Enzymes

Enzymes are globular proteins that speed up chemical reactions by acting as biological catalysts. They catalyse metabolic reaction without undergoing permanent changes themselves. They can be reused repeatedly and therefore effective in small amounts.

Enzymes have an active site, which has a specific shape. The active site is the part of the enzyme where the substrate molecules bind to. Enzymes are highly specific due to their tertiary structure.

In a chemical reaction, a certain amount of energy needs to be supplied to the chemicals before the reaction will start. This is called the activation energy. Enzymes lower the amount of activation energy that's needed, often making reactions happen at a lower temperature than they could without an enzyme. This speeds up the rate of reaction.

When a substrate fits into the enzyme's active site it forms an enzyme-substrate complex – it's this that lowers the activation energy.

- If two substrate molecules need to be joined, being attached to the enzyme holds them together, reducing any repulsion between the molecules so they can bond more easily
- If the enzyme is catalysing a breakdown reaction, fitting into the active site puts a strain on the bonds in the substrate, so the substrate molecule breaks up more easily

The 'lock and key' model

Enzymes only work with substrates that fit their active site. Early scientists studying the action of enzymes came up with the lock and key model, which is where the substrate fits into the enzyme in the same way that a key fits into a lock – the active site and the substrate have a complementary shape.

However, scientists soon realised that the lock and key model didn't give the full story as although the enzyme and substrate have to fit together, evidence shows that the complex changed shape slightly to complete the fit. This locks the substrate even more tightly to the enzyme. This is how the 'induced fit' model came about.

The induced fit model