

B8- Photosynthesis Exam Practice 2

Name:

Score:

Q1.

This question is about photosynthesis.

(a) What are the **two** products of photosynthesis?

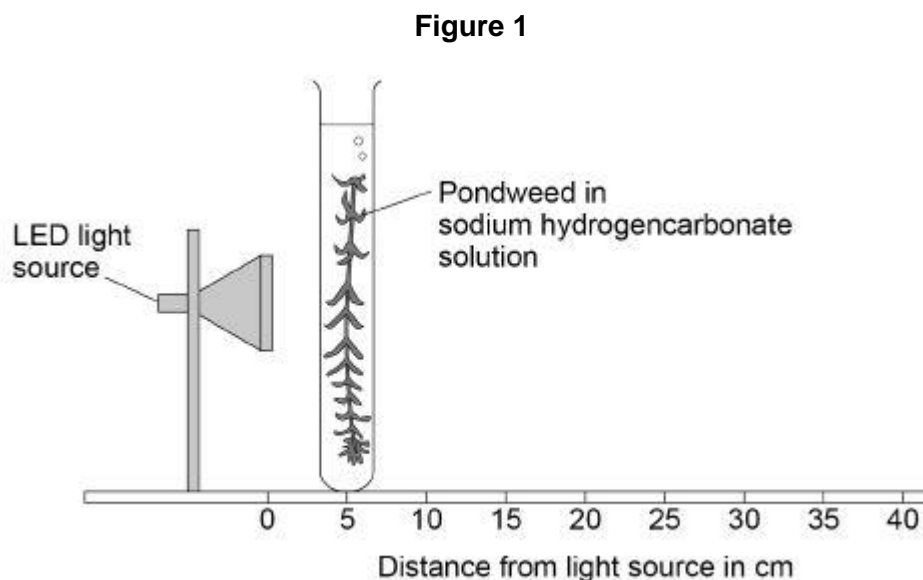
Tick **two** boxes.

Carbon dioxide	<input type="checkbox"/>
Chlorophyll	<input type="checkbox"/>
Glucose	<input type="checkbox"/>
Oxygen	<input type="checkbox"/>
Water	<input type="checkbox"/>

(2)

A student investigated the effect of light intensity on the rate of photosynthesis.

Figure 1 shows the apparatus.



This is the method used.

1. Place the pondweed at 5 cm from the light source.
2. Measure the rate of photosynthesis by counting the number of bubbles produced in 30 seconds.
3. Repeat the investigation with the pondweed at different distances from the light source.

(b) How could the student measure the rate of photosynthesis more accurately?

Tick **two** boxes.

- Count the number of bubbles produced in 1 minute
- Measure the change in mass of the pondweed in 30 seconds
- Measure the volume of gas produced in 30 seconds
- Place the pondweed further from the light source
- Use water instead of sodium hydrogencarbonate solution

(2)

(c) The LED light source does **not** get hot.

Why is this important?

(1)

The table below shows the student's results.

Distance of light source from pondweed in cm	Number of bubbles produced in 30 seconds
5	40
10	13
15	5
20	2
25	1
30	0

- (d) Calculate the number of bubbles produced in 2 minutes when the light source was 10 cm from the pondweed.

