

GCSE Biology (9 – 1)

Photosynthesis

Name:

Group:

Instructions

- Read each question carefully before you begin to answer it.
- Use black ink or black ball-point pen for your answers.
- Fill in the boxes at the top of this page with your name and group.
- Attempt to answer every question in the booklet.
- Answer the questions in the spaces provided – there may be more space than you need in some answer spaces.
- Calculators may be used for this booklet.
- For any calculations, you **must** show all your working.
- Any and all drawings or graphs should be completed in pencil.



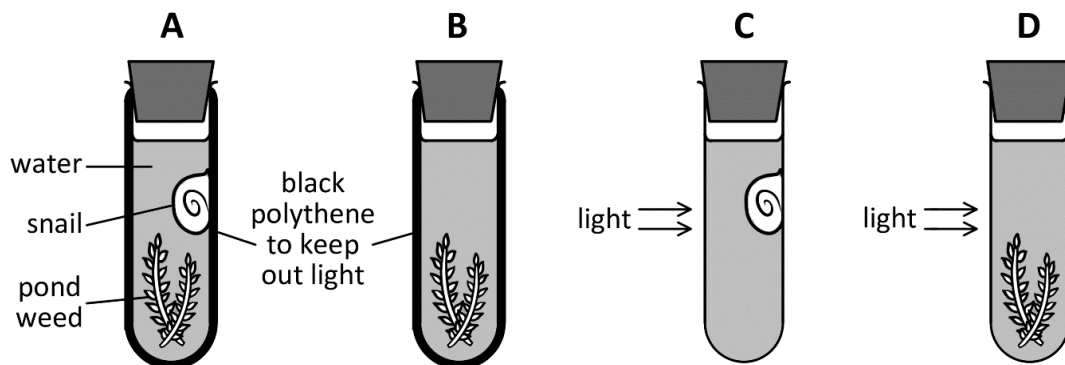
For markers use	
Question	Mark
1	/3
2	/10
3	/15
4	/6
5	/12
6	/9
Total	/55
%	
Grade	

Information

- The maximum mark for this paper is 55 marks.
- The marks for each question are shown in brackets.
- Please be aware that good English and clear presentation are required in your answers.



1. Photosynthesis is the fundamental process by which green plants and some other organisms convert light energy into chemical energy in the form of glucose. Answer the following questions. Circle the letter of the correct answer for each.
- a) The diagram shows an experiment to investigate the balance between respiration and photosynthesis. In which tube are photosynthesis and respiration both taking place at the same time?



(1 mark)

- b) The equation for photosynthesis is shown.

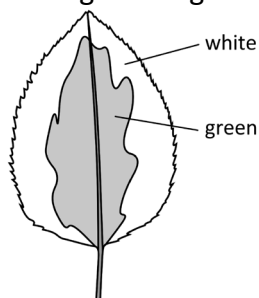
..... 1 + ... 2 → glucose + ... 4

Which words correctly complete gaps 1, 2 and 4?

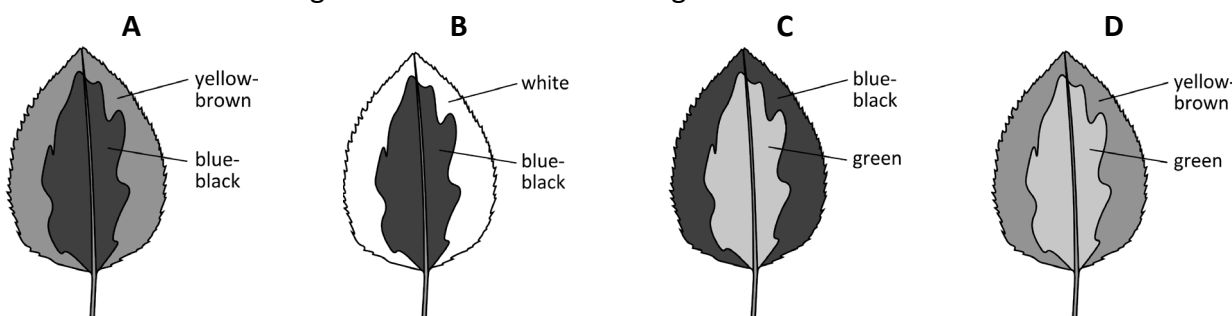
	1	2	4
A	oxygen	light	carbon dioxide
B	carbon dioxide	water	lactic acid
C	carbon dioxide	water	oxygen
D	oxygen	light	carbon dioxide

