



Resources available from

**kickstart
tutors**

Student number

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Name _____

Date _____

Attempt/Time taken _____

GCSE BIOLOGY

Topic Paper: 4.1 Photosynthesis
Part 2

Time allowed: 35 minutes

Materials

For this paper you must have:

- the Periodic Table/Data Sheet, provided as an insert (enclosed)
- a ruler with millimetre measurements
- a calculator, which you are expected to use where appropriate.

Instructions

- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- All working must be shown.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information

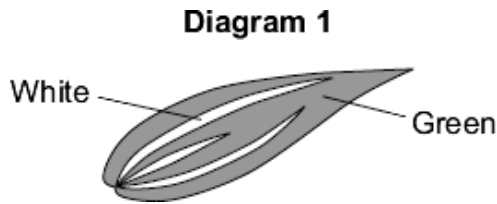
- The Periodic Table/Data Sheet is provided as in insert.
- You are reminded of the need for good English and clear presentation in your answers.
- When answering questions you need to make sure that your answer:
 - is clear, logical, sensibly structured
 - fully meets the requirements of the question
 - shows that each separate point or step supports the overall answer.



32 Marks

Q6. Students investigated the effect of changing the carbon dioxide concentration on the rate of photosynthesis in pieces of leaf.

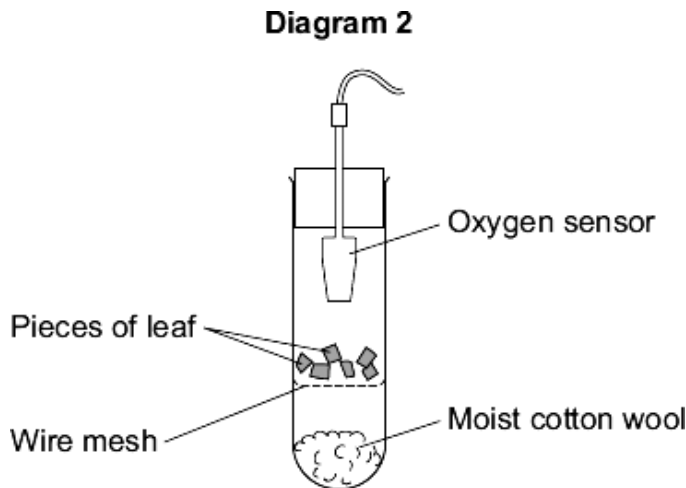
Diagram 1 shows the type of leaf used by the students.



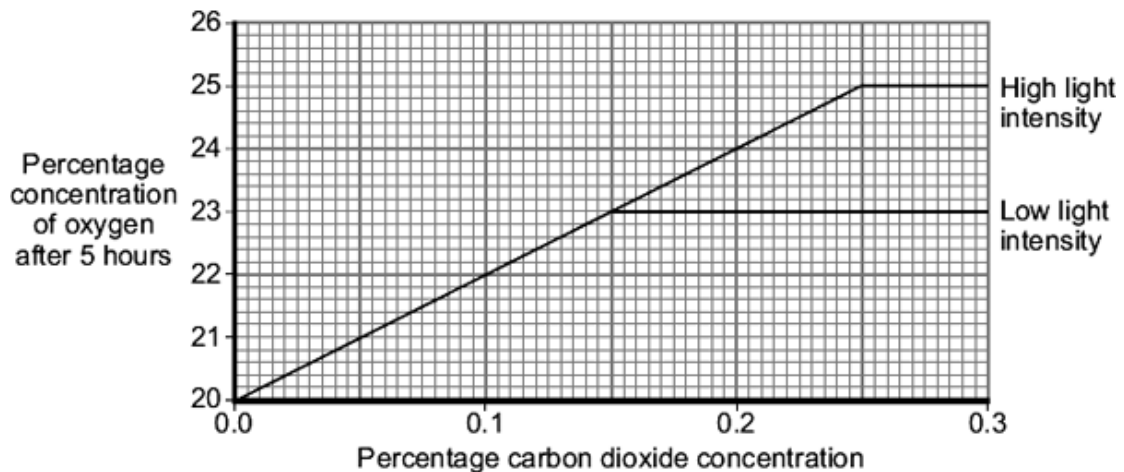
The students:

- cut pieces of leaf from the green region
- put the pieces into tubes
- added different concentrations of carbon dioxide to each tube
- shone lights on the tubes with either high or low light intensity
- recorded the concentration of oxygen in the tubes after 5 hours.

Diagram 2 shows how each experiment was set up.



The graph shows the results of the investigation.



(a) (i) Describe the effect of increasing carbon dioxide concentration on the rate of



photosynthesis at low light intensity.

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(1)

(ii) Explain the effect that you have described.

In your answer you should refer to limiting factors.

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(2)

(b) What would have been the effect on oxygen concentration over the five-hour period if a white region of the leaf had been used, instead of a green region?

Effect

Explain your answer.

Explanation

.....
.....

(2)

(c) Some people keep indoor plants which have variegated leaves (leaves with green and white regions).

If plants with variegated leaves are kept in dim light conditions the white areas of the leaves start to turn green.

This is an advantage to the plant.

Suggest why.

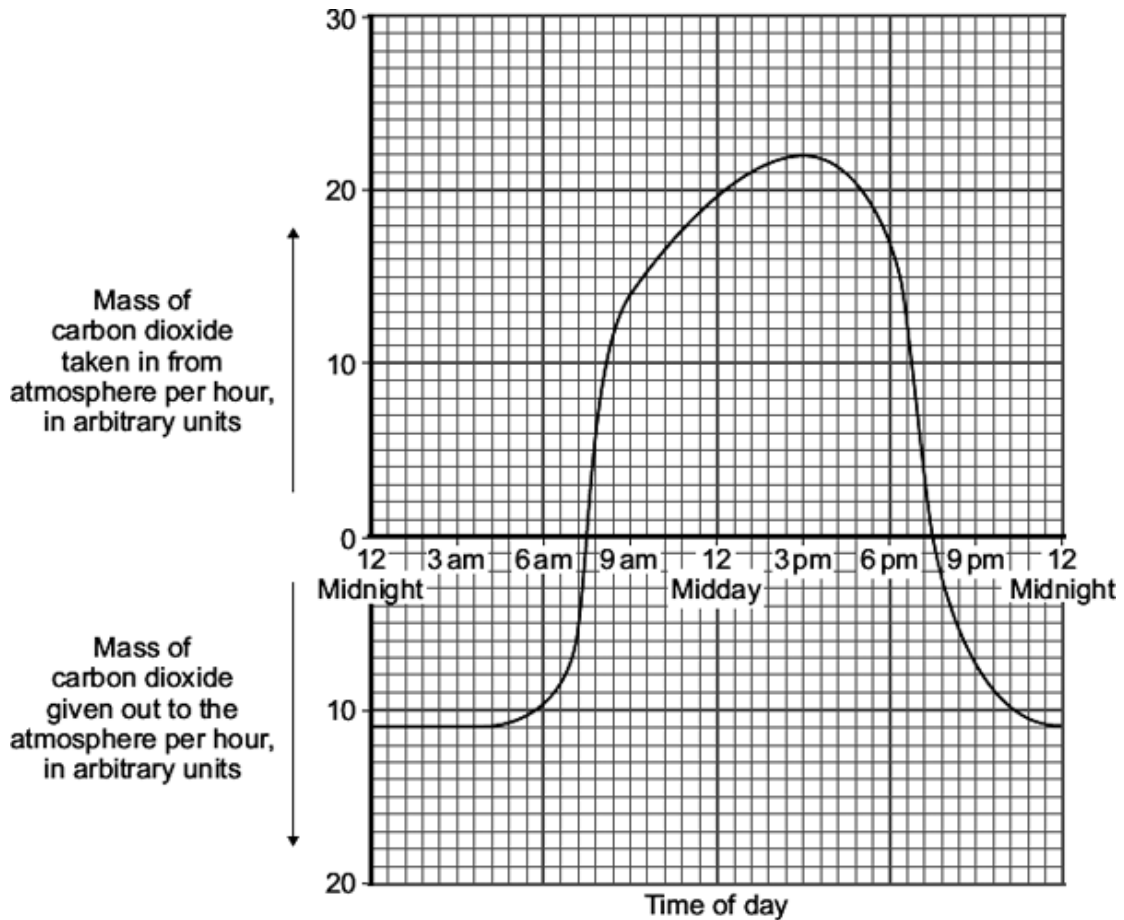
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(2)