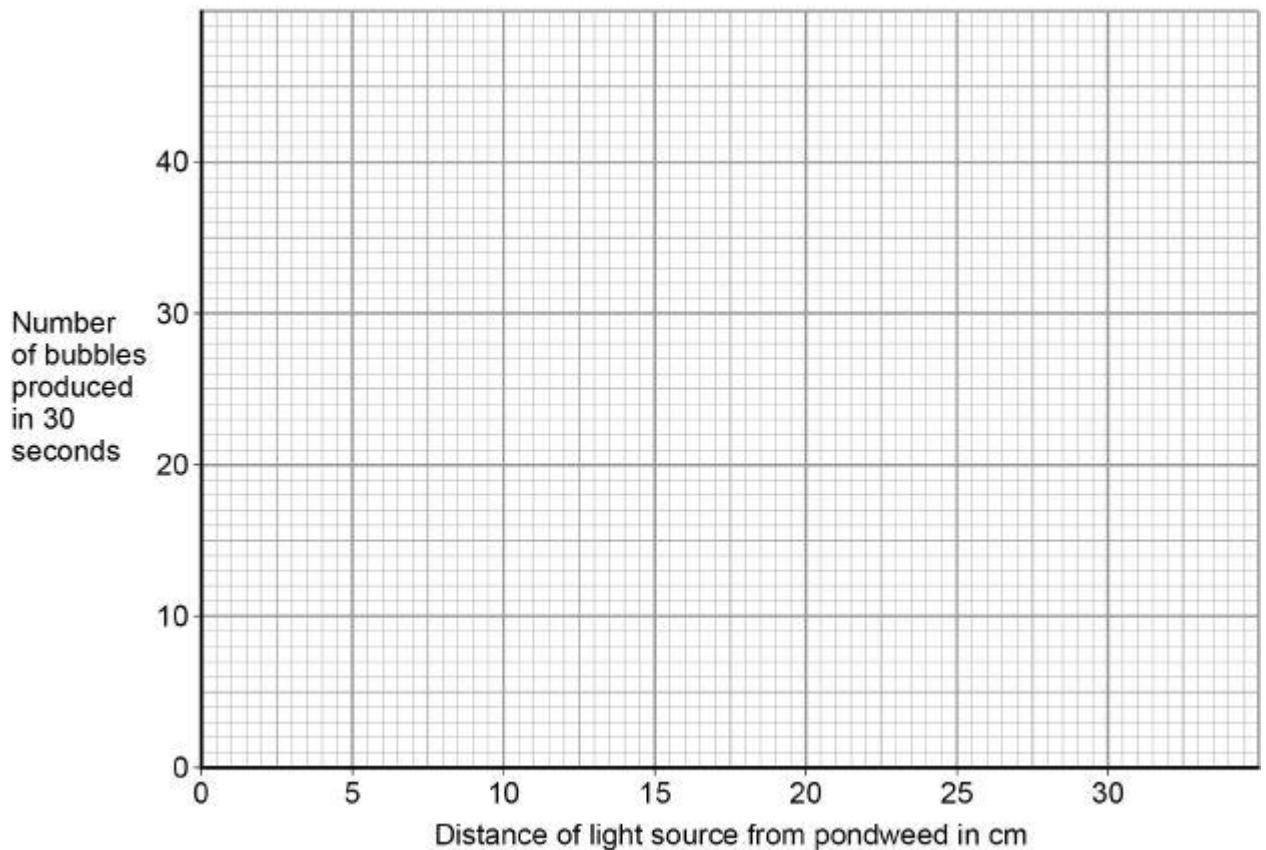
Number of bubbles produced in 2 minutes = _____

(1)

- (e) Plot the data from the table above on **Figure 2**

Draw a line of best fit.

Figure 2



(3)

- (f) Give **one** conclusion that can be made from these results.

(1)

(Total 10 marks)

Q2.

Plants make glucose by photosynthesis.

(a) Complete the word equation for photosynthesis.

_____ + _____ → glucose + _____

(1)

(b) What is the name of the chemical that makes a leaf look green?

Tick **one** box.

Cellulose

Chlorophyll

Chloroplast

Chromosome

(1)

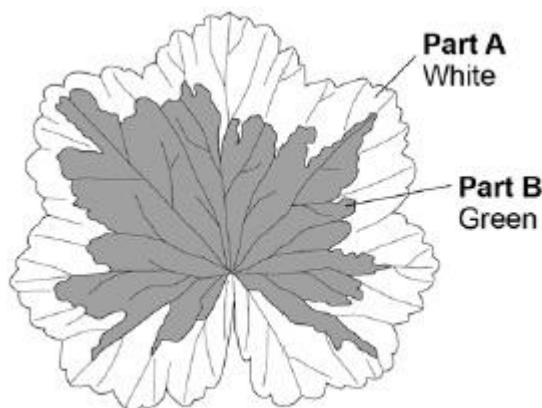
(c) A test for starch is used to show that a plant has photosynthesised.