(1 mark)

- c) A plant with variegated leaves was kept in bright sunlight for 4 hours. The figure below shows the leaf.



A leaf was taken from the plant and the chlorophyll was removed by boiling it in ethanol. The leaf was then tested for starch using iodine solution. Which diagram shows the correct result of the test?



(1 mark)

(Total for Question 1 is 3 marks)

2. Plants carry out photosynthesis in order to have chemical energy for their processes.

a) Identify the **two** substances produced by photosynthesis.

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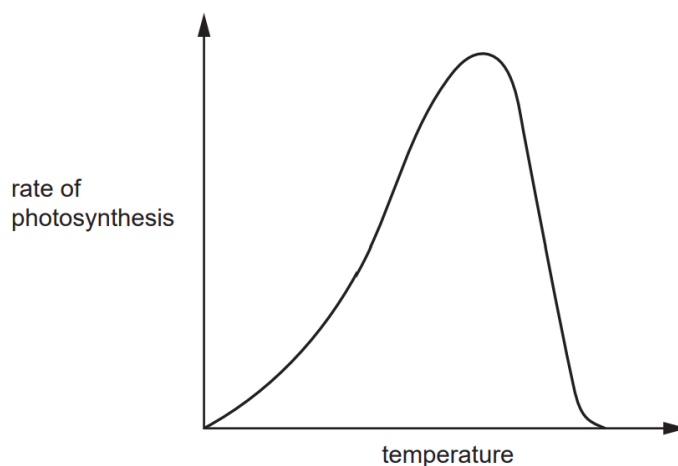
(2 marks)

b) Give the balanced symbol equation for the process of photosynthesis.

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(3 marks)

A student investigated how temperature affects the rate of photosynthesis. The figure below shows the rate of photosynthesis as temperature increased.



All other variables were kept constant.

c) Explain why the rate of photosynthesis decreased after 25 degrees Celsius.

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(3 marks)

d) Identify **two** other variables that would need to be kept constant during this practical.

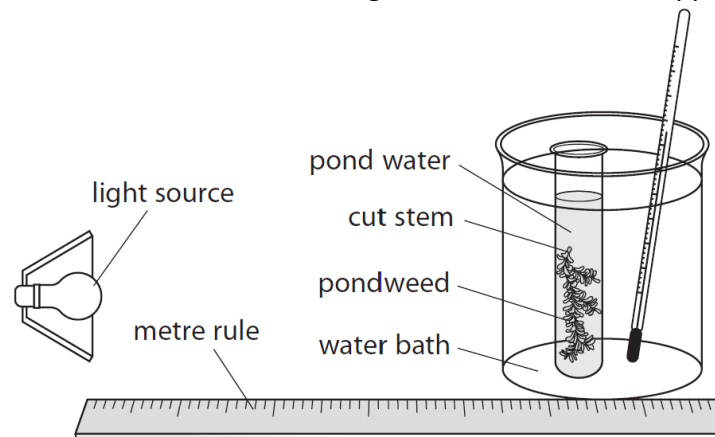
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(2 marks)

(Total for Question 2 is 10 marks)

3. A student did an investigation to determine the effect of light intensity on the photosynthesis of pondweed. The student placed a light source at set distances from the pondweed.

The pondweed then produced bubbles. These bubbles were counted for 5 minutes before the light source was moved to the next set distance. The figure below shows the apparatus that was used.



- a) State **two** variables that should be controlled when completing this investigation.

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(2 marks)

- b) Give the **word** equation for the process of photosynthesis.

