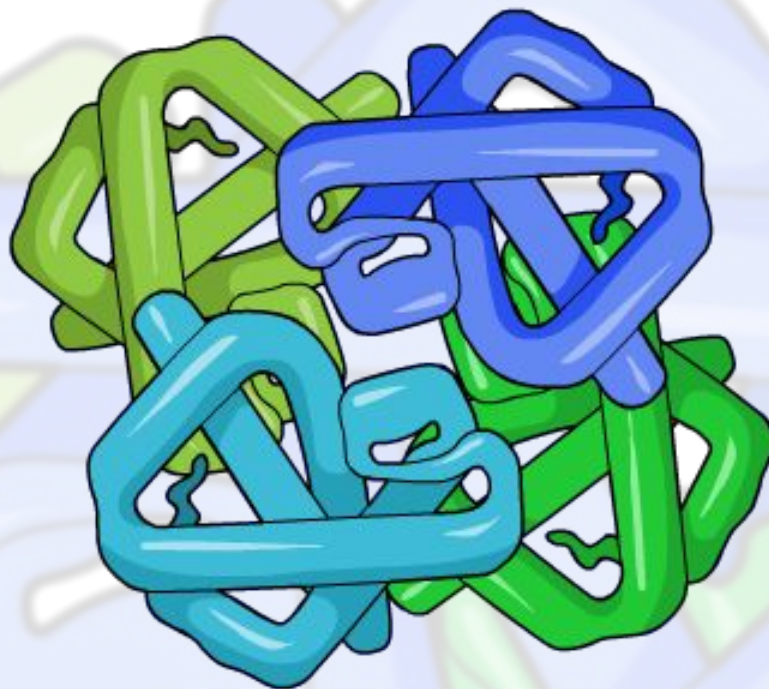


Polymers and Amino Acids



Amino acids



Systematic and trivial names, optical isomerism, formation of zwitterions of amino acids

• Lesson objectives

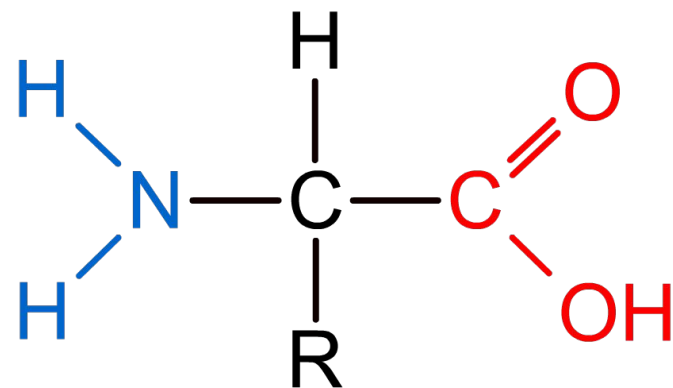
- - to use the systematic names of common amino acids and know their trivial names;
- - understand that amino acids are usually optically active;
- - recognise the ability of amino acids to form zwitterions and understand the conditions in which this takes place

What are the success criteria?



Proteins are a diverse group of large and complex polymer molecules, made up of long chains of **amino acids**.

Amino acids contain both amine (NH_2) and carboxyl (COOH) functional groups.



glycine (gly)

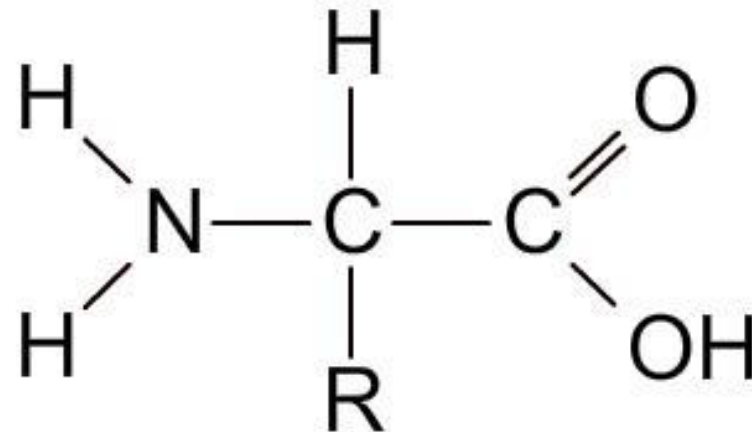
In **alpha amino acids**, these groups are attached to the same carbon atom.

