

Edexcel Biology IGCSE

2.23: Photosynthesis

Practical notes



Photosynthesis

Aim

Investigate photosynthesis, showing the evolution of oxygen from a water plant, the production of starch and the requirements of A. light, B. carbon dioxide and C. chlorophyll.

Equipment

- a boiling tube
- freshly cut 10 cm piece of pondweed
- a light source
- a ruler
- a test tube rack
- a stopwatch
- a range of concentrations of dilute solutions of sodium hydrogen carbonate (including 0.2%)
- a glass rod
- White tile
- Iodine solution (dilute)

Method for A

1. Place a test tube rack containing a boiling tube 10 cm away from the light source, measured using the ruler.
2. Fill the boiling tube with a fixed volume of 0.2% sodium hydrogen carbonate solution.
3. Place the cut pondweed into the boiling tube with the cut end at the top. Gently push the pondweed down with the glass rod.
4. Leave the boiling tube to rest for 5 minutes.
5. Start the stopwatch and count the number of bubbles produced in one minute.
6. For each light intensity/distance, repeat the count twice more and take a mean.
7. Record in a table as seen below.
8. Repeat steps 1-7 for 3 more distances (20, 30, 40 cm) of the boiling tube from the light source.
9. Plot a graph of the rate of photosynthesis (given by the no. of bubbles) against light intensity (using the inverse square law, light intensity $\propto 1/\text{distance}^2$ between pondweed and light source).

Controlled variables

- Species of pondweed
- Temperature
- Volume and concentration of hydrogen carbonate solution
- Time for counting bubbles



Method for B

1. Place a test tube rack containing a boiling tube 10 cm away from the light source, measured using the ruler.
2. Fill the boiling tube with a fixed volume of 0.2% sodium hydrogen carbonate solution.
3. Place the cut pondweed into the boiling tube with the cut end at the top. Gently push the pondweed down with the glass rod.
4. Leave the boiling tube to rest for 5 minutes.
5. Start the stopwatch and count the number of bubbles produced in one minute.
6. For each sodium hydrogen carbonate concentration, repeat the count twice more and take a mean.
7. Record in a table as seen below.
8. Repeat steps 1-7 for 3 more concentrations of sodium hydrogencarbonate solution.
9. Plot a graph of the rate of photosynthesis (given by the no. of bubbles) against sodium hydrogen carbonate concentration.

Controlled variables

- Species of pondweed
- Temperature
- Volume of hydrogen carbonate solution
- Light intensity
- Time for counting bubbles

| Distance between pondweed and light source in cm / Sodium hydrogen carbonate concentration / Presence of chlorophyll | Number of bubbles per minute | | | |
|--|------------------------------|---|---|------|
| | 1 | 2 | 3 | Mean |
| | | | | |



Method for C

1. Use a variegated leaf (with green parts and white parts).
2. Immerse the leaf in boiling water for 30 seconds.
3. Carefully spread onto a white tile so the colour change can be accurately seen.
4. Use a dropping pipette to add iodine solution to the leaf.
5. The green parts of the leaf should turn blue-black due to the presence of starch the white areas should not.

Potential Hazards

Be careful with boiling water and iodine solution. Wear eye protection.

There is a potential allergy risk from the pondweed.

Lamp may get hot.

Be careful to keep water away from electrical power outlets and wiring.