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(2 marks)

- c) Describe the role of chlorophyll in photosynthesis.

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(2 marks)

- d) Which organelle is the site of photosynthesis within the plant cell?

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(1 mark)

- e) Why did the student include a water bath in their apparatus.

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(2 marks)

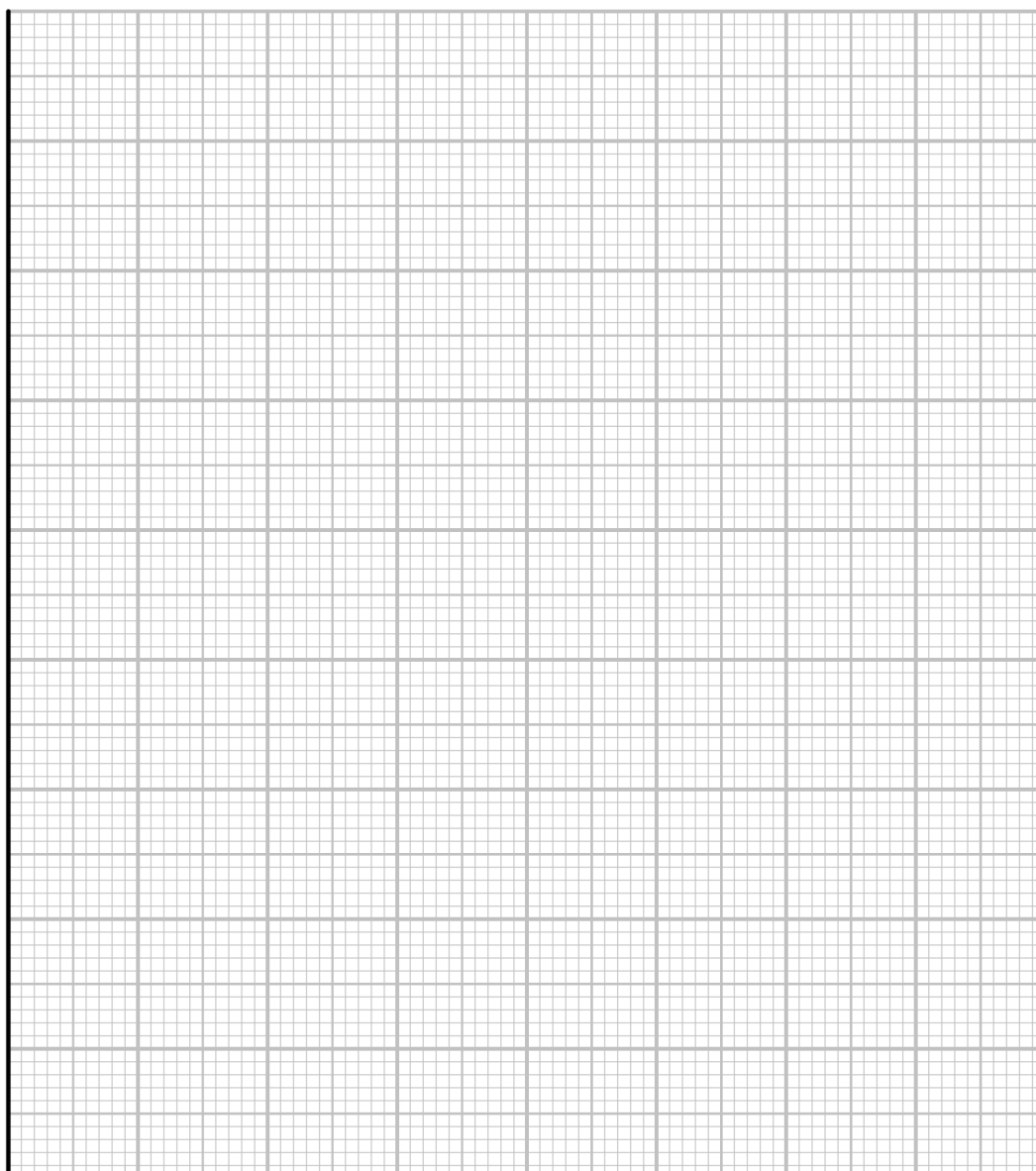
The table below shows the results of the student's investigation.

