

Photosynthesis

Question Paper 1

Level	GCSE (9-1)
Subject	Combined Science: Trilogy - Biology
Exam Board	AQA
Topic	4.4 Bioenergetics
Sub-Topic	Photosynthesis
Difficulty Level	Gold Level
Booklet	Question Paper 1

Time Allowed: 60 minutes

Score: /59

Percentage: /100

Grade Boundaries:

Q1. A student investigated the effect of pond organisms on the amount of carbon dioxide in their surroundings.

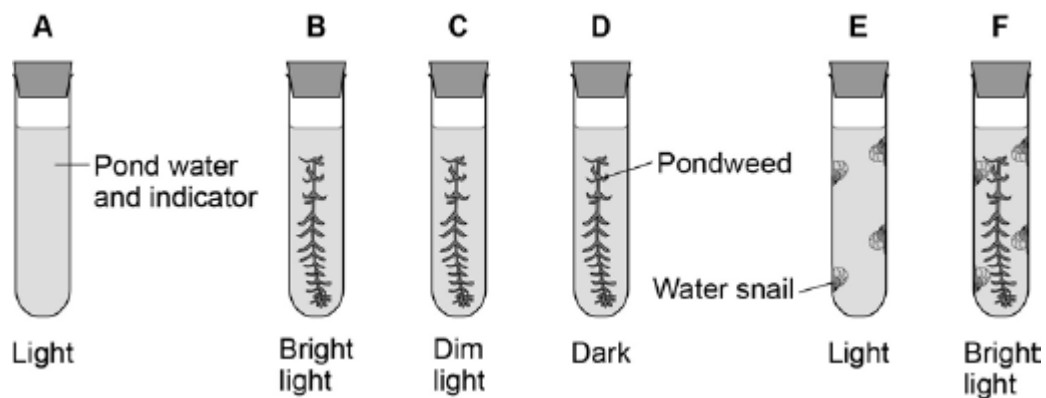
The student set up six boiling tubes as shown in the figure below.

They were left for 2 days.

Each boiling tube contained pond water with an indicator.

The indicator was pink at the start of the investigation.

- If the amount of carbon dioxide in the water increased the indicator turned yellow.
- If the amount of carbon dioxide in the water decreased the indicator turned purple.



(a) What is the purpose of boiling tube **A**?

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(2)

(b) In which boiling tube would the indicator be the **most yellow** after 2 days?

Explain your answer.

Boiling tube

Explanation

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(3)

- (c) The colour of the indicator in boiling tube **C** had not changed after 2 days.

Suggest why.

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(1)

(Total 6 marks)

Q2. A student investigated the effect of light intensity on the rate of photosynthesis in pondweed.

- (a) The formula for glucose is $C_6H_{12}O_6$

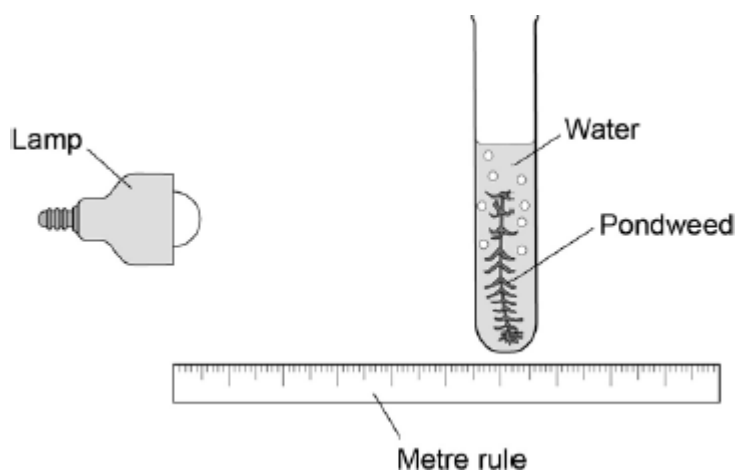
Use the formula for glucose to write the balanced symbol equation for photosynthesis.

