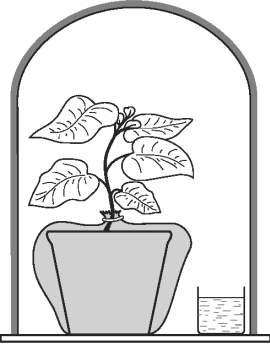# WJEC (Eduqas) Biology GCSE
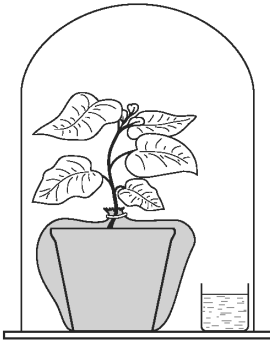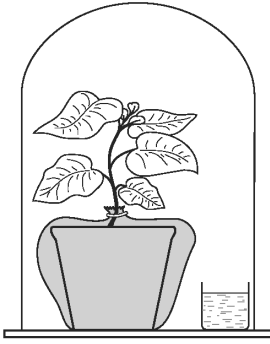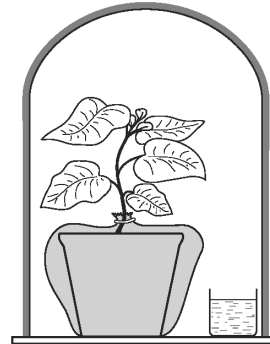
Topic 5 Photosynthesis

Questions by Topic

1.

(a) Complete the word equation for photosynthesis shown below. [2]

carbon dioxide + ... ⟶ glucose + ...

(b) The diagrams below show four experiments used to investigate the conditions needed for photosynthesis. Four well-watered potted green plants were placed in glass bell jars, which were sealed onto greased glass plates. The soil in each pot was covered with a polythene sheet. Each apparatus was then subjected to different environmental conditions.

Experiment A	Experiment B
• Bell jar covered in thick black paper • Beaker contains a chemical that **produces** carbon dioxide	• Beaker contains a chemical that **produces** carbon dioxide

Experiment C	Experiment D
• Beaker contains a chemical that **absorbs** carbon dioxide	• Bell jar covered in thick black paper • Beaker contains a chemical that **absorbs** carbon dioxide

(ii) The results from which **two** experiments should be compared to show that

I.   carbon dioxide is needed for photosynthesis, [1]

....

II. light is needed for photosynthesis? [1]

....

2.   *(a)*   (i)   Complete the following equation for photosynthesis in green plants.

.... + water $\xrightarrow{\text{light}}$ glucose + ... [1]

(ii)   Name the chemical substance which absorbs the light needed for photosynthesis.
[1]

....

