

# OCR (B) Biology GCSE

Topic B3.1: What happens during  
photosynthesis?

Flashcards



# What are enzymes?



# What are enzymes?

Biological catalysts that the rate of a chemical reaction go faster without being permanently altered themselves.



# What is the active site of an enzyme?



What is the active site of an enzyme?

The region of an enzyme in which a substrate molecule binds and the reaction takes place.



Why are enzymes described as having a  
'high specificity' for their substrate?



Why are enzymes described as having a 'high specificity' for their substrate?

Only substrates with a specific, complementary shape can fit into an enzyme's active site.



# Describe the 'lock and key' model



## Describe the 'lock and key' model

1. The active site of the enzyme and the substrate come into contact
2. Substrate binds, enzyme-substrate complex forms
3. Substrate converted to products
4. Products released from the active site. The active site is now free to bind to another substrate.



What factors affect the rate of an enzyme-controlled reaction?



# What factors affect the rate of an enzyme-controlled reaction?

- Temperature
- pH
- Substrate concentration



Explain how increasing temperature initially affects the rate of an enzyme-controlled reaction



## Explain how increasing temperature initially affects the rate of an enzyme controlled reaction

- As temperature increases molecules have more KE
- Movement of molecules increases
- Probability of a successful collision increases
- More enzyme-substrate complexes form
- Rate of reaction increases



Explain how increasing temperature above the optimum affects the rate of an enzyme-controlled reaction



# Explain how increasing temperature above the optimum affects the rate of an enzyme controlled reaction

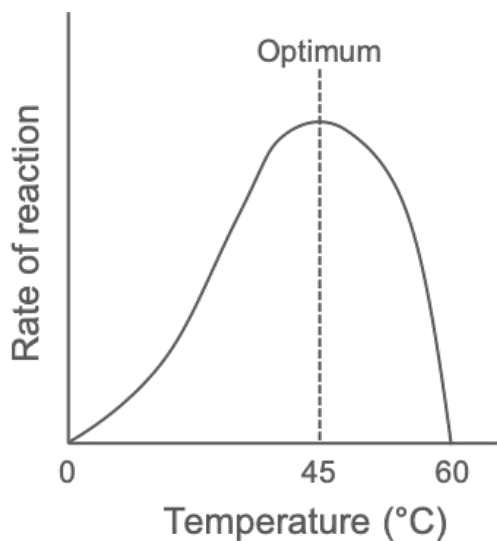
- Temperature increases above the optimum
- Increased vibrations break bonds in enzyme's structure
- Active site changes shape, enzyme is denatured
- No more enzyme-substrate complexes can form
- Rate of reaction decreases



Draw a graph to show the effect of increasing temperature on the rate of an enzyme-catalysed reaction.



Draw a graph to show the effect of increasing temperature on the rate of an enzyme-catalysed reaction.



Explain how pH affects the rate of an enzyme-controlled reaction



## Explain how pH affects the rate of an enzyme controlled reaction

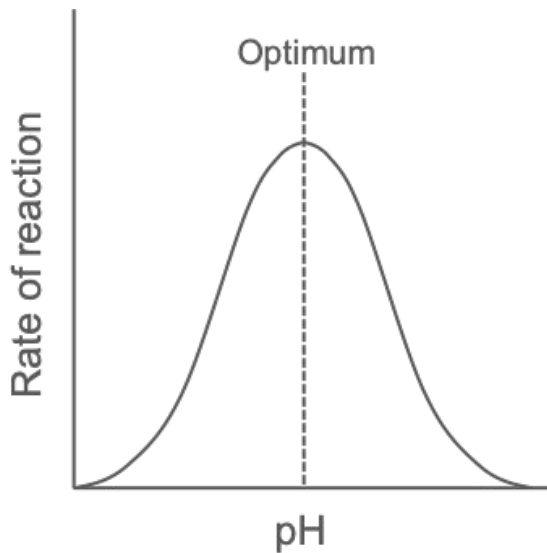
- Enzymes have an optimum pH
- pH shifts from the optimum
- Bonds in the enzyme's structure are altered
- Active site changes shape, enzyme is denatured
- Rate of reaction decreases



Draw a graph to show the effect of increasing pH on the rate of an enzyme-catalysed reaction



Draw a graph to show the effect of increasing pH on the rate of an enzyme-catalysed reaction



Explain how substrate concentration affects the rate of an enzyme-controlled reaction