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(2)

- (b) **Figure 1** shows the apparatus the student used.

Figure 1



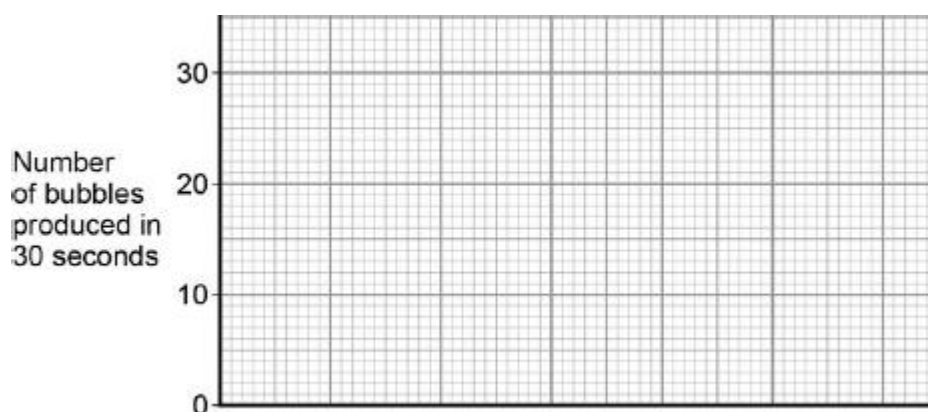
The student altered the distance of the lamp from the pondweed and counted the number of bubbles produced in 30 seconds for each distance.

The table below shows the student's results.

Distance in cm	Number of bubbles produced in 30 seconds
10	27
20	23
30	16
40	7
50	2

Use the data in the table above to complete the graph on **Figure 2**.

Figure 2



(3)

- (c) The student concluded that the rate of photosynthesis is inversely proportional to the distance of the lamp from the pondweed.

Does the student's data support this conclusion?

Use data from **Figure 2** to justify your answer.

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(3)

- (d) The volume of one bubble can be calculated using the equation:

$$V = \frac{4}{3} \pi r^3$$

The radius of one bubble is 0.1 cm.

The value for π is 3.14

Use data from the table above and the information above to calculate the rate of gas production at a distance of 40 cm.

Give your answer in standard form to three significant figures.

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Rate of reaction = cm^3 per minute

(5)

(Total 13 marks)

Q3. Green plants can make glucose.

- (a) Plants need energy to make glucose.

How do plants get this energy?

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(2)

- (b) Plants can use the glucose they have made to supply them with energy.

Give **four** other ways in which plants use the glucose they have made.

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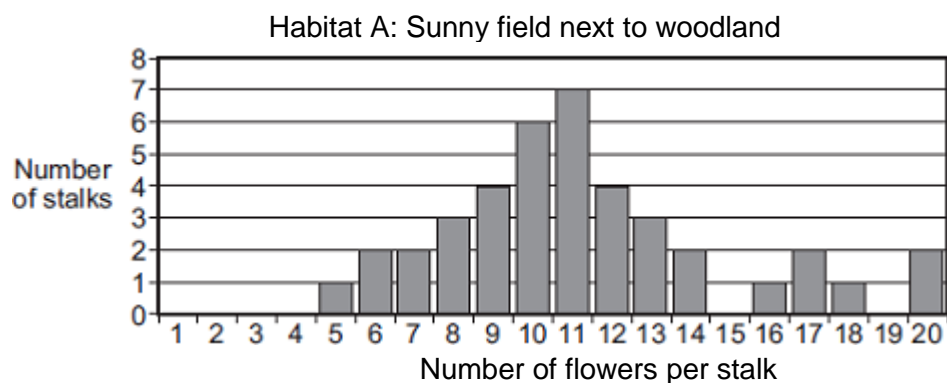
(4)
(Total 6 marks)

Q4. Some students studied bluebell plants growing in two different habitats.

