

WJEC (Wales) Chemistry

A-level

Topic 4.7 - Amino Acids, Peptides and Proteins

Flashcards

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What is an α -amino acid?



What is an α -amino acid?

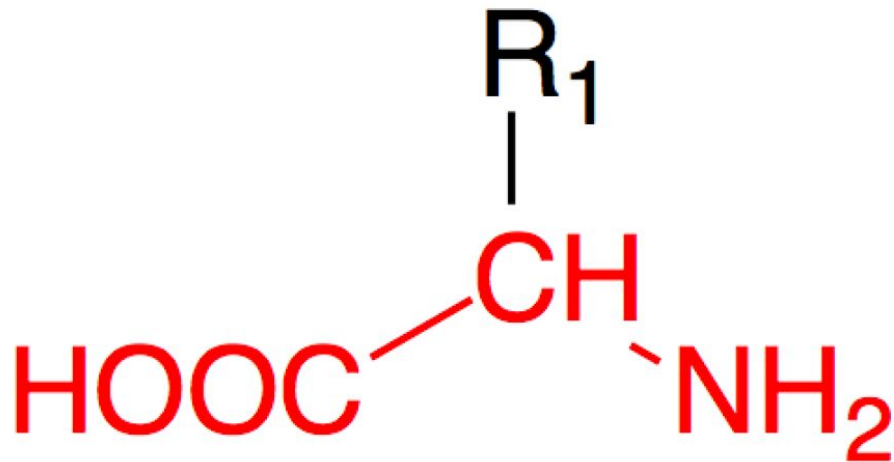
α -amino acids are organic molecules containing a carboxylic acid group and amine group bonded to the same carbon atom.



Give the displayed structure of an α -amino acid, representing the side chain with 'R'



Give the displayed structure of an α -amino acid, representing the side chain with 'R'



Which amino acid is the only amino acid that is not chiral?



Which amino acid is the only amino acid that is not chiral?

Aminoethanoic acid (glycine):

The R group on aminoethanoic acid is just a hydrogen atom so the carbon is not bonded to 4 different groups.



Why are all amino acids (except glycine)
chiral molecules?



Why are all amino acids (except glycine) chiral molecules?

All amino acids, except glycine, contain a chiral carbon atom bonded to four separate groups. It is bonded to an amino group, a carboxylic group, a hydrogen atom and an R group.



How are amino acids amphoteric?



How are amino acids amphoteric?

Amino acids are amphoteric meaning they have both acidic and basic properties. This is because they have a basic amino group and an acidic carboxylic group.



What is a zwitterion?



What is a zwitterion?

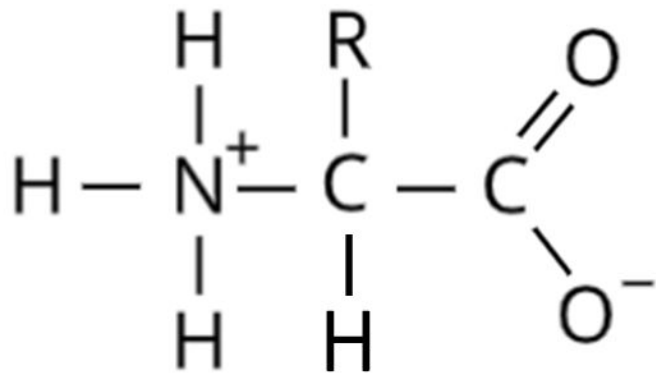
A zwitterion is a dipolar ion which means it has a positive charge in one part of the molecule and a negative charge in another part of the molecule.



Give the general displayed structure of
an amino acid zwitterion



Give the general displayed structure of an amino acid zwitterion



What happens when an alkali is added to an amino acid zwitterion?



What happens when an alkali is added to an amino acid zwitterion?

The NH_3^+ group donates a hydrogen ion to the OH^- ions of the alkali to form water. The organic compound is no longer a zwitterion because it only contains a negative charge.



