

Gas exchange in flowering plants: practice questions

6 questions • 20 marks • mark scheme at the back

For Pearson Edexcel International GCSE Biology 4BI1 and Science (Double Award) 4SD0. **Biology only** is not in the Double Award and is only examined on Paper 2.

Name

Total / 20

1 **Biology only** [1 mark]

Which cells control the opening and closing of the stomata?

- A. ☐ Palisade cells
- B. ☐ Guard cells
- C. ☐ Xylem cells
- D. ☐ Root hair cells

2 **Biology only** [2 marks]

Carbon dioxide moves from the air into the cells of a leaf during the day. Explain how this happens.

3 Carbon dioxide and oxygen are waste products of metabolism in a leaf. (a) Name the process in a leaf that produces carbon dioxide as a waste product. (b) Name the process that produces oxygen as a waste product. (c) State how these gases leave the leaf. [3 marks]

4

Biology only

[4 marks]

The table shows the net exchange of carbon dioxide by a leaf at different light intensities. A negative value means carbon dioxide is released and a positive value means carbon dioxide is taken in. (a) Explain the value at light intensity 0. (b) Explain why the value is 0 at light intensity 4. (c) Explain the value at light intensity 8.

Net carbon dioxide exchange by a leaf (arbitrary units)

Light intensity	Net carbon dioxide exchange
0	-4
2	-2
4	0
6	+3
8	+5

5

Biology only

[4 marks]

A student puts the same size of leaf into three boiling tubes containing hydrogen-carbonate indicator. Tube A is in bright light, tube B is wrapped in foil and tube C has no leaf and is in bright light. Hydrogen-carbonate indicator is red/orange in normal air, yellow with more carbon dioxide and purple with less. (a) State the colour of the indicator in tube A and tube B after two hours. (b) Explain the result in tube B. (c) State the purpose of tube C.

Biology only

Describe and explain the exchange of carbon dioxide and oxygen between a leaf and the air in bright light, at the compensation point and in darkness.

[illegible]

Mark scheme

One mark for each point unless a maximum is given. Words in brackets are not needed for the mark.

1. [1] Biology only

B B (1)

2. [2] Biology only

- by diffusion (1)
- the concentration of carbon dioxide is higher in the air than in the leaf cells (which use it in photosynthesis) / down a concentration gradient (1)

3. [3]

- (a) respiration (1)
- (b) photosynthesis (1)
- (c) (by diffusion) through the stomata (1) allow through stomata without diffusion

4. [4] Biology only

- (a) no light so no photosynthesis (1)
- only respiration happens so carbon dioxide is released (1)
- (b) rate of photosynthesis equals rate of respiration / carbon dioxide made by respiration is used in photosynthesis (1)
- (c) rate of photosynthesis is faster than respiration so there is a net uptake of carbon dioxide (1)

5. [4] Biology only

- (a) A purple (1)
- B yellow (1)
- (b) no light so no photosynthesis, but the leaf still respire and releases carbon dioxide (1)
- (c) control / to show the colour change is caused by the leaf (1)

6. [6] Biology only

Level 3 5-6	Describes and explains the net exchange of both gases in all three conditions, linking each to the relative rates of respiration and photosynthesis.
Level 2 3-4	Describes the net exchange in at least two conditions with some explanation, or explains one condition fully for both gases.
Level 1 1-2	Gives simple statements about one or two gases or conditions, with little explanation.

Indicative content

- respiration happens all the time and uses oxygen and releases carbon dioxide
- photosynthesis happens only in light and uses carbon dioxide and releases oxygen
- bright light: photosynthesis faster than respiration, so net uptake of carbon dioxide and net release of oxygen
- compensation point: photosynthesis equals respiration, so no net exchange of either gas
- darkness: only respiration, so net release of carbon dioxide and net uptake of oxygen
- gases diffuse through the stomata