Stomata and leaf gas exchange

Student activity • observation and reasoning

YEAR 10 / LESSON 34 / BIOLOGY ONLY

The question

What can a prepared epidermal view show about gas exchange?

Use the supplied examples, record your reasoning and correct it using evidence.

Equipment

- Microscope and permanent prepared epidermal slides
- Booklet, pencil and ruler; calibrated field-area information if density is required

Handle slides carefully and report cracks. Keep objectives clear of the slide and use fine focus at higher power. No nail varnish, solvents or fresh human material is used.

Course coverage: Biology only: 2.42B–2.43B. Leaf structure and stomata.

Plan, model or apparatus sketch

Draw and label the apparatus or biological model; identify one limitation.

Method and reasoning

Read the whole sequence before starting

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1. Focus a permanent prepared leaf-epidermis slide at low power, then centre a suitable region and use higher power with fine focus.

2. Draw a clearly resolved stoma and its guard cells; record magnification and slide identity. Label the pore separately from the cells.

3. Count stomata in three non-overlapping fields chosen by a consistent method. Record field area only if the microscope scale has been calibrated.

4. If comparing upper and lower surfaces, use matched slides from the same species and the same magnification and field area. Do not assume all species have the same distribution.

5. Explain how open pores allow carbon dioxide and oxygen diffusion but also allow water-vapour loss.

6. State the limits: a preserved slide is a snapshot and cannot demonstrate dynamic opening, closing or current gas flux.

Cleanup

• Return prepared epidermal slides to labelled boxes. Lower the microscope stage, switch off and cover the instrument as directed.

• Keep the labelled drawings and field-count record; report damaged slides to the teacher.

Record your evidence

Blank spaces are for your own work

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Reference and task data

A stoma is a pore bordered by guard cells. Guard-cell changes regulate pore opening; gas movement through an open pore follows gradients. Counts per field can be compared only with consistent field area. Density per mm² requires a calibrated area, not just a magnification label.

Example / trial	Observation / evidence	Explanation / limit
Labelled stoma and guard cells		
Three field counts / field area		
Comparison / limitation		

Show your calculations, labelled model or correction here.

Explain and evaluate

Use evidence and show calculation steps where relevant

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1. Distinguish a stoma from a guard cell.

2. Why use more than one field?

3. Why must field area be matched?

4. What trade-off occurs when stomata open?

5. Can a permanent slide establish current gas-exchange rate?

6. How is density calculated if field area is known?