What happens when an acid is added to an amino acid zwitterion?



What happens when an acid is added to an amino acid zwitterion?

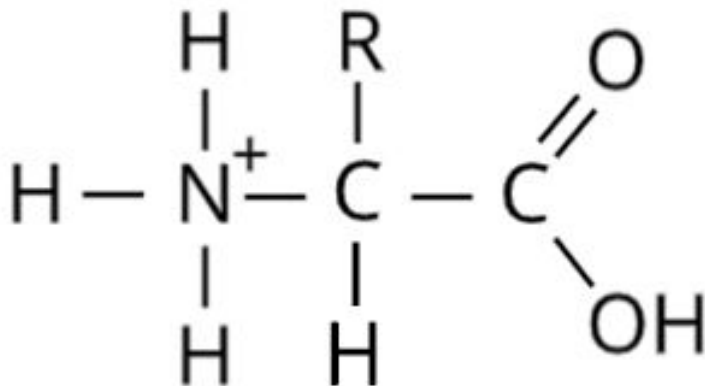
The COO^- group accepts a hydrogen ion from the acid. The organic compound is no longer a zwitterion as it only contains a positive charge.



Give the general displayed structure of
an amino acid in acidic conditions



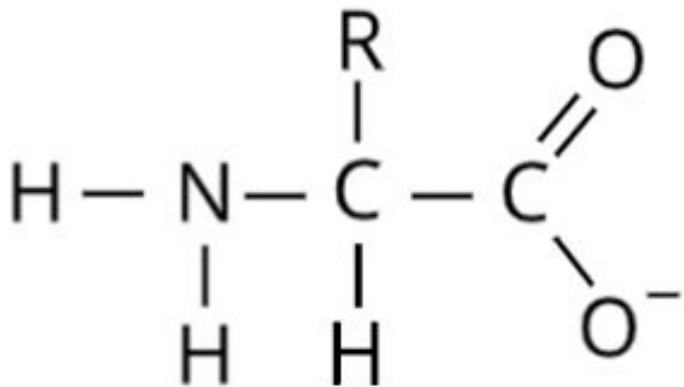
Give the general displayed structure of an amino acid in acidic conditions



Give the general displayed structure of
an amino acid in alkaline conditions



Give the general displayed structure of an amino acid in alkaline conditions



Why do amino acids have relatively high melting points?



Why do amino acids have relatively high melting points?

In the solid state, the zwitterion is the usual form that an amino acid exists in. This means there are strong ionic attractions between neighbouring zwitterions in the solid, so a large amount of energy is required to break the ionic attractions.



Explain the solubility of amino acids in water



Explain the solubility of amino acids in water

Amino acids are generally soluble in water because strong ionic attractions form between the zwitterions and the polar water molecules.



How does a peptide bond form?



How does a peptide bond form?

A peptide bond forms during a condensation reaction between two amino acids. A water molecule is lost.



What is the difference between a dipeptide and a polypeptide?

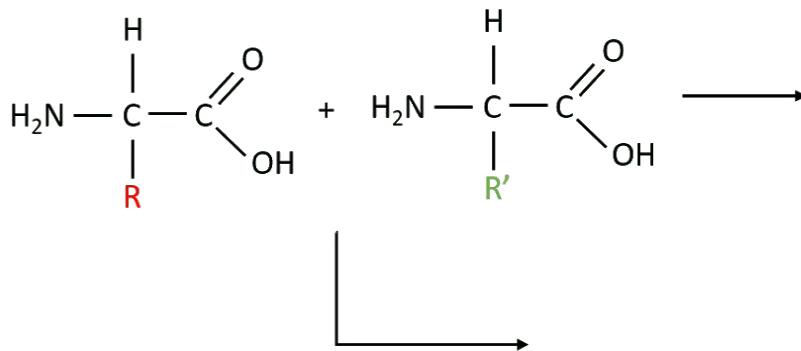


What is the difference between a dipeptide and a polypeptide?