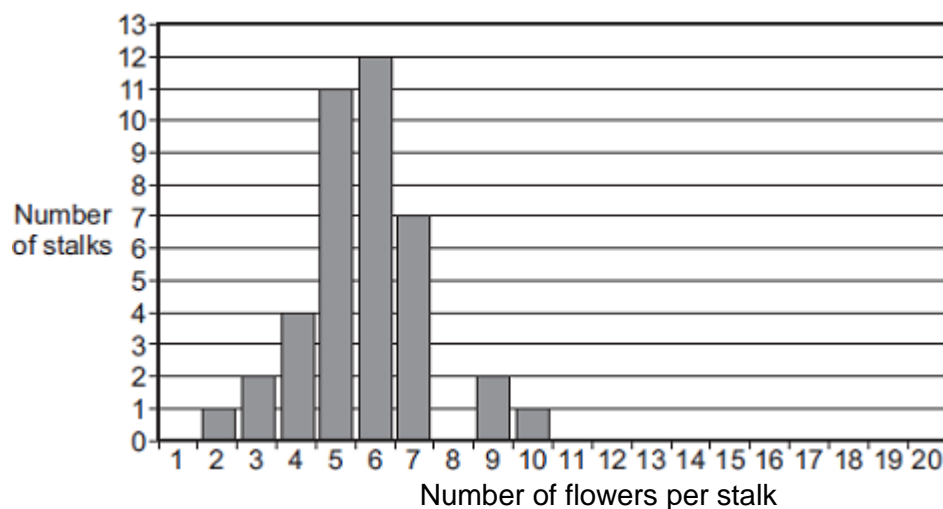
Habitat **A** was a sunny field next to woodland.

Habitat **B** was a shady, moist woodland.

A bluebell plant can have several flowers on one flower stalk. The students counted the number of flowers on each of 40 bluebell flower stalks growing in each habitat. The bar charts show the results.



Habitat B: Shady, moist woodland



- (a) The students wanted to collect valid data.
Describe how the students should have sampled the bluebell plants at each habitat to collect valid data.

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(2)

- (b) (i) The students used the bar charts to find the mode for the number of flowers per stalk in the two habitats.

The mode for the number of flowers per stalk in habitat **A** was 11.

What was the mode for the number of flowers per stalk in habitat **B**?

Mode =

(1)

- (ii) The students suggested the following hypothesis:

‘The difference in the modes is due to the plants receiving different amounts of sunlight.’

Suggest why.

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(2)

- (iii) Suggest how the students could test their hypothesis for the two habitats.

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(2)

- (c) Suggest how receiving more sunlight could result in the plants producing more flowers per stalk.

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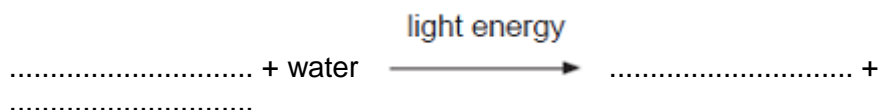
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(2)

(Total 9 marks)

- Q5.(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.

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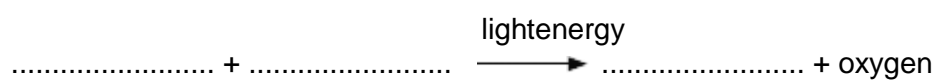
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(5)
(Total 8 marks)

Q6. (a) Complete the equation for photosynthesis.



(2)

- (b) Scientists investigated how temperature affects the rate of photosynthesis. The scientists grew some orange trees in a greenhouse. They used discs cut from the leaves of the young orange trees.

The scientists used the rate of oxygen production by the leaf discs to show the rate of photosynthesis.

- (i) The leaf discs did not produce any oxygen in the dark.

Why?

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(1)

- (ii) The leaf discs took in oxygen in the dark.

Explain why.

