AQA Biology GCSE

4.1 - Photosynthesis

Flashcards

What is photosynthesis?

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The process by which plants synthesise glucose using light energy from the Sun. Light energy is converted into chemical energy.

Where does photosynthesis take place?

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Within chloroplasts in leaf palisade cells.They contain chlorophyll, a pigment which absorbs light energy.

State the equations for photosynthesis (word and symbol)

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Word: carbon dioxide + water $\xrightarrow{\text{light}}$ glucose + oxygen

Symbol: $6CO_2 + 6H_2O \xrightarrow{\text{light}} C_6H_{12}O_6 + 6O_2$

Is photosynthesis an endothermic or exothermic reaction, and why?

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Endothermic - energy is transferred from the environment to chloroplasts by light.

How can you show that a plant gives off oxygen during photosynthesis?

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Using a water plant (eg. Elodea), collect gas bubbles produced during photosynthesis. The gas will relight a glowing splint as it contains oxygen.

Give examples of leaf adaptations which maximise the rate of photosynthesis

Give examples of leaf adaptations which maximise the rate of photosynthesis

- Broad leaves - maximise surface area.
- Thin leaves - short diffusion distance.
- Chlorophyll present - trap light energy.
- Veins - transport water to leaves via xylem, remove photosynthesis products via phloem.
- Air spaces - allow CO_2 to enter and O_2 to leave.
- Guard cells - control opening of stomata for gaseous exchange and prevent water loss.

What are the four main factors that affect the rate of photosynthesis?

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- Temperature
- Light intensity
- Carbon dioxide concentration
- Amount of chlorophyll

How does temperature affect the rate of photosynthesis?

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Increasing the temperature increases the rate of photosynthesis as the kinetic energy of particles is increased. The rate decreases past a certain temperature as enzymes become denatured.

How does light intensity affect the rate of photosynthesis?

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Increasing the light intensity increases the rate of photosynthesis until another factor becomes limiting.

How does carbon dioxide concentration affect the rate of photosynthesis?

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Increasing the carbon dioxide concentration increases the rate of photosynthesis (until another factor becomes limiting) as CO_2 is required to make glucose.

How does the amount of chlorophyll affect the rate of photosynthesis?

How does the amount of chlorophyll affect the rate of photosynthesis?

Decreasing the amount of chlorophyll (eg. due to a lack of magnesium) decreases the rate of photosynthesis as chlorophyll is required to absorb light energy.

What is a limiting factor?

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An environmental factor which can restrict the rate of photosynthesis eg. light intensity.

Explain how you can calculate the rate of photosynthesis by measuring oxygen production

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- Set up bubble potometer apparatus (pondweed in a sealed tube of water, attached to a capillary tube and a gas syringe).
- Oxygen gas produced causes the bubble in the capillary tube to move. The distance moved by the bubble is used to calculate the volume of oxygen produced.

How can farmers use their knowledge of limiting factors to increase their profits? (higher)

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They can control temperature, light intensity and CO_2 concentration to achieve the fastest possible rate of photosynthesis, leading to a greater yield.

State the law which describes the relationship between the distance of a light source from a plant and light intensity (higher)

State the law which describes the relationship between the distance of a light source from a plant and light intensity (higher)

Inverse square law - light intensity $\propto$ 1 / distance^2

State 5 uses of the glucose produced during photosynthesis

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- Respiration
- Starch for storage
- Cellulose for strength
- Amino acid and protein synthesis (combined with nitrates)
- Lipids for energy storage in seeds