Light and net leaf gas exchange

Teacher / technician

YEAR 10 / LESSON 35 / BIOLOGY ONLY

Staff preparation and answer guidance. Keep separate from student sheets. Net gas-exchange indicator, not a direct measure of gross photosynthesis or oxygen production.

Coverage and delivery

Biology only: 2.45B. Core practical: light and net gas exchange.

Allow about 70 minutes. Follow the student sequence and use the answers to check reasoning.

Requisition • class of 30, working in 15 pairs

Item	Per pair / setup	Class total
Booklets / eye protection	2 of each per pair	30 of each
Identical clear vessels / supports	4 per pair	60 vessels and 30 leaf supports
Hydrogencarbonate indicator	20 cm^3 per pair	350 cm^3 including spare
Matched leaf pieces	2 per pair	30 plus spares
Foil / timers / thermometers	2 dark covers and 1 timer per pair	30 covers; 15 timers; shared thermometers
LED light stations	temperature-controlled shared positions	3–5 stations

Immediate safety

Wear eye protection, avoid indicator or plant sap contact, and do not taste materials. Keep water away from electrical equipment. Use fresh plant material and a short observation period; do not keep sealed biological setups for prolonged incubation.

Preparation and delivery

Read alongside the student method

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1. Air-equilibrate indicator according to its supplier's instructions and confirm the starting colour. Pilot a healthy leaf species at the actual light intensity and 30–60 minute interval.

2. Use matched fresh leaf areas, equal vessel/headspace volumes and supports keeping leaves out of the indicator. Provide both light and dark no-leaf controls.

3. Keep temperature comparable, using LEDs and avoiding direct sunlight. Do not breathe into the vessels or use contaminated glassware; these can alter carbon dioxide before the trial.

Close of lesson

- Return indicator and plant material through the school's designated waste routes.
- Rinse vessels, wipe surfaces and wash hands.

Check before teaching

Check the cards, reference data and quantities against this requisition. Keep the staff answer guide separate until the checking stage. Supplied numerical practice datasets are labelled examples; they are not class measurements.

Answers and teaching notes

Expected explanations • do not give as experimental observations

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- They reveal background changes due to light, temperature, handling or the indicator without leaf metabolism.
- Both affect the amount of exchange relative to the gas/indicator system being observed.
- A net increase in carbon dioxide relative to the control, consistent with respiration.
- Net carbon dioxide uptake can exceed respiratory release under sufficient light.
- No. Opposing processes may balance, or the change may be below the method’s sensitivity.
- Temperature affects metabolism and gas/indicator behaviour and would confound the light comparison.

References and provenance

Pearson Biology specification

Practical Biology: organisms and carbon dioxide indicator

Prepared 22 November 2026. Original wording, tables and questions. Sources inform the concepts and technique; the lesson scope and classroom quantities are explicitly described here. No laboratory trial or final school risk approval is claimed.