Breathing, exercise and alveolar exchange

Teacher / technician

YEAR 10 / LESSON 56 / BIOLOGY + SCIENCE (DOUBLE AWARD)

Staff preparation and answer guidance. Keep separate from student sheets. Original learning tasks; no supplied numerical example represents class measurements.

Coverage and delivery

Shared Biology / Double Award: 2.48 and 2.50. Alveoli and breathing investigation.

Allow about 60 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
Recording sheets	1 per learner	30
Timers	1 per pair	15
Appropriate CO_2 sensor and display	teacher demonstration	1, checked for range/response
Clear activity area	gentle marching or observer role	supervised class space

Immediate safety

Participation is voluntary. Follow existing school health plans and offer observer/data roles without requiring public medical disclosure. No vigorous exercise, breath holding or deliberate rapid breathing. Stop if dizzy, breathless beyond comfort, wheezy or unwell and tell the teacher. Never share mouthpieces or breathe into a sealed container.

Preparation and delivery

Read alongside the student method

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1. Check the school's exercise participation arrangements in advance and provide equal-status observer/data roles. Use gentle one-minute marching only, with clear floor space and a supervised comfortable pace.

2. Use a CO_2 sensor with suitable range and response for this demonstration; check manufacturer instructions and room-air baseline. A low-range classroom air-quality monitor may saturate and must not be used to claim exact exhaled concentration.

3. A willing adult demonstrator exhales normally past the intake without touching it. Follow manufacturer hygiene guidance, ventilate between observations and wait for baseline recovery. Do not ask pupils to share breathing equipment.

4. Provide anonymised actual or explicitly labelled practice data when needed. Do not rank pupils' fitness or retain identifiable health-related records.

Close of lesson

- Restore seating, wash hands as appropriate and clean the sensor according to its manufacturer.
- Keep only anonymised class summaries if comparing results.

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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- Inhalation and exhalation.
- It avoids multiplication of a short counting interval and labels the averaging period clearly.
- No; breath depth also matters.
- Respiring muscles use more oxygen and produce more carbon dioxide.
- Large total area and a thin diffusion barrier; blood flow and ventilation maintain gradients.
- The breath mixes with room air and the instrument has response-time and range limits.

References and provenance

Pearson Biology specification

Pearson: core practical guide

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.