Distance of the light source (m)	Number of bubbles in 5 minutes
0.10	140
0.20	80
0.30	55
0.40	34
0.50	12

f) Plot the student's results on the graph below.

You should:

- label the x-axis.
- use a suitable scale.
- plot the data from the table.
- draw a line of best fit.



(4 marks)

The student repeated the experiment and took five readings for the number of bubbles produced at the distance of 0.20 m. The number of bubbles the student recorded were:

68

75

82

84

81

- g) Determine the mean value of the number of bubbles produced.

Mean = ...

(2 marks)

(Total for Question 3 is 15 marks)

4. Explain how light intensity, carbon dioxide concentration, and temperature can each affect the rate of photosynthesis in a plant.

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(6 marks)

(Total for Question 4 is 6 marks)

5. Photosynthesis involves reactions that are endothermic.

a) What is an endothermic reaction?

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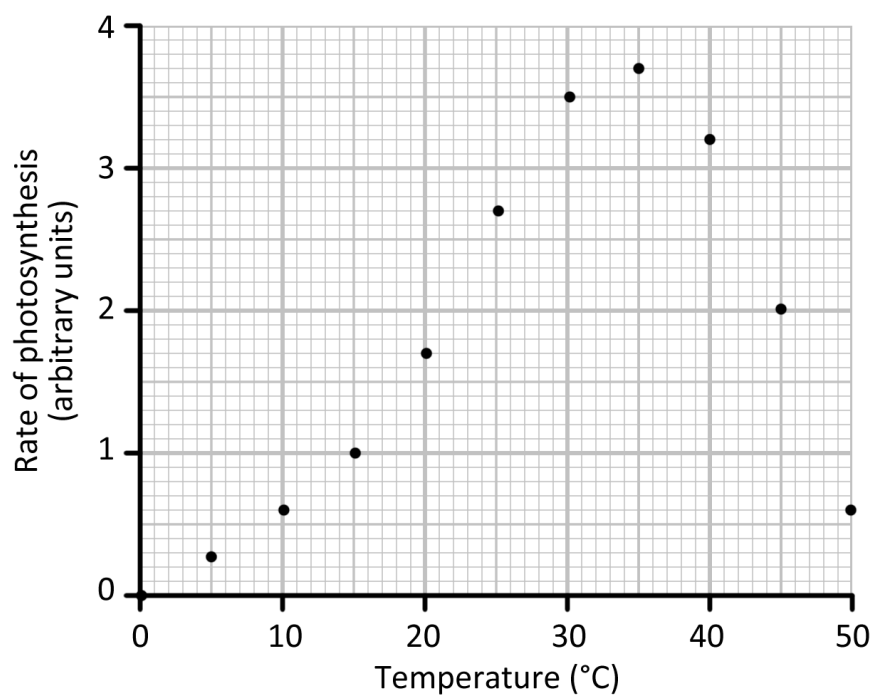
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(2 marks)

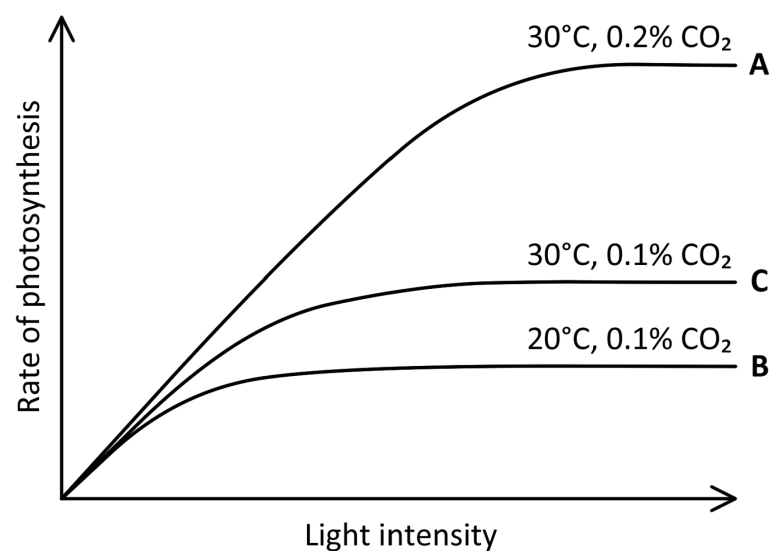
b) The graph is from an experiment to show the effect of temperature on the rate of photosynthesis.