How does the presence of starch show that photosynthesis has taken place?

(1)

A student investigated where starch was made in a leaf.

She used a leaf that was part green and part white as shown in the diagram.



This is the method used.

1. Put the leaf in boiling water for 1 minute.
Reason: stops all chemical reactions in the leaf.
2. Transfer the leaf to boiling ethanol for 5 minutes.
Reason: removes the green colour.

3. Dip the leaf in hot water.
Reason: softens the leaf.
4. Spread the leaf on a white tile and test with iodine solution.
Reason: stains any starch.
- (d) If the chemical reactions in the leaf were not stopped, the amount of starch in the leaf would decrease.

Give the reason why.

(1)

- (e) Suggest why it is important to remove the green colour from the leaf before adding iodine solution.

(1)

- (f) Ethanol is flammable.

The student wore safety goggles when testing the leaf for starch.

Give one other safety precaution the student should have taken.

(1)

- (g) Look at the leaf in the diagram.

What colour would part **A** and part **B** stain with iodine solution after the starch test?

A _____

B _____

(2)

(Total 8 marks)

Higher Questions

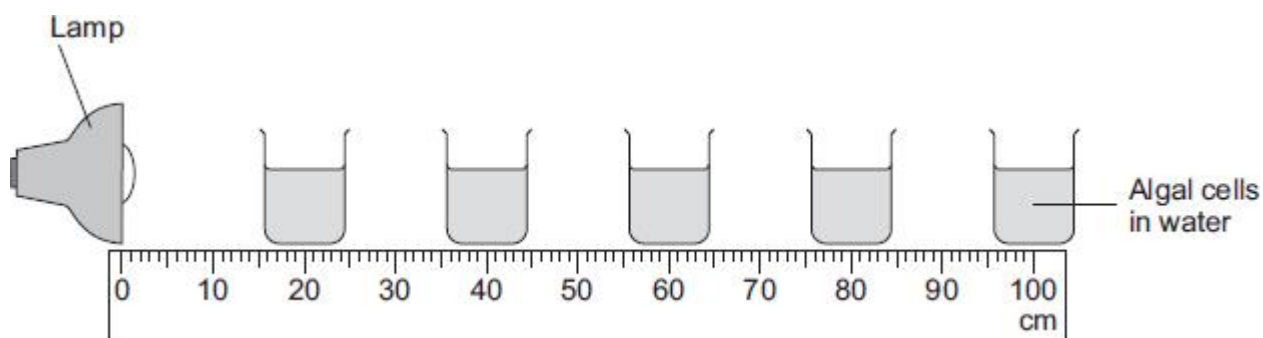
Q3.

Algal cells can photosynthesise.

A student investigated the effect of light intensity on photosynthesis in algal cells.

Figure 1 shows the apparatus used.

Figure 1



- (a) Describe the relationship between light intensity and distance, as the distance of the algal cells from the lamp is doubled.

You **must** include calculations of light intensity at 20 cm and 40 cm in your answer.

Use the equation:

$$\text{light intensity} \propto \frac{1}{\text{distance}^2}$$

(3)

The student recorded the pH of the water at the start and after one hour in each beaker.

The table below shows the results.

Distance of algal cells from lamp in cm	pH of water at start	pH of water after one hour
20	7.8	9.1
40	7.8	8.8
60	7.8	8.5
80	7.8	8.3
100	7.8	8.2

The method produced valid results.

(b) Carbon dioxide is an acidic gas.

Explain the results in the table above.