# Explain how substrate-concentration affects the rate of an enzyme-controlled reaction

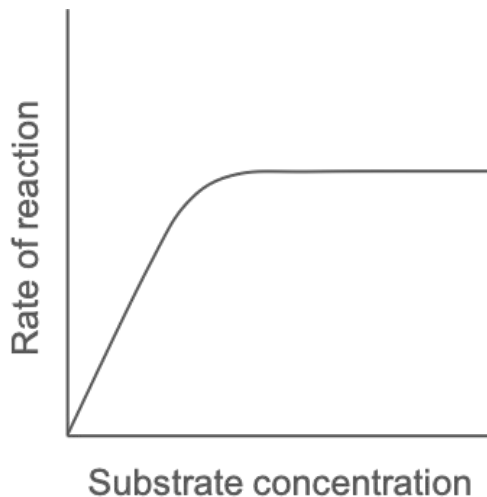
- Substrate concentration increases
- Number of substrate molecules in the same volume increases
- Probability of a successful collision increases
- More enzyme-substrate complexes form
- Rate of reaction increases
- Once all active sites become full, the rate of reaction plateaus



Draw a graph to show the effect of increasing substrate concentration on the rate of an enzyme-catalysed reaction



Draw a graph to show the effect of increasing substrate concentration on the rate of an enzyme-catalysed reaction



# What is photosynthesis?



# What is photosynthesis?

A chemical reaction that takes place inside photosynthetic organisms (e.g. plants, algae) converting light energy into chemical energy



Write the word equation for  
photosynthesis



Write the word equation for photosynthesis

carbon dioxide + water  $\rightarrow$  glucose + oxygen



Write the symbol equation for  
photosynthesis



Write the symbol equation for photosynthesis



# Why is photosynthesis important?



# Why is photosynthesis important?

Photosynthesis produces glucose which has a wide range of uses:

- Used in respiration to release energy
- Converted to starch and stored - starch can be broken down to glucose when the plant requires energy
- Used to make a wide range of organic molecules such as lipids, proteins and other sugars which are used for growth



# Where does photosynthesis take place?



Where does photosynthesis take place?

Within chloroplasts



What type of reaction is photosynthesis?



What type of reaction is photosynthesis?

An endothermic reaction that takes in energy (in the form of light)



# What is chlorophyll?



# What is chlorophyll?

A pigment found in chloroplasts that absorbs light



Describe the two main stages of  
photosynthesis



# Describe the two main stages of photosynthesis

1. Chlorophyll absorbs light energy which is used to split water into oxygen gas (waste product) and hydrogen ions
2. Carbon dioxide combines with hydrogen ions to form glucose



What does the first stage of photosynthesis require?



What does the first stage of photosynthesis require?

Light energy

Water, H<sub>2</sub>O



What are the products of the first stage of photosynthesis?



What are the products of the first stage of photosynthesis?

Oxygen gas,  $O_2$

( $O_2$  is a waste product and is released into the atmosphere)

Hydrogen ions,  $H^+$



What does the second stage of photosynthesis require?



What does the second stage of photosynthesis require?

Carbon dioxide gas,  $\text{CO}_2$

Hydrogen ions,  $\text{H}^+$



What is produced in the second stage of photosynthesis?



What is produced in the second stage of photosynthesis?

Glucose,  $C_6H_{12}O_6$



What factors affect the rate of photosynthesis?



# What factors affect the rate of photosynthesis?

- Temperature
- Light intensity
- Carbon dioxide concentration



What is a limiting factor? (higher)



What is a limiting factor? (**higher**)

A variable that limits the rate of a particular reaction



Explain how temperature affects the rate of photosynthesis



# Explain how temperature affects the rate of photosynthesis

- Higher temperatures provide more KE for enzymes involved in photosynthesis so the rate increases as temperature rises
- The optimum temperature is usually  $25^{\circ}\text{C}$
- If the temperature becomes too high (around  $45^{\circ}\text{C}$ ) enzymes become denatured and the rate of photosynthesis decreases



Explain how light intensity affects the rate of photosynthesis



Explain how light intensity affects the rate of photosynthesis

As light intensity increases, the rate of photosynthesis increases until another factor (e.g. temperature) becomes limiting.



How can the effect of light intensity on the rate of photosynthesis be measured in the lab? (2) (higher)



How can the effect of light intensity on the rate of photosynthesis be measured in the lab? (2) (higher)

- Using a light meter
- Using the inverse square law where:

$$\text{light intensity} \propto \frac{1}{\text{distance}^2}$$



Why does the rate of photosynthesis decrease as the distance from a light source increases? (**higher**)



Why does the rate of photosynthesis decrease as the distance from a light source increases? (**higher**)

Light intensity is inversely proportional to the square of the distance from the light source.

Thus, as the distance increases, light intensity decreases and the rate of photosynthesis decreases.



Explain how carbon dioxide concentration affects the rate of photosynthesis



Explain how carbon dioxide concentration affects the rate of photosynthesis

As carbon dioxide concentration increases, the rate of photosynthesis increases until another factor (e.g. light intensity) becomes limiting.

