

Plant nutrition practice questions

7 questions • 26 marks • mark scheme at the back

For Cambridge IGCSE Combined Science 0653. **Supplement** is Extended content, only examined on Papers 2 and 4.

Name

Total / 26

Photosynthesis **Spec B6.1**

1 **Supplement** [4 marks]

(a) Complete the word equation for photosynthesis. [2] carbon dioxide + → + (b) State the name of the green pigment that is found in chloroplasts. [1] (c) State what this pigment does in photosynthesis. [1]

2 [5 marks]

A student investigates whether chlorophyll is needed for photosynthesis. She uses a destarched plant with variegated leaves (green and white). The plant is placed in bright light for several hours. A leaf is then tested for starch. (a) Explain why the plant was destarched. [1] (b) Describe how the leaf is prepared before iodine solution is added. [2] (c) State the result expected for the white parts of the leaf and explain it. [2]

3

Supplement

[5 marks]

A student counts the bubbles of oxygen released by pondweed at different water temperatures. The results are shown in the table. (a) Describe the effect of temperature on the rate of photosynthesis. [2] (b) Explain the result at 45 °C. [2] (c) State one variable the student must keep constant. [1]

Bubbles of oxygen released per minute at different temperatures	
temperature / °C	bubbles per minute
15	6
25	18
35	30
45	9

[illegible]

4

Supplement

[4 marks]

Hydrogencarbonate indicator is red in air. Three tubes are set up and left for three hours. Tube A: pondweed in bright light. Tube B: pondweed wrapped in foil. Tube C: no pondweed, in bright light. (a) State the final colour of the indicator in tube A and in tube B. [2] (b) Explain the colour in tube B. [1] (c) State the purpose of tube C. [1]

[illegible]

5

Supplement

[6 marks]

(a) State the balanced chemical equation for photosynthesis. [2] The table shows the rate of photosynthesis at two carbon dioxide concentrations. (b) State the limiting factor between 0 and 40 arbitrary units of light intensity, and explain how you know. [2] (c) At 80 arbitrary units of light intensity the rate at 0.04% carbon dioxide is 24, but at 0.4% carbon dioxide it is 40. Explain this difference. [2]

Rate of photosynthesis at two carbon dioxide concentrations		
light intensity / arbitrary units	rate at 0.04% carbon dioxide / arbitrary units	rate at 0.4% carbon dioxide / arbitrary units
0	0	0
20	10	10
40	20	20
60	24	30
80	24	40

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Leaf structure Spec B6.2

Spec B6.2

6

Which part of a leaf contains the most chloroplasts?

[1 mark]

- A. ☐ Upper epidermis
B. ☐ Palisade mesophyll
C. ☐ Spongy mesophyll
D. ☐ Guard cells

7

What is the main function of the guard cells?

[1 mark]

- A. ☐ to absorb light
- B. ☐ to open and close the stomata
- C. ☐ to carry water to the leaf
- D. ☐ to store starch

Mark scheme

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

1. [4] Supplement

- (a) water (1)
- (a) glucose and oxygen, either order (1) reject sugar
- (b) chlorophyll (1)
- (c) transfers energy from light into energy in chemicals / carbohydrates (1) allow absorbs light (energy); reject makes energy

2. [5]

- (a) to remove (existing) starch so that any starch found was made during the experiment (1)
- (b) boil in water to kill the leaf / stop reactions / soften it (1) allow to let iodine in
- (b) heat in ethanol (in a water bath) to remove chlorophyll / decolourise (1)
- (c) stays orange-brown / does not turn blue-black (1)
- (c) no chlorophyll so no photosynthesis / no starch made (1)

3. [5] Supplement

- (a) rate increases up to 35 °C then falls / highest at 35 °C (1)
- (a) quotes data, for example 6 at 15 °C and 30 at 35 °C (1)
- (b) enzymes (for photosynthesis) (1)
- (b) are denatured at the high temperature / active site changes shape (1) reject killed
- (c) any one from: light intensity / carbon dioxide concentration / same piece of pondweed / time (1)

4. [4] Supplement

- (a) A: purple (1)
- (a) B: yellow (1)
- (b) plant respire / no photosynthesis in the dark, so carbon dioxide is released / concentration rises (1)
- (c) control / to show the colour change is caused by the plant (1)

5. [6] Supplement

- (a) correct formulae: $\text{CO}_2 + \text{H}_2\text{O} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + \text{O}_2$ (1)
- (a) correctly balanced: $6\text{CO}_2 + 6\text{H}_2\text{O} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$ (1)
- (b) light intensity (1)
- (b) rate increases as light intensity increases / rate is the same at both carbon dioxide concentrations (1)
- (c) at 0.04% carbon dioxide is the limiting factor / in short supply (so more light has no effect) (1)
- (c) at 0.4% more carbon dioxide (raw material) is available, so the rate can keep increasing with light (1)

6. [1]

B B (1)

7. [1]

B B (1)