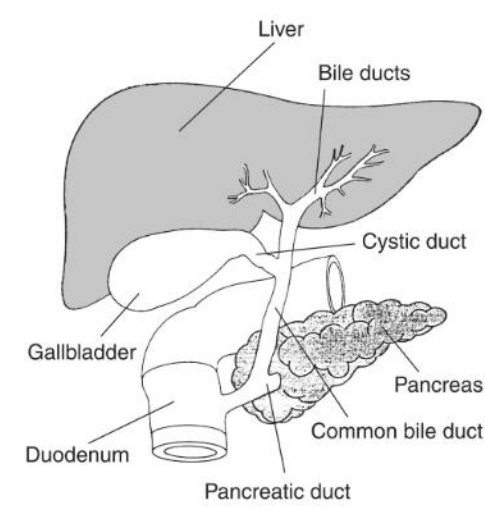


Glucose is needed in our body for respiration

Note



B5.1 Enzymes

Core

1 Describe enzymes as proteins that are involved in all metabolic reactions, where they function as biological catalysts

Supplement

3 Describe and explain enzyme action with reference to: the active site, enzyme-substrate complex, substrate and product

4 Describe and explain the specificity of enzymes in terms of the complementary shape and fit of the active site with the substrate

5 Explain the effect of changes in temperature on enzyme activity in terms of kinetic energy, shape and fit, frequency of effective collisions and denaturation

6 Explain the effect of changes in pH on enzyme activity in terms of shape and fit and denaturation

Definition

Enzymes are **proteins** involved in all metabolic reactions inside all cells, where they function as **biological catalysts**

without being used up

in our body, they last about 2-3 days

Enzymes work on them

The **Substrates**

These react together to form

the reactors

The **Products**

The part of the enzyme that binds to the substrate

Every enzyme's active site is 'specific'

A particular active site can only bond to one type of substrate

The Reaction

Phase 1: Finding key and lock

In a reaction, the substrate is randomly moving. As a result, it will collide and bind to an enzyme it is specific to

This results in the formation of an enzyme-substrate complex

Phase 2: Enzyme-substrate complex

The enzyme then catalyzes the reaction - the result is different based on the type of reaction:

Catabolic reaction

Breaking up a substrate

Anabolic reaction

Joining two substrates

Phase 3: Product(s)

The enzyme releases the products

To make space for more substrates

To continue catalyzing reactions

Lock & Key Mechanism

The shape of the active site is 'complementary' to its fitting substrates

The same way a key fits in a lock

An enzyme's shape is determined by the sequence of amino acids in its structure and the bonds that form between the atoms of those molecules

Why do enzymes speed up reactions?

Enzymes speed up reactions by lowering the **activation energy (E_a)** of a reaction. This is the energy needed to start a reaction.

Rate of enzyme-catalyzed reactions depends on

Temperature

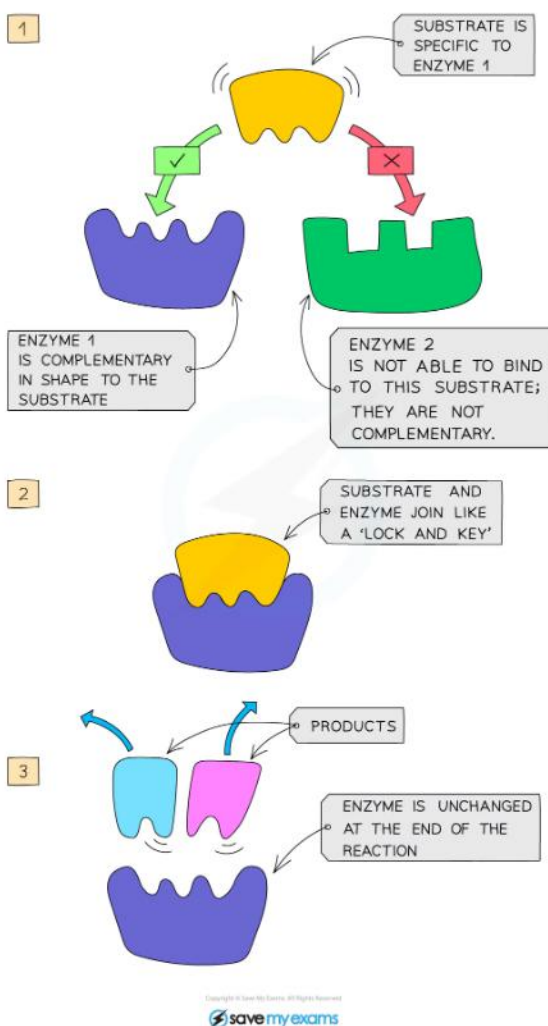
pH

Enzyme concentration

Substrate concentration

Surface area

Pressure



Enzymes in Cells

Some examples of reactions catalysed by enzymes

Digestion

Protein

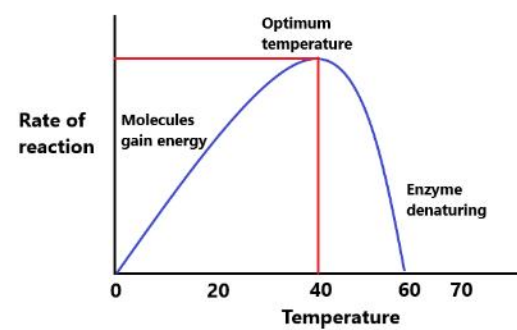
Fats & Oils

Breadmaking

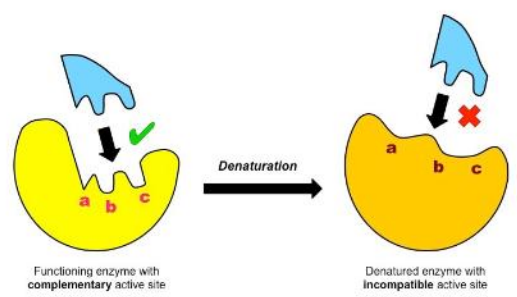
Baking

Fermentation

Examples of outside of cell processes



Enzymes work best at our body temperature (37°C). This is their **optimum**.

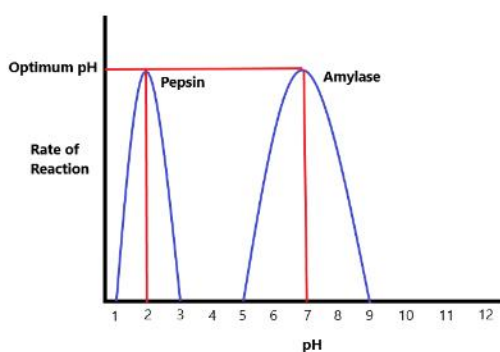


Because it becomes denatured

Because, when temperature is higher, particles move faster due to higher KE so the enzymes and substrates are more likely to bind

brownian motion

Generally: the lower the temperature (under optimum), the slower the enzyme works; the higher the temp (when above the optimum) the less the enzyme works



One exception: pepsin

Generally, enzyme's **optimum** pH is 7.

Effects

(Body) temperature

pH

This enzyme is present in our stomach, therefore functions best in our stomach's acidic conditions - pH2