



How Enzymes Speed Up Chemical Reactions

KS4 BIOLOGY

BIOCHEMISTRY

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What Are Enzymes?

Enzymes are special **proteins** made by living things that speed up **chemical reactions** in your body. Without enzymes, the processes that keep you alive — like digesting food, making energy, and growing — would happen far too slowly. Enzymes are like tiny helpers that work non-stop inside your cells to make these reactions happen faster.

Every second, thousands of chemical reactions happen inside your body. Your cells need to break down food, create new proteins, and release energy. **Enzymes** make all of this possible by working as **biological catalysts** — substances that speed up reactions without being used up themselves.

Think of it like a chef preparing ingredients. Without a sharp knife (the enzyme), chopping vegetables would take forever. With a sharp knife, the job gets done quickly and easily. The knife doesn't get smaller or worn out — it just helps the work happen faster.

How Do Enzymes Work?

Enzymes work by holding **substrate molecules** (the chemicals that need to react) in the perfect position. Each enzyme has a special shape, like a lock and key. Only specific molecules fit into an enzyme, just like only the right key opens a specific lock.

When a molecule fits into an enzyme, something remarkable happens. The enzyme weakens the bonds inside the molecule, making it easier for a reaction to occur. Once the reaction is complete, the enzyme releases the new product and is ready to help with another reaction. One enzyme can speed up thousands of reactions every second!

Think of it like a skateboard ramp. Without the ramp (enzyme), a skateboard struggles to go fast on flat ground. With the ramp, it zooms down easily. The ramp isn't used up — it helps lots of skaters move faster.

Why Are Enzymes Important?

Without enzymes, your body simply couldn't work. **Digestive enzymes** break down food so your body can absorb nutrients. **Metabolic enzymes** release energy from food. Other enzymes help build new cells and repair damaged ones.

Different enzymes work in different parts of your body. **Amylase** breaks down starch in your mouth. **Pepsin** breaks down protein in your stomach. Each enzyme is perfectly designed for its specific job.

Temperature and **pH levels** affect how well enzymes work. Most human enzymes work best at around **37°C** (normal body temperature). If your body gets too hot or too cold, enzymes work more slowly, which is why fever makes you feel awful.

Think of it like a recipe. Too much heat ruins the dish, but the right temperature makes it perfect. Enzymes are the same — they need just the right conditions to work their magic.