(b)   A scientist investigated the rate of photosynthesis at different light intensities and temperatures. The results are shown in the graph.
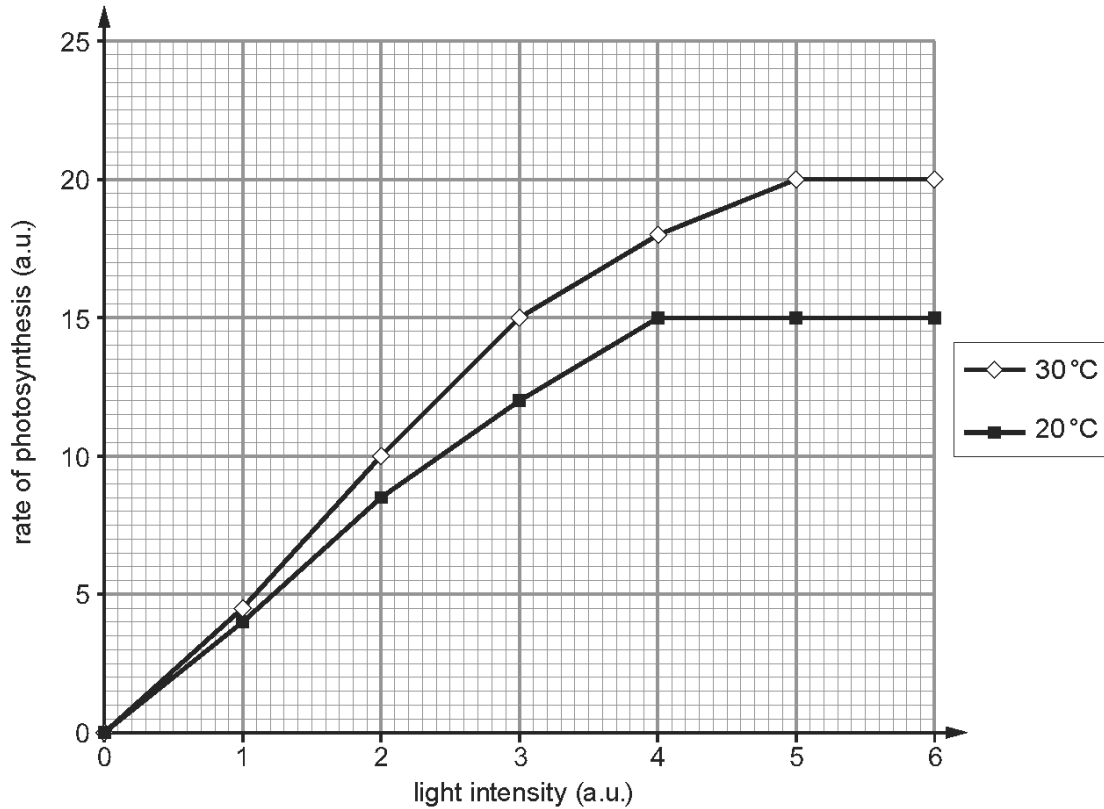
Use the graph to:

(i)   Describe in detail how light intensity affected the rate of photosynthesis at **20 °C**.
[2]

....

....

(ii)   Calculate the difference in the rate of photosynthesis between 20 °C and 30 °C at a light intensity of 3.5 a.u. [2]

difference in rate of photosynthesis .... a.u.

(iii)   Name **one** *other* environmental factor which can affect the rate of photosynthesis.
[1]

....

(a) State what the investigation shown opposite demonstrates. [1]

....

....

3.

A plant was destarched. A leaf on the plant was treated as shown in diagram **M** below. The plant was then placed in bright sunlight for 6 hours. The leaf was removed and tested for starch. The result is shown in diagram **N**.