(4)

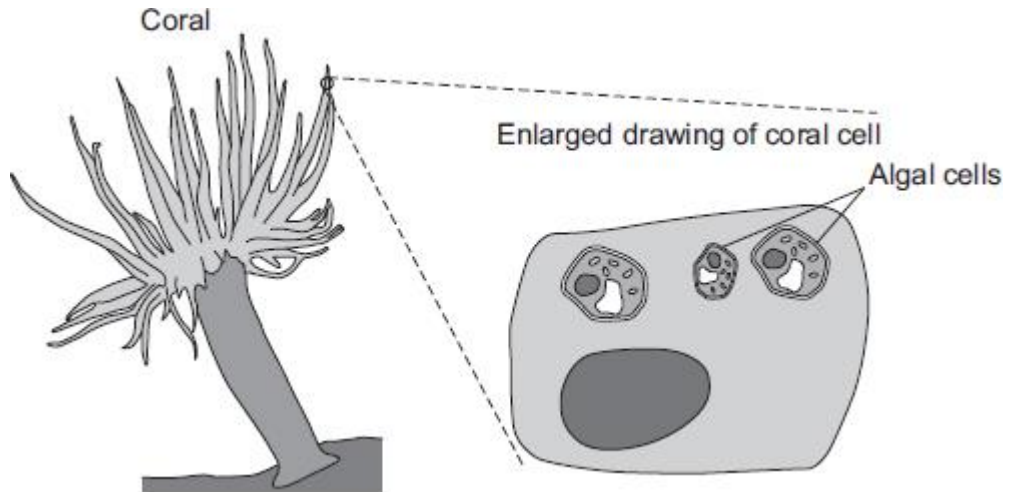
Corals are animals that live in the sea.

Corals:

- cannot move from one place to another place
- feed on tiny animals that float past in the water
- have algal cells living inside their own cells.

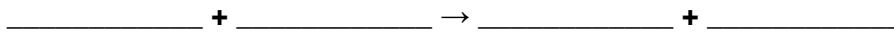
Figure 2 shows a coral and an enlarged coral cell.

Figure 2



Algal cells photosynthesise to produce glucose ($C_6H_{12}O_6$).

(c) Write the balanced symbol equation for photosynthesis.



(3)

(d) Explain **one** way the algal cells use glucose for growth.

(2)

(e) Suggest **one** advantage to the algal cells of living inside the coral cells.

(1)

(f) An increase in water temperature can cause coral to release the algal cells.

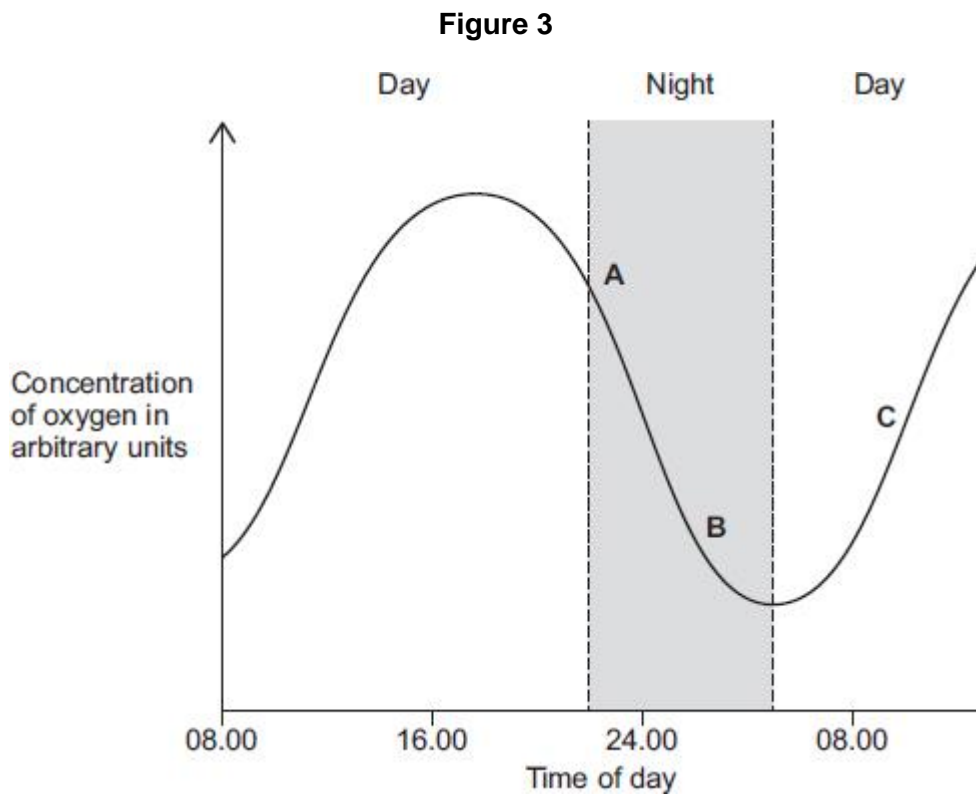
Releasing algal cells can result in the death of coral.

