interactions between several secondary structures along the protein chain form the **tertiary structure**. This comes about due to bonding between the side groups of amino acids. The type of bonding taking place is summarised in the diagram on the right.
- d) A **quaternary structure** occurs when two or more tertiary structures come together. These structures held together by hydrogen bonding and by covalent disulfide links.

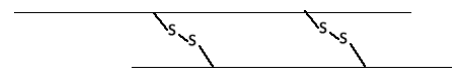


Heat and changes in pH can severely disrupt and destroy the secondary and tertiary structures of proteins, which are primarily, held together by weaker bonding forces, such as hydrogen bonding and van der waals interactions. The primary structure is not broken down by heat or pH changes as covalent bonds holding the amino acids together are too strong.



- 1) Consider a small section of protein chain shown above.
- Circle and name a common functional group.
 - Name the amino acids present.

- 2) A protein is made up of 80 amino acids and has the structure shown on the right.



- How many amide links are present in this protein?

b) The image shown on the right represents structures associated with proteins.

- Which structures are likely to be disrupted by heat?
- Which represents a primary structure of a protein?
- Which represents a structure most likely to involve a disulphide bond?
- Which represents a structure formed primarily from the hydrogen bonding between amide groups.
- Which structure can form a zwitterion at a given pH?

