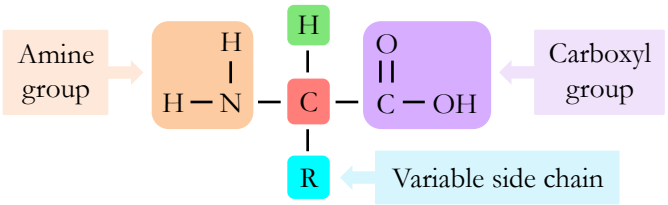
TOPIC 2.4: PROTEINS

Amino Acids

The monomer of a protein is called an amino acid
- Amino acids are linked together to form polypeptides

There are 20 different amino acids that form polypeptides
- These can be linked in any sequence to create variation

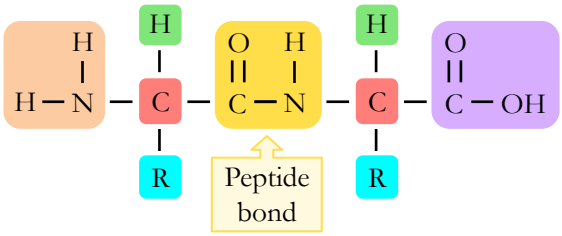


Structure of a Generalised Amino Acid

Peptide Bonds

Amino acids are covalently joined by peptide bonds to form polypeptide chains (requires condensation reactions)

The sequence of amino acids is encoded by genes and the assembly of a polypeptide chain occurs at the ribosome



Structure of a Dipeptide

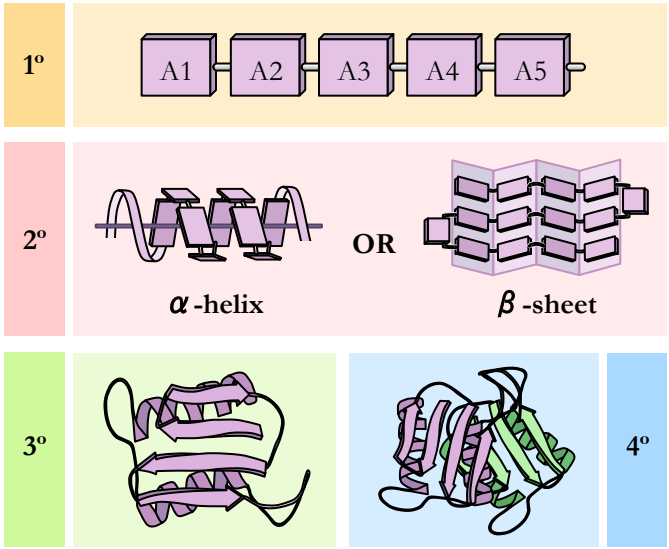
Protein Structure

Primary Structure
- Order of amino acid sequence
- Formed by covalent peptide bonds

Secondary Structure
- Folding into repeat patterns (α-helix or β-pleated sheet)
- By hydrogen bonds between amine and carboxyl groups

Tertiary Structure
- Overall three-dimensional arrangement of a polypeptide
- Determined by interactions between variable side chains

Quaternary Structure *(optional)*
- Presence of multiple polypeptides or prosthetic groups



Functions of Proteins

Proteins are a very diverse class of compounds that may serve a wide range of functions within the cell, including:

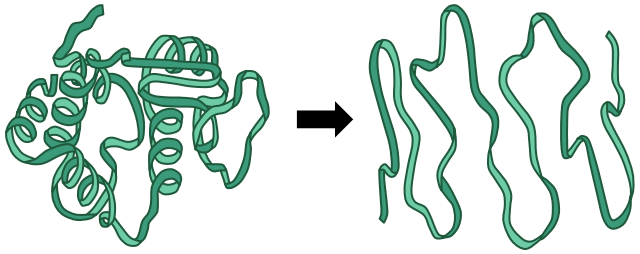
- **S**tructure (collagen, spider silk)
- **H**ormonal (insulin, glucagon)
- **I**mmunity (immunoglobulins)
- **T**ransport (haemoglobin)
- **S**ensation (rhodopsin)
- **M**ovement (actin, myosin)
- **E**nzymatic (Rubisco, catalase)

The totality of all proteins that are expressed within a cell, tissue or organism at a certain time is called the **proteome**
- The proteome of any given individual will be unique as protein expression patterns are influenced by a genome

Denaturation

Denaturation is a structural change in a protein that results in the loss (usually permanent) of its biological properties

Denaturation can be caused by certain conditions:
- **Temperature** (heat may break structural bonds)
- **pH** (alters protein charge ➡ changes solubility & shape)



Folded Protein **Unfolded** *(Denatured)*