The R group, also attached to the same carbon atom, can vary. There are 22 amino acids that are used to make proteins (**proteinogenic**). The simplest is glycine, where $\text{R} = \text{H}$.

What is a zwitterion?

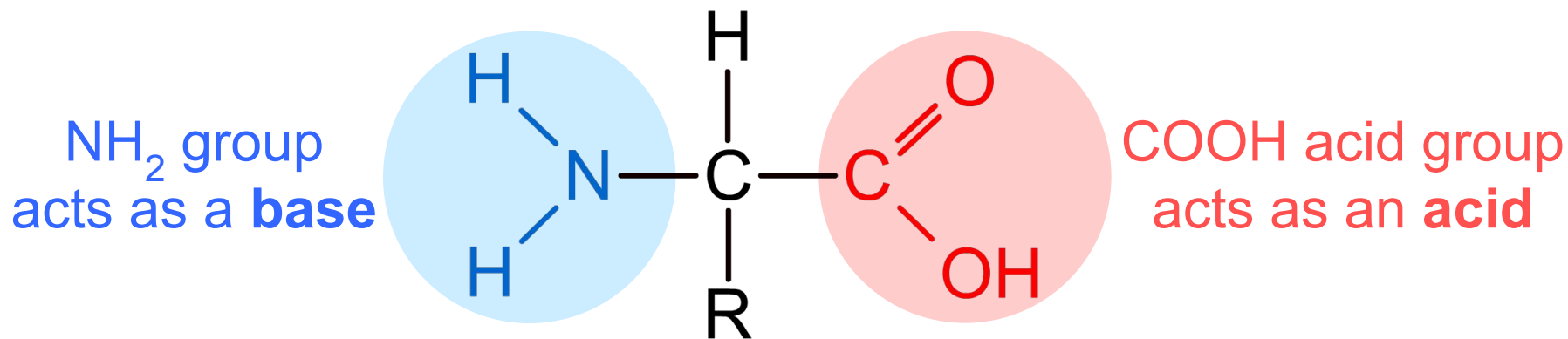
The physical properties of amino acids do not fit their molecular structure.

Press **play** to find out why this is.



Acid–base properties of amino acids

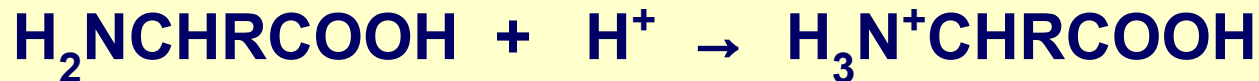
The presence of a carboxyl group and an amine group mean that amino acids have both acidic and basic properties.



When acting as an acid, the COOH group loses a H^+ ion:



When acting as a base, the NH_2 group gains a H^+ ion:

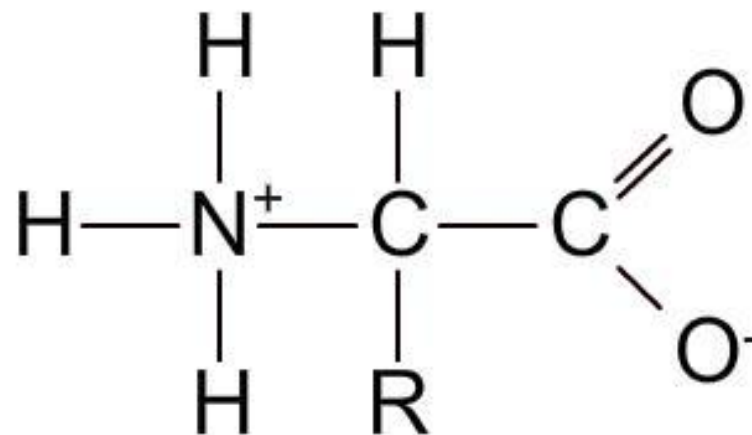


The effect of pH on amino acids

Amino acids are **amphoteric** because they have both acidic and basic groups. This means they react with acids and bases.