Draw the line of best fit for this graph.



(1 mark)

Look at the graph. It shows how light intensity affects the rate of photosynthesis. The lines show different carbon dioxide concentrations and temperatures.



- c) Explain what is limiting the rate of photosynthesis at the three points A, B and C on the graph. Use evidence from the graph in your answer.

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(3 marks)

- d) Give the balanced symbol equation for the process of photosynthesis.

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(3 marks)

- e) Outline what happens to the glucose produced during photosynthesis in a plant.
Give at least **two** different uses.

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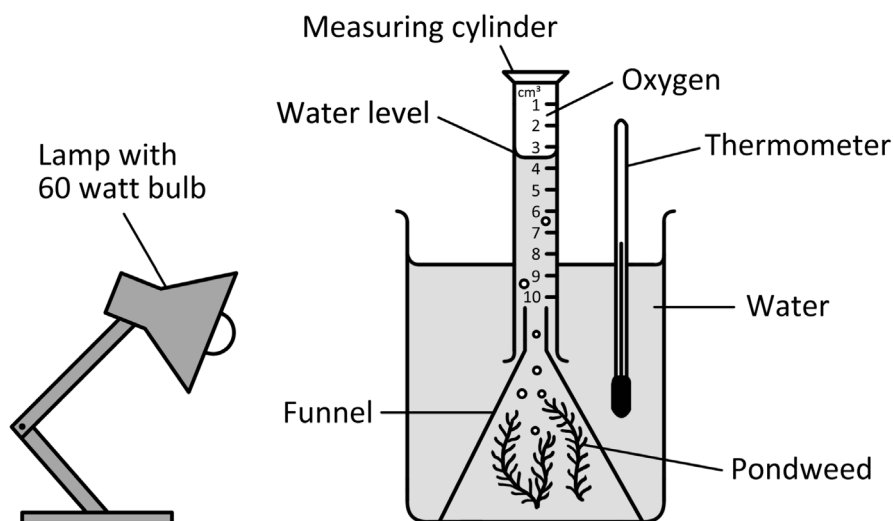
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(3 marks)

(Total for Question 5 is 12 marks)

6. A student is investigating the effect of light intensity on the rate of photosynthesis in a species of pondweed. They set up the following experiment:

A piece of pondweed is placed in a beaker of water connected to an inverted measuring cylinder to collect any gas produced. A lamp is used as the light source. The figure below shows the apparatus.



The distance between the lamp and the beaker is varied, and the volume of gas collected in 5 minutes is recorded at each distance.

The student's results are shown in the table below:

Distance between lamp and beaker (cm)	Volume of gas collected in 5 minutes (cm ³)
10	25
20	6
30	

- a) Name the gas that the pondweed is producing during photosynthesis.

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(1 mark)

The intensity of light decreases as the distance from the light source increases. The relationship between light intensity and distance follows the inverse square law.

- b) State the inverse square law in words, relating light intensity and distance.

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(1 mark)

- c) Using the student's results, explain whether the change in the volume of gas collected supports the idea that light intensity follows the inverse square law in this experiment. You should refer to the data in your answer.

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(4 marks)

- d) Suggest **one** way the student could improve the reliability of their results.

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(1 mark)

- e) Suggest **one** practical limitation of this experimental setup that might affect the accuracy of the results related to the inverse square law.

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(2 marks)

(Total for Question 6 is 9 marks)