Answers to Further Questions
in GCSE Biology for You (5th Edition)

On the following pages we show the detailed Answers and Mark Schemes for the Further Questions on Plants as organisms.

The answers have been prepared by an Examiner using the mark schemes published by each Examination Board. They are laid out in the same way as the pages of Further Questions in the Students’ Book.

For the Student:

● It is very important that you are able to answer the questions on your own, using your own knowledge of Biology.
  So it is important that you have a go at the questions first, and then afterwards you can check your answers using these pages.
  If you get a question wrong, try to work out where you have made an error. Discuss it with your teacher if you are not sure.

● Be aware that in some answers the mark is for the idea in your own words (not necessarily the exact words shown), whereas in other answers the number and unit must be exactly correct.

For the Teacher:

● You will find these sheets useful when marking the students’ homework, or when going over the Further Questions in class.
  The Answer Sheet will also enable you to assess how much work is involved in answering the questions when planning how much homework to set.

● The PDFs are available for you to hand out to the students if you wish (perhaps as part of a Revision Programme).
  As with all mark schemes there may be alternative credit-worthy statements for qualitative answers (for the idea) and this may need to be explained to your students. Quantitative answers, however, are generally more prescriptive and your students may need to be encouraged to show the exact numerical value and the appropriate unit.

Gareth Williams
For answers marked by levels of response:
Read through the whole answer from start to finish, using the Level descriptors to help you decide whether it is a strong or weak answer. The indicative scientific content indicates the expected parameters for candidates’ answers, but be prepared to recognise and credit unexpected approaches where they show relevance. Using a ‘best-fit’ approach based on the skills and science content evidenced within the answer, first decide which set of level descriptors, Level 1, Level 2 or Level 3, best describes the overall quality of the answer. Once the level is located, award the higher or lower mark:

The higher mark should be awarded where the level descriptor has been evidenced and all aspects of the communication statement (in italics) have been met.

The lower mark should be awarded where the level descriptor has been evidenced but aspects of the communication statement (in italics) are missing.

In summary:
The skills and science content determines the level.
The communication statement determines the mark within a level.

▶ Feeding in plants

1 (a) 1 mark for one idea eg.
  flat – to capture as much light as possible;
  contain chlorophyll – to capture light.

(b) 1 mark for each of the following ideas:
  (i) to allow light to penetrate to the palisade cells;
  (ii) for maximum absorption of light (which comes from above);
  (iii) gases enter via the stomata and from here must diffuse quickly to the palisade cells where most photosynthesis occurs.

(c) 1 mark for chlorophyll.

(d) 1 mark for each of the following ideas:
  (i) increase – since there will be more available light;
  (ii) decrease – the higher the temperature, the faster the chemical reactions in photosynthesis.

Total 7 marks

2 (a) 1 mark for the idea that it is to prevent light reaching that part of the leaf.

(b) (i) 1 mark for iodine solution;
  (ii) 1 mark each for:
    X – blue / black;
    Z – yellow / straw coloured / light brown.

(c) 1 mark for the idea that leaves need light to produce starch.

Total 5 marks

3 (a) (i) 1 mark each for:
  carbon dioxide;
  water;
  (ii) 1 mark for photosynthesis.

(b) (i) 1 mark for each of the following ideas:
  the amount rises as it is made by photosynthesis;
  the amount falls as it is converted into starch for storage or into other materials for growth;
  (ii) 1 mark for the idea that the plants are growing so there will be more leaves producing sugars;
  (iii) 1 mark for the idea that it was a dull day so there was less photosynthesis.

(c) 1 mark for each of the following ideas:
  the temperature would increase, so increasing the rate of photosynthesis;
  burning gas results in the production of carbon dioxide – increased amounts of carbon dioxide increase the rate of photosynthesis.

Total 9 marks

4 (a) 1 mark for D.

(b) Please refer to the marking instructions at the beginning of this mark scheme for guidance on how to mark this question.

Level 3 (5–6 marks)
A clear description of a method with apparatus that would produce valid results is given.
A description of how the rate of photosynthesis is measured and is included.

Level 2 (3–4 marks)
The substantive content of a method involving pondweed and varying light intensity is given. A description of what is measured or at least one control variable is included.

Level 1 (1–2 marks)
There is a basic description of a simple method involving pondweed and light. 1–2 marks for no relevant content.

Indicative content:
description of how the apparatus would be used;
plant releases gas / oxygen;
use of ruler to measure distance of light from beaker / pondweed;
reference to varying distance of light from pondweed;
Answers to Further questions on Plants as organisms pages 230–232

(accept alternative methods to alter light intensity)
calculate light intensity using \(1/d^2\);
measure number of bubbles / volume of gas produced;
same length of time;
reference to control of temperature;
reference to control / supply of carbon dioxide in water;
do repeats and calculate a mean.
(c) 1 mark for rate does not increase if light intensity increased.
(d) 1 mark for any one from:
temperature;
carbon dioxide (concentration);
amount of chlorophyll.
(allow number of chloroplasts)

Total 9 marks

5 (a) (i) 1 mark for each of:
\[25 \times 25 = 625;\]
\[1 \div 625 = 0.0016.\]
(award full marks for correct numerical answer without working)
(ii) 1 mark for each of the following points made in a description:
as light intensity decreases the rate of photosynthesis also decreases;
up to 25 cm away when light intensity appears to have little effect on the rate of photosynthesis.
(iii) 1 mark for use a light meter.
(iv) 1 mark for each of the following points made in an explanation:
collect the gas/oxygen produced in a graduated gas syringe;
to enable the volume of gas produced to be measured more accurately.
(accept alternative gas collection method with measuring cylinder and beehive shelf)
(accept leave the apparatus for a longer amount of time)
(b) 1 mark for each of the following points made in an explanation:
the volume of gas produced would decrease to below 4 bubbles;
because light is needed for photosynthesis.