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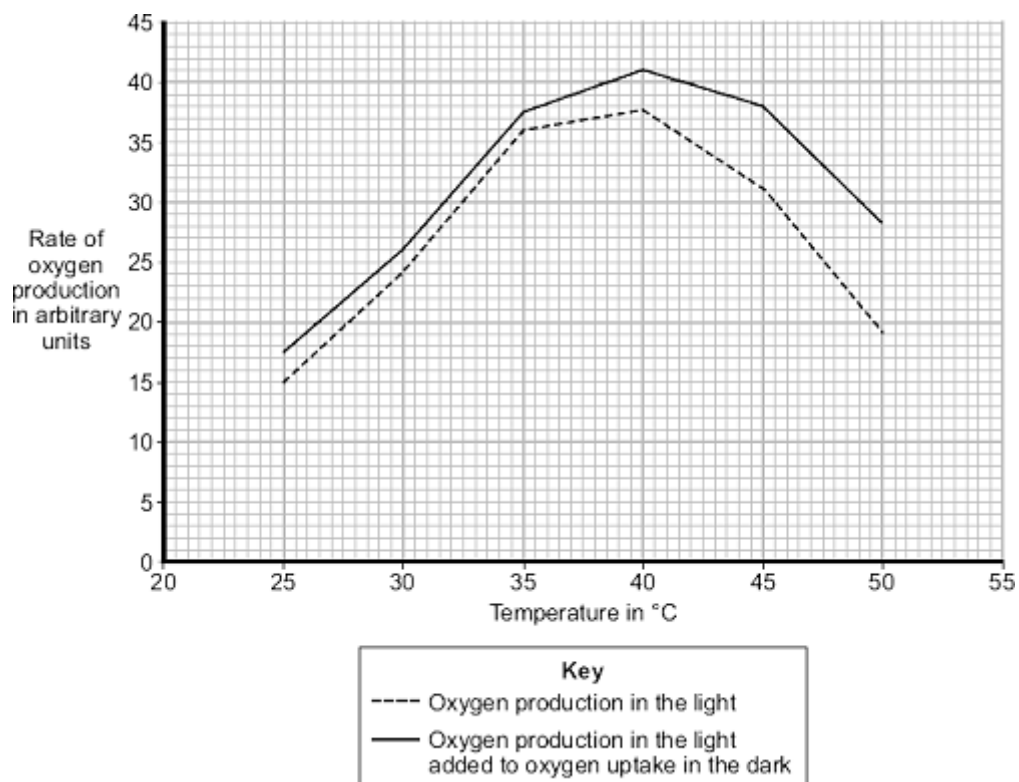
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(2)

- (c) In their investigation, the scientists measured the rate of oxygen release by the leaf discs in the light. The scientists then measured the rate of oxygen uptake by the leaf discs in the dark.

The graph shows the effect of temperature on

- oxygen production in the light
- oxygen production in the light added to oxygen uptake in the dark.



Use the information from the graph to answer each of the following questions.

- (i) Describe the effect of temperature on oxygen production in the light.

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(2)

- (ii) Explain the effect of temperature on oxygen production in the light when the temperature is increased:

from 25 °C to 35 °C

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from 40 °C to 50 °C.

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(2)

- (d) A farmer in the UK wants to grow orange trees in a greenhouse. He wants to sell the oranges he produces at a local market.
He decides to heat the greenhouse to 35 °C.

Explain why he should **not** heat the greenhouse to a temperature higher than 35 °C.
Use information from the graph in your answer.