Suggest why coral may **not** survive without the algal cells.

(1)

Scientists investigated how the concentration of oxygen in the water around one coral changed during the day.

Figure 3 shows the results.



(g) Explain the changes in oxygen concentration between **A** and **B**.

(3)

- (h) At **C** the rate at which oxygen is being produced equals the rate at which oxygen is being used.

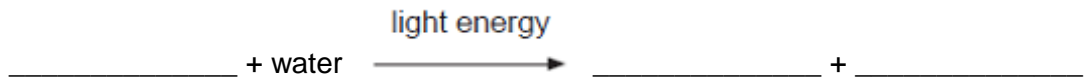
Give the reason why.

(1)

(Total 18 marks)

Q4.

- (a) Complete the equation for photosynthesis.



(3)

- (b) The rate of photosynthesis in a plant depends on several factors in the environment. These factors include light intensity and the availability of water.

Describe and explain the effects of **two other** factors that affect the rate of photosynthesis.

You may include one or more sketch graphs in your answer.

(5)
(Total 8 marks)

Mark schemes

Q1.

- (a) glucose 1
- oxygen 1
- extra ticks negates marks*
- (b) count the number of bubbles produced in 1 minute 1
- measure the volume of gas produced in 30 seconds 1
- extra ticks negates marks*
- (c) any **one** from:
- to control the temperature
allow so pondweed / solution did not warm up
 - temperature affects the rate of photosynthesis
allow correct description of effect of temperature on rate
allow high temperatures denature enzymes
ignore references to limiting factors
- 1
- ignore reference to 'it'*
- (d) 52 1
- (e) all points plotted correctly
- allow $\pm \frac{1}{2}$ a square*
allow 1 mark for three points correctly plotted
- 2
- smooth curve drawn through all points
- ignore extensions of line / curve unless inconsistent with line / curve drawn*
- 1
- (where a bar chart has been plotted)*
allow 1 mark for all bars plotted correctly
if points are plotted as well as bars, ignore bars
- (f) any **one** from:
- the nearer the light source to the pondweed the faster the rate of photosynthesis
allow the nearer the light source to the pondweed the faster the bubbles produced
 - the greater the light intensity the faster the rate of photosynthesis
allow the greater the light intensity the faster the bubbles produced

allow the closer the light source the more the plant photosynthesises

ignore more bubbles are produced with no reference to rate

allow oxygen for bubbles

*do **not** accept carbon dioxide*

1

allow converse statements for all marking points

[10]

Q2.