Total 9 marks

6 (a) 1 mark each for two of:
nitrate;
phosphate;
potassium.
(b) 1 mark for 19 tonnes.
(c) 1 mark for each of the following ideas:
(i) increase;
(ii) decrease.
(d) 1 mark for each of the following ideas:
advantages:
safer to eat ie. food less likely to be contaminated with toxins;
less detrimental effect on environment eg. pesticides kill many organisms which are not pests or fertilisers may cause eutrophication or production of fertilisers / pesticides uses valuable energy resources.
disadvantages:
yields often lower;	only more expensive.

Total 9 marks

7 (a) (i) 1 mark for carbon dioxide;
(ii) 1 mark for oxygen.
(b) (i) 1 mark for xylem;
(ii) 1 mark for phloem.
(c) 1 mark for the idea that it provides energy / light energy converted to chemical energy.
(d) 1 mark each for three of the following ideas:
starch insoluble/sugars soluble or in solution;
starch does not exert osmotic effect (or a lot of sugar would tend to draw water into the cell);
starch ‘metabolically inert’ / does not react easily with other substances in the cell;
starch (insoluble) takes up less space in the cell.

Total 8 marks

8 (a) 1 mark for each letter, in the order of the descriptions given in the table:
C; A; E; B; D;
(b) (i) 1 mark for photosynthesis;
(ii) 1 mark for one of the following ideas:
different weather ie. cloudier around 6.00p.m. for day X / sunnier on day Y;
short daylight on day X / dark later on day Y.
(c) 1 mark for about 3.00p.m. / 15.00 hours.
(d) 1 mark for each of two substances, such as:
water; nitrate; phosphate; magnesium; calcium, potassium, etc.

Total 10 marks

9 (a) 1 mark for photosynthesis.
(b) 1 mark for each of the following ideas:
by osmosis;
through the partially-permeable membrane of the root hair;
concentration of water molecules higher in soil than in root hair cell;
water molecules move along their diffusion gradient.

Total 8 marks

► Plant transport
(c) 1 mark for each of the following ideas: transpiration exerts a pull; on the water in the xylem; water molecules are cohesive so the column of water is pulled up the xylem.

Total 8 marks

10 (a) 4 marks for five correct matches, 3 marks for three/four correct matches, 2 marks for two correct matches, 1 mark for one correct match: cuticle – waterproofs the leaf; stoma – allows gaseous exchange with surroundings; palisade cell – produces glucose; phloem tissue – transports sucrose out of the leaf; spongy mesophyll – allows diffusion of gases within the leaf.

(b) 1 mark each for: transport of minerals or named mineral into the leaf; transport of ions or named ion into the leaf.

(c) 1 mark for starch / sucrose

(d) 1 mark each for any two from: evaporation of water; from the surfaces of mesophyll (leaf) cells; (followed by) loss of water vapour; out of stomata / stoma.

Total 9 marks

11 (a) (i) 2 marks for 0.23.

(allow 1 mark for 7/30)

(ii) 1 mark for measure the rate of water uptake with a fan running on the shoot.

(do not allow ‘place plant/apparatus outside’)

(iii) 1 mark each for any two from: water may be lost from parts of the equipment that are not sealed; some water is used for photosynthesis; if the plant is wilting, the plant will use water to restore turgidity.

(do not allow incorrect use of water, e.g. respiration)

(b) 1 mark each for any two from: Potassium ions (reduce the water potential) increase the concentration in the guard cells; So water moves into the cell; By osmosis; Guard cells become turgid.

Total 7 marks

12 (a) 1 mark for each of the following points made in an explanation: the elongated root hair cells increase the surface area available; for the absorption of water/or the absorption of mineral ions.

(b) (i) 1 mark for C.

(ii) 1 mark for auxin.

(iii) 1 mark for each of the following points made in a description: plant hormone diffuses to underside of root; which inhibits cell elongation and causes the root to grow downwards.

(accept auxin for plant hormone)

(c) 1 mark for each of the points made in a description: surround the Petri dish in black cardboard to prevent light from entering; cut a hole in one side of the black card/leave one side open and place a lamp in front of the hole; after a period of time measure the angle of the growing cress.

(d) 1 mark for D.

Total 10 marks

13 (a) 1 mark for each of the following ideas: the tip; shading the tip results in no response; shading the area below the tip has no effect on the response;

(b) 1 mark for each of the following ideas: increased concentration of auxin / hormone on shaded side of stem; results in increased growth of cells on shaded side; resulting in curvature towards light.

(c) 1 mark for each of the following ideas: plants grow towards maximum light; which they need for photosynthesis.

Total 8 marks

14 1 mark each for any four from: Gibberellins: initiate seed germination; used to end seed dormancy; used to promote flowering; used to increase fruit size. Ethene: controls cell division; controls ripening of fruit; used to control fruit ripening during storage and transport.

(For max marks both hormones must be included)

Total 4 marks