

Plant nutrition practice questions

12 questions • 45 marks • mark scheme at the back

For Cambridge IGCSE Biology 0610 (and 0970, which has the same content). **Supplement** is Extended content, only examined on Papers 2 and 4.

Name

Total / 45

Photosynthesis **Spec 6.1**

1 Which row shows the correct use of a mineral ion in a plant? [1 mark]

- A. ☐ Nitrate ions: making chlorophyll
- B. ☐ Magnesium ions: making amino acids
- C. ☐ Nitrate ions: making amino acids
- D. ☐ Magnesium ions: making starch

2 (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] [4 marks]

3 Glucose made in photosynthesis is used or stored in different ways. State the use of each substance in a plant. (a) starch [1] (b) cellulose [1] (c) sucrose [1] (d) nectar [1] (e) A plant is grown in soil that lacks magnesium ions. Explain why it makes less glucose. [2] [6 marks]

- 4** 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]

[illegible]

- 5** 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] **[5 marks]**

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

[illegible]

Leaf structure Spec 6.2

8 Which part of a leaf contains the most chloroplasts? **[1 mark]**

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

9 State two ways in which most leaves are adapted for photosynthesis because of their shape, and explain one of them. **[3 marks]**

10 The diagram of a leaf cross-section has four labelled parts: W (upper epidermis), X (palisade mesophyll), Y (air spaces) and Z (stoma). Describe the function of each part in photosynthesis. [4] **[4 marks]**

11 (a) Name the two tissues found in the vascular bundle of a leaf. [1] (b) State the role of each tissue in a leaf. [2] (c) Explain why the cells of the palisade mesophyll are close to the upper surface of the leaf. [2] **[5 marks]**

12 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. [1]

C C (1)

2. [4]

- (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

3. [6]

- (a) energy store / store of carbohydrate (1)
- (b) to build cell walls (1)
- (c) transport (of carbohydrate) in the phloem (1)
- (d) to attract insects for pollination (1)
- (e) magnesium is needed to make chlorophyll (1)
- (e) less chlorophyll, so less energy from light is transferred / absorbed for photosynthesis (1) ignore yellow leaves

4. [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)

5. [5]

- (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)

6. [4]

- (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)

7. [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)

8. [1]

B B (1)

9. [3]

- large surface area (1)
- thin (1)
- large surface area absorbs more light / thin so light reaches all cells / thin so short distance for carbon dioxide to diffuse (1)

10. [4]

- W: transparent / lets light through to the cells below (1)
- X: contains many chloroplasts / absorbs light for photosynthesis (1)
- Y: allow carbon dioxide to diffuse through to the cells (1)
- Z: allows carbon dioxide to enter (and oxygen to leave) (1)

11. [5]

- (a) xylem and phloem (1)
- (b) xylem: brings water to the leaf (1)
- (b) phloem: carries sucrose / products of photosynthesis away from the leaf (1)
- (c) this is where the most light reaches (1)
- (c) so more light is absorbed by the chloroplasts for photosynthesis (1)

12. [1]

B B (1)