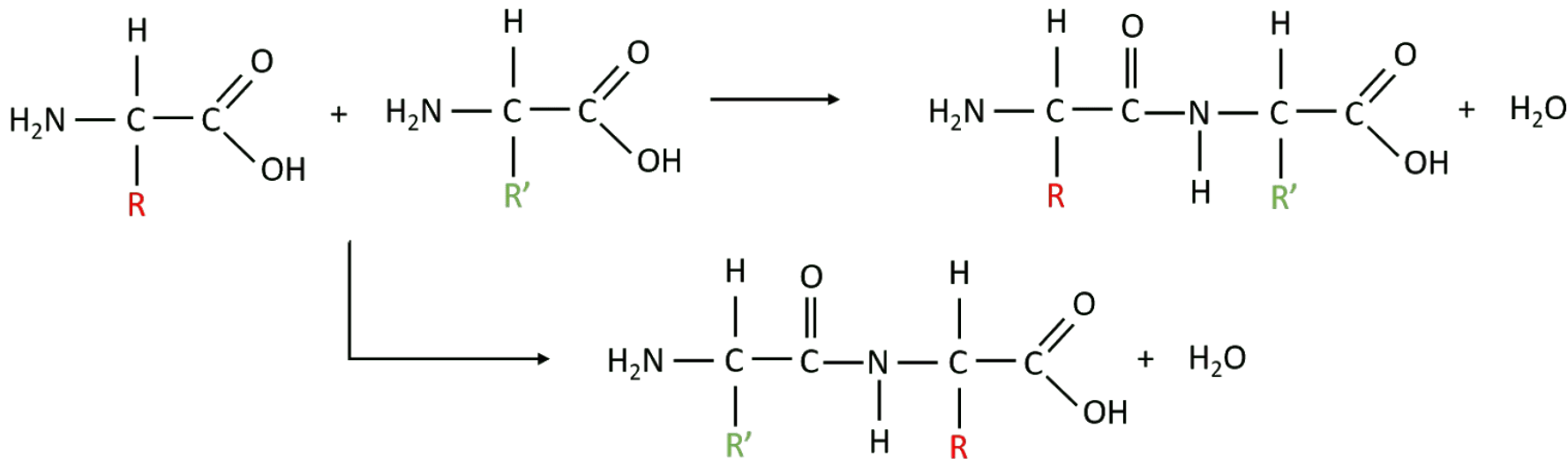
A dipeptide is formed from two amino acids while a polypeptide is formed from more than two amino acids.



Complete the equation below to show the dipeptides that could be formed from these amino acids:



Complete the equation below to show the dipeptides that could be formed from these amino acids:



How do polypeptides lead to protein formation?



How do polypeptides lead to protein formation?

Polypeptides are chains of more than two amino acids joined together by peptide links. When the chain becomes very long, they can fold into proteins.



What does the primary structure of a protein involve?



What does the primary structure of a protein involve?

The primary structure of a protein is the sequence of amino acids which make up the polypeptide chain.



What does the secondary structure of a protein involve?



What does the secondary structure of a protein involve?

The protein chain has peptide links which can form hydrogen bonds with with each other, leading to two possible shapes of the chain, known as the secondary structure:

- α -helix spiral
- β -pleated sheet

Both are stabilised by hydrogen bonding.



What does the tertiary structure of a protein involve?



What does the tertiary structure of a protein involve?

The tertiary structure relates to the extra bonds which can form between different parts of the polypeptide chain, determining how the α -coils or β -pleated sheets of the protein fold with respect to each other. The types of extra bonds include ionic and hydrogen bonds and disulphide bridges.



Give examples of how proteins are essential for living systems



Give examples of how proteins are essential for living systems

- Proteins are important for structural functions in living organisms. Nails, feathers, skin and collagen are all made up of protein.
- Enzymes are proteins that are biological catalysts that speed up chemical reactions in the body.
- Some hormones are proteins, e.g. insulin.