Press **start** to find out more.

start



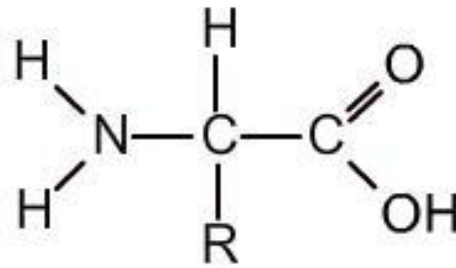
net charge: neutral (zwitterion)



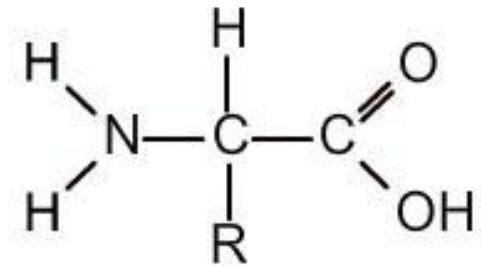
What is a peptide bond?

Two amino acids can join together to form a **dipeptide**, linked by a **peptide bond**.

Press **play** to find out more.



amino acid 1

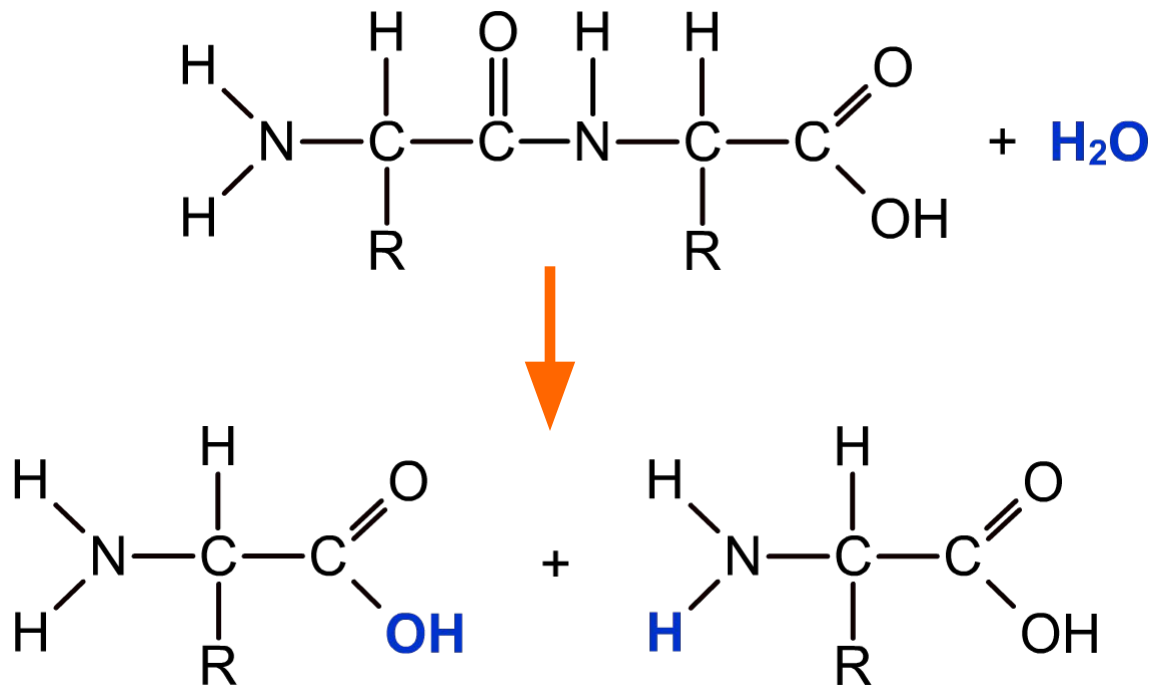


amino acid 2



Hydrolysis of peptide bonds

A peptide bond can be split by refluxing with hydrochloric acid. During hydrolysis, the water molecule adds across the peptide bond, forming a mixture of the two amino acids.



Peptide links can also be broken using a solution of alkali, such as aqueous sodium hydroxide at above 100°C.