# WJEC England Biology A-level

## SP CC 04 - Enzyme Activity

Flashcards

# What are the four factors that affect enzyme activity?

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1. Enzyme concentration
2. Substrate concentration
3. Temperature
4. pH

# How is a control set up in a practical measuring enzyme activity?

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Replace the enzyme solution with distilled water or boiled enzyme solution.

# Outline the practical procedure used to find the effect of substrate concentration on enzyme activity, using hydrogen peroxide and catalase.

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1. Grind a piece of potato cylinder with 5 $cm^3$ of distilled water to make a paste.
2. Transfer 10 $cm^3$ of hydrogen peroxide to a test tube.
3. Dip a filter paper disc into the enzyme solution, and place the disc into the hydrogen peroxide solution and measure the time that taken to float up to the surface from touching the bottom.
4. Remove the disc from the tube using forceps and discard.
5. Repeat steps 1-4 using at least 4 other concentrations of hydrogen peroxide.

State the word equation for the action of catalase on hydrogen peroxide.

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Hydrogen peroxide → Oxygen + Water

# How is the rate of reaction calculated from time?

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Rate of reaction = 1/time

# What is the effect of enzyme concentration on enzyme activity?

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As the concentration of enzyme increases, **successful collisions to form ES complexes** increase, so the rate of reaction **increases** to an optimum.

Beyond the optimum, the rate plateaus as **substrate concentration** becomes limiting.

# What is the effect of substrate concentration on enzyme activity?

# What is the effect of substrate concentration on enzyme activity?

Enzyme activity **increases** initially as substrate concentration increases, as **substrate concentration is limiting**, and higher concentration results in **more successful collisions** to form **ES complexes**.

Beyond a certain substrate concentration, enzyme activity **plateaus**, as all the enzyme active sites are saturated and **enzyme concentration is limiting**.

# How does phenolphthalein indicate the rate of enzyme activity (using milk and lipase)?

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As lipase digests lipids in milk into fatty acids (and glycerol), the pH of the solution decreases, causing a colour change from pink to colourless at the end point. The shorter the time, the faster the rate.

# How is the effect of temperature on lipase activity measured?

# How is the effect of temperature on lipase activity measured?

Prepare water baths with a range of temperatures. Place 1 $cm^3$ of lipase solution, 5 $cm^3$ of milk and 7$cm^3$ of sodium carbonate in a water bath.

Leave for 10 minutes.

Mix together. Start the stopwatch and measure the time taken for the pink colour to disappear. Repeat for at least 4 other temperatures.

# What is the effect of temperature on enzyme activity?

# What is the effect of temperature on enzyme activity?

Increasing temperature **increases** enzyme activity to an **optimum**. Enzyme and substrate molecules gain **kinetic energy** and move faster, so there are more **successful collisions to form ES complexes**.

Beyond the optimum temperature, enzyme activity **decreases** as the high temperature **disrupts the tertiary structure** of enzymes and **denatures** them.

# How is the effect of pH on enzyme activity investigated?

# How is the effect of pH on enzyme activity investigated?

Add a fixed volumes of buffer solutions with a range of pH values to 1 $cm^3$ of trypsin and 2 $cm^3$ of milk, both of a fixed concentration.

Record the absorbance immediately and every 15 seconds for 5 minutes.

# What is the effect of pH on enzyme activity?

# What is the effect of pH on enzyme activity?

Enzyme activity is **highest** at the **optimum pH**.

Above or below the optimum pH, enzyme activity decreases as the unsuitable pH **disrupts its tertiary structure** and changes the shape of its **active site**, causing **partial denaturation**.

**Complete denaturation** may occur at extreme pH values.

State a hazard and safety precaution involved in this practical.

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Students may have allergic reactions to enzymes, so avoid contact with skin and eyes, wear eye protection.