

Limiting Factors

GCSE Biology · Written to the shared content for AQA, Edexcel and OCR

Name _____ Class _____ Date _____

1. Worked example

Describe and explain the shape of a graph of photosynthesis rate against light intensity that rises and then levels off. (3 marks)

Step 1 · Rising part

As light intensity increases, the rate increases: light is the limiting factor.

Step 2 · Levelling off

At higher light intensities the rate stays the same.

Step 3 · Explain plateau

Another factor, such as CO_2 concentration or temperature, is now limiting the rate.

Answer: Light limits at first; then another factor limits

Check: Name a specific other factor.

2. Now try one with the steps

A lamp is moved from 10 cm to 20 cm from a plant. By what factor does light intensity change? (2 marks)

Step 1 · Inverse square law

Step 2 · Distance doubled

Answer:

3. Practice

Show your working. The marks tell you how much is expected.

1. Name four factors that can limit the rate of photosynthesis. [4]

2. What is a limiting factor? [1]

3. Explain why the rate of photosynthesis falls at very high temperatures. [2]
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4. Suggest how a greenhouse owner could increase CO₂ concentration. [1]
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5. Explain why plants with less chlorophyll photosynthesise more slowly. [2]
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6. On a sunny winter day, which factor is most likely to limit photosynthesis? [1]
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7. In a closed greenhouse at midday in summer, which factor is likely to be limiting? [1]
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8. Suggest why commercial growers use artificial lighting at night. [2]
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9. If a lamp is moved three times further away, by what factor does light intensity change? Give the answer fraction. [1]
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10. Light intensity is 64 units at 10 cm. Calculate the intensity at 40 cm. [2]
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11. A lamp gives 100 units at 10 cm. Calculate the intensity at 20 cm. [1]
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12. Explain why increasing CO₂ concentration increases the rate only up to a point. [2]
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13. Extra lighting costs £80 a week and increases crop value by £95 a week. Calculate the weekly profit or loss. [1]
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14. Explain why a graph of rate against light intensity at a high CO₂ concentration levels off at a higher rate than one at low CO₂. [2]

4. Before you hand it in

"Doubling the distance halves the light intensity."

Inverse square law: intensity $\propto 1/d^2$. Doubling distance gives 1/4 the intensity.

"Adding more of any factor always speeds up photosynthesis."

Increasing a factor that is not limiting has no effect on the rate.

"Plants photosynthesise faster the hotter it gets."

Above the optimum, enzymes denature and the rate falls.