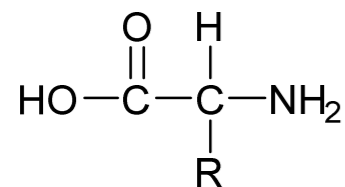


# RB1 - Amino Acids and Proteins – Biology Revision

Draw the general structure of an amino acid:



How many amino acids exist in nature? What is the difference between them?

20. They all have the same general structure, but they have different side chains.

Why is it biologically useful to have so many different natural amino acids?

Different amino acids have different side chains, and therefore they all have slightly different properties. This allows them to combine in many very specific ways to form overall proteins. Amino acids can be acidic, basic, hydrophilic, or hydrophobic. They exist in a range of different 3D structures and shapes.

Which type of reaction produces dipeptides?

A condensation reaction between two amino acids. This reaction joins the two amino acids, and eliminates a molecule of water.

Draw the dipeptide which forms from these amino acids:

Proteins have a primary, secondary, tertiary, and sometimes even a quaternary structure.

Explain how each of these structures contribute to the overall function of a protein:

The primary structure dictates the secondary structures which can form. The secondary structures together make up the tertiary structure, and when tertiary structures combine, they can create an overall quaternary structure.

Enzymes are a type of protein. Explain how the primary structure of an enzyme affects its ability to catalyse a reaction:

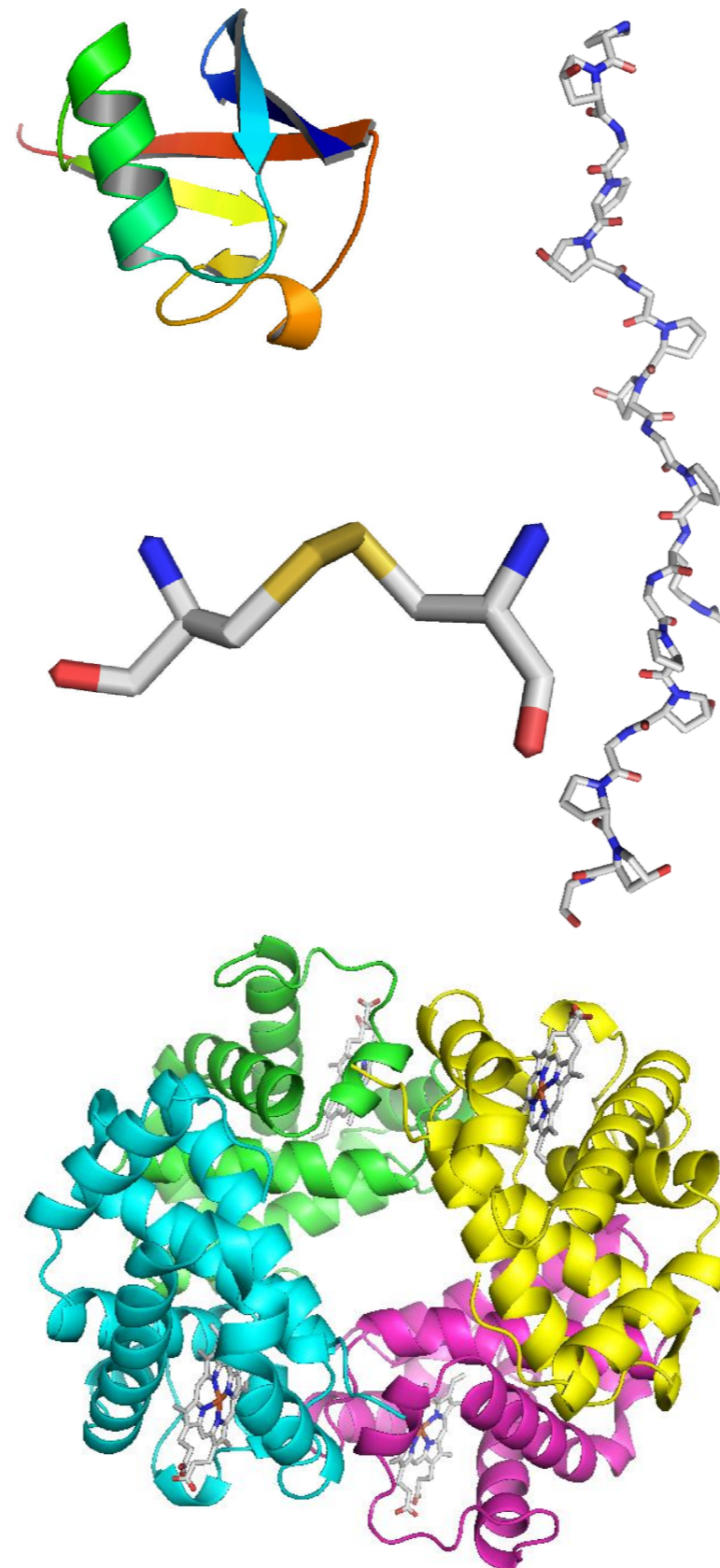
The primary structure will influence the tertiary structure of a protein. Importantly this will affect the structure of the active site. Enzymes work by utilising an active site, so if the primary structure is changed, then the active site may change, and it may not be able to bind to a substrate and catalyse its reaction.

The traditional model for enzyme action was the lock and key model. Explain how this model works:

This model assumes that each enzyme active site acts as a lock, and only accepts a complementary key (substrate). This model doesn't allow any flexibility in the structure of the enzymes active site, and assumes that a substrate has a perfect natural fit within the active site.

How do enzymes make a specific reaction more favourable?

By acting as a catalyst, they provide an alternative reaction pathway of lower activation energy.



Define the following terms:

**Protein:** Structures consisting of one or more polypeptide chains.

**Primary structure:** The sequence of amino acids in a polypeptide chain.

**Secondary structure – include 2 examples:** The local arrangements of a polypeptide chain into commonly seen structures, such as  $\alpha$ -helices and  $\beta$ -sheets.

**Tertiary structure:** The overall 3D structure of a single polypeptide chain. This takes into account the arrangement of the polypeptide, and the secondary structure in it.

**Quaternary structure:** The overall structure of a protein which forms when multiple polypeptide chains are combined and interact.

**Conjugated protein:** A structure made from a protein joined to a non-polypeptide unit, such as another molecule or ion.

Explain why hydrogen bonding is important to the overall structure of a protein:

Hydrogen bonding creates the secondary structure on the protein, such as  $\alpha$ -helices and  $\beta$ -sheets. It also affects the tertiary structure, as polypeptide chains interact with themselves, folding into a specific shape. Lastly it can create quaternary structures when multiple polypeptide chains hydrogen bond together.

Explain how disulfide and ionic bonding affects the tertiary structure of a protein:

Disulfide bonding occurs between cysteine residues. It forces the polypeptide chain to adopt a very specific 3D shape to allow the disulfide bonds to form. This gives the protein a specific, overall 3D structure.

Ionic bonding acts similarly, but between charged groups. Ionic bonds form, which force the protein into a specific 3D structure.