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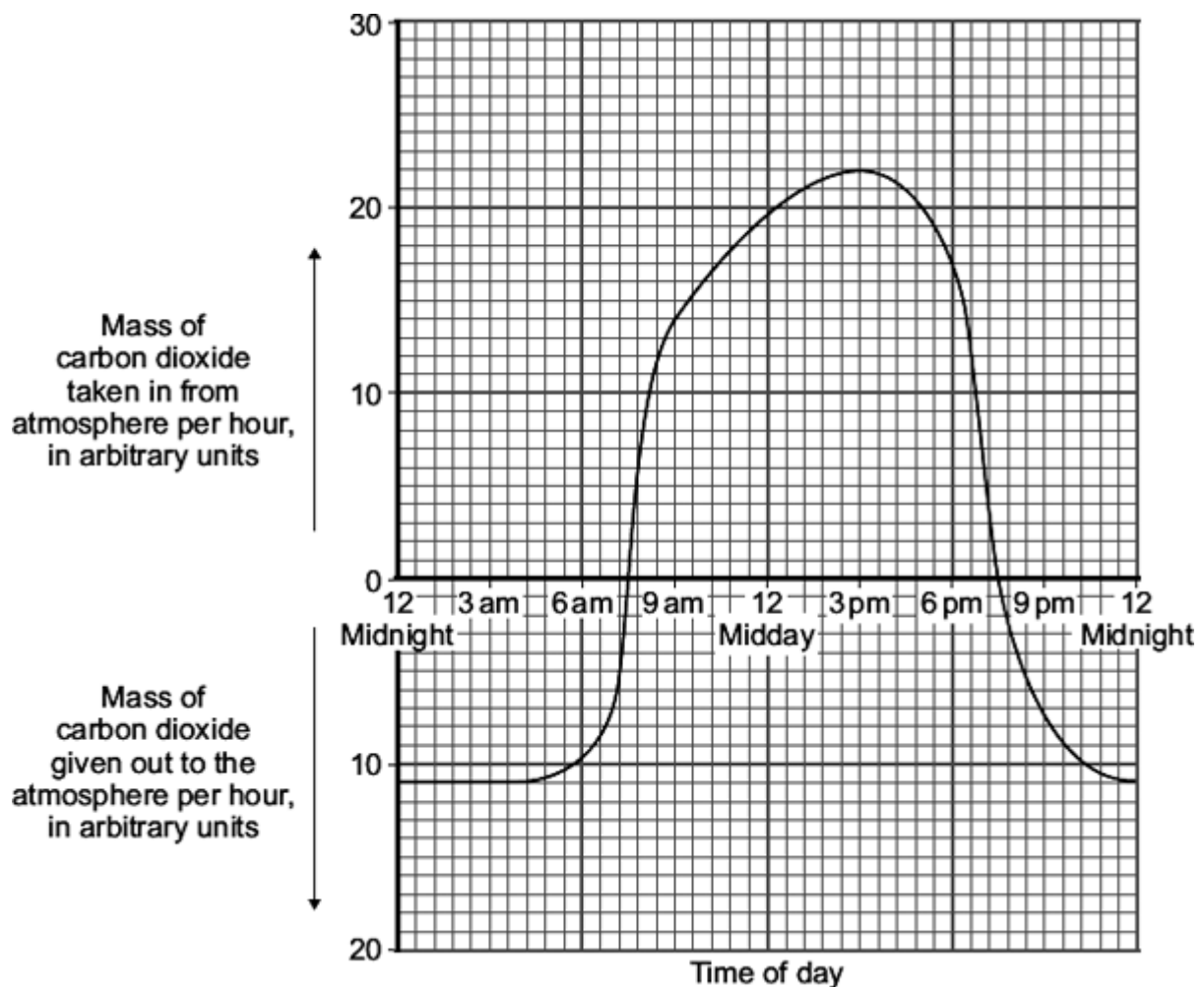
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(3)

(Total 12 marks)

- Q7.** The graph shows the uptake of carbon dioxide and the release of carbon dioxide by a bean plant on a hot summer's day.



- (a) At which **two** times in the day did the rate of photosynthesis exactly match the rate of respiration in the bean plant?

1 2

(1)

- (b) The bean plant respire at the same rate all through the 24 hour period.

- (i) How much carbon dioxide is released each hour during respiration?

..... arbitrary units

(1)

- (ii) How much carbon dioxide is used by photosynthesis in the hour beginning at 3 pm?

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Answer = arbitrary units

(1)

- (c) Over the 24 hour period, the total amount of carbon dioxide taken in by the bean plant was greater than the total amount of carbon dioxide given out by the bean plant.

Explain, in detail, why this was important for the bean plant.

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(2)

(Total 5 marks)