(a) carbon dioxide + water → (glucose) + oxygen

allow reactants in either order

allow correct formulae, balancing not required

1

(b) chlorophyll

1

(c) glucose (produced in photosynthesis) is converted into starch

1

(d) starch could be broken down (into sugar)

1

(e) so the colour of the iodine solution / result can be seen

1

(f) any **one** from:

- turn off Bunsen / flame before collecting ethanol

- use a water bath to heat the ethanol

allow idea that there are no naked flames near the ethanol

1

(g) **A** orange / brown

1

B black / blue-black

1

[8]

Higher Mark Scheme

Q3.

(a) (at 20 cm)
light intensity \propto 0.0025

or

2.5×10^{-3}

1

(at 40 cm)
light intensity \propto 0.000625

or

6.25 × 10⁻⁴

1

increasing the distance by a factor of 2, causes a decrease in the light intensity by a factor of 4

allow doubling the distance causes the light intensity to be divided by 4

allow doubling the distance quarters light intensity 1

1

(b) (pH of the water became) more alkaline

allow pH of the water increased

ignore pH became less acidic

1

(because algal cells) used carbon dioxide (from the solution) for photosynthesis

1

as the distance increases the (change in) rate of photosynthesis decreases

allow as the light intensity decreases the (change in) rate of photosynthesis decreases

1

as the distance increases the rate of change in pH decreases

allow as the light intensity decreases the rate of change in pH decreases

1

(c) $6 \text{ CO}_2 + 6 \text{ H}_2\text{O} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6 \text{ O}_2$

allow 1 mark for correct formulae right-hand side

allow 1 mark for correct formulae left-hand side

allow 1 mark for correct balancing if all formulae correct

3

(d) glucose is converted into amino acids

1

(amino acids) used in protein synthesis

allow used to produce proteins

or

glucose is used in respiration to provide energy (1)

do not accept produce / make / create energy

(for) synthesis of / protein / amino acids / cellulose (1)

or

glucose is used to make cellulose (1)

(which can be) used to make cell walls (1)

1

- (e) any **one** from:
- provides protection from consumers
 - provides supply of carbon dioxide
 - provides supply of amino acids / nitrates
- allow other useful molecules which could diffuse*
- 1
- (f) any **one** from:
- they cannot gain enough glucose
- allow the algae provided extra glucose*
- they cannot gain enough oxygen
- allow the algae provided extra oxygen*
*do **not** accept the coral does not have any glucose / oxygen*
- 1
- (g) decrease in light intensity
- allow no light*
allow decrease in light
- 1
- (so) rate of photosynthesis decreases meaning less oxygen produced
- allow (so) of photosynthesis stops meaning no oxygen produced*
- 1
- (and) oxygen is being used in respiration by algae / coral
- 1
- (h) the rate of photosynthesis is equal to the rate of respiration
- 1

[18]

Q4.

- (a) LHS – carbon dioxide / CO₂
- allow CO₂*
ignore CO²
- 1
- RHS
- in either order*
- glucose / carbohydrate / sugar
- allow starch*
allow C₆H₁₂O₆ / C₆H₁₂O₆
ignore C⁶H¹²O⁶
- 1
- oxygen
- allow O₂ / O₂*
ignore O² / O
- 1
- (b) any **five** from:

- factor 1: CO₂ (concentration)
- effect - as CO₂ increases so does rate and then it levels off or shown in a graph
- explanation:
(graph increases) because CO₂ is the raw material or used in photosynthesis / converted to organic substance / named eg
or
(graph levels off) when another factor limits the rate.
accept points made via an annotated / labelled graph
- factor 2: temperature
allow warmth / heat
- effect – as temperature increases, so does the rate and then it decreases or shown in a graph
allow 'it peaks' for description of both phases
- explanation:
(rise in temp) increases rate of chemical reactions / more kinetic energy
allow molecules move faster / more collisions
or
(decreases) because the enzyme is denatured.
context must be clear = high temperature

*allow other factor plus effect plus explanation:
eg light wavelength / colour / pigments / chlorophyll / pH / minerals / ions / nutrients / size of leaves
2nd or 3rd mark can be gained from correct description and explanation*

5

[8]