(Total 7 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?

.....
.....

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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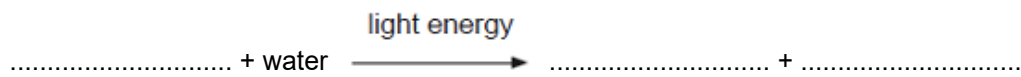
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(2)
(Total 5 marks)

- Q8.** (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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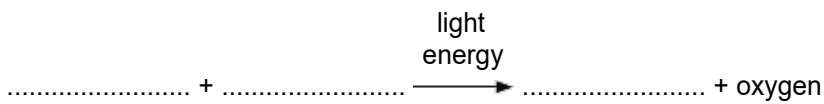
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(5)
(Total 8 marks)

- Q9.** (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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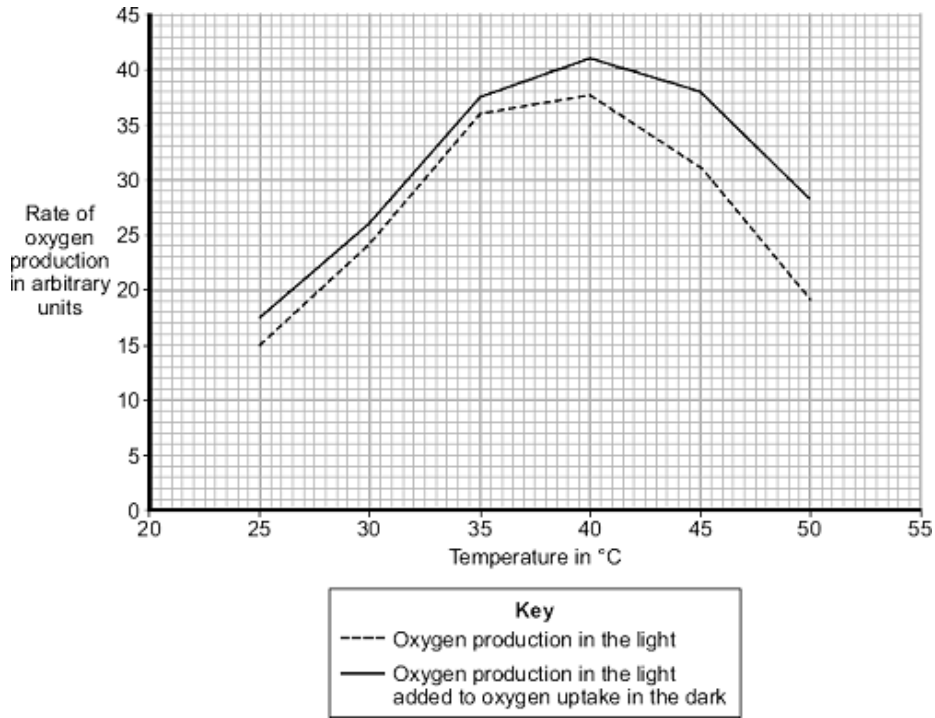
(2)

- (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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(3)
(Total 12 marks)