Diagram **M**
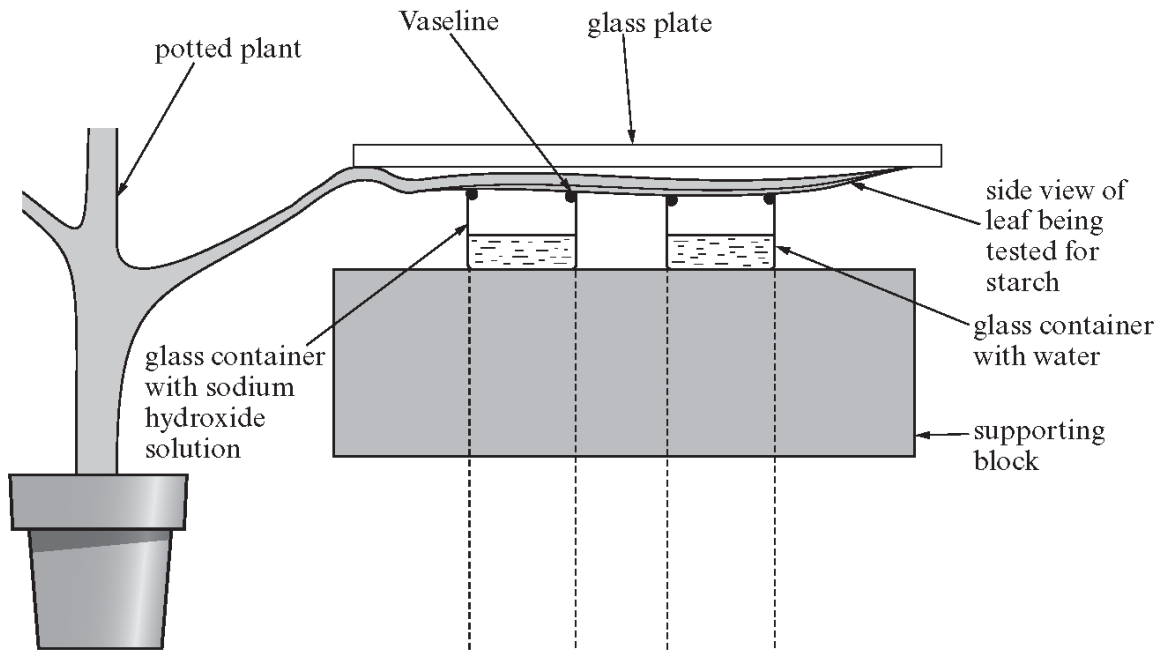
Diagram **N**

surface view of leaf after being tested for starch
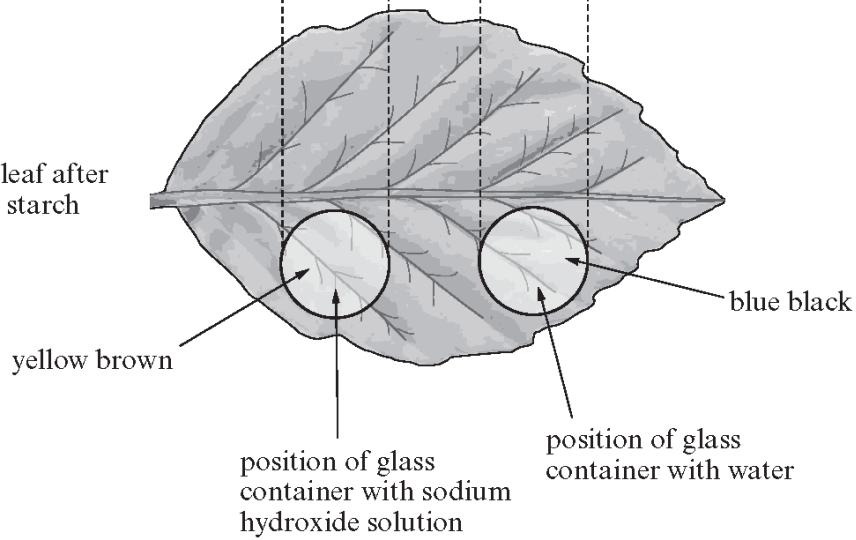
(a)   State what the investigation shown opposite demonstrates.   [1]

....

....

4.

Some physical and chemical changes were measured in a rock pool on the sea shore at low tide. The measurements were made during daylight hours over a period of one week. The rock pool contained a high biodiversity of animals and algae.

The results are shown in the table below.

Time of day	Physical and chemical conditions in rock pool water			
	Carbon dioxide (mg/l)	Oxygen (mg/l)	Temperature (°C)	Salt (%)
10 am	97.0	9.4	14.4	3.25
11 am	84.7	10.9	14.7	3.26
12 noon	74.3	13.9	15.6	3.27
1 pm	60.6	14.0	20.8	3.29
2 pm	50.8	17.4	21.3	3.41
3 pm	65.1	15.1	19.6	3.33
4 pm	85.0	13.2	15.3	3.26

(a) Which limiting factor of photosynthesis is influenced by the animals in the rock pool? [1]

....

(b) Explain the effect of temperature on the salt concentration in the rock pool. [2]

....

....

....

(c) Explain how the animals living in the rock pool could be affected by an increase in the salt concentration of the water. [4]

....

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....

5. The experiment was set up in a school laboratory using the apparatus shown below and left near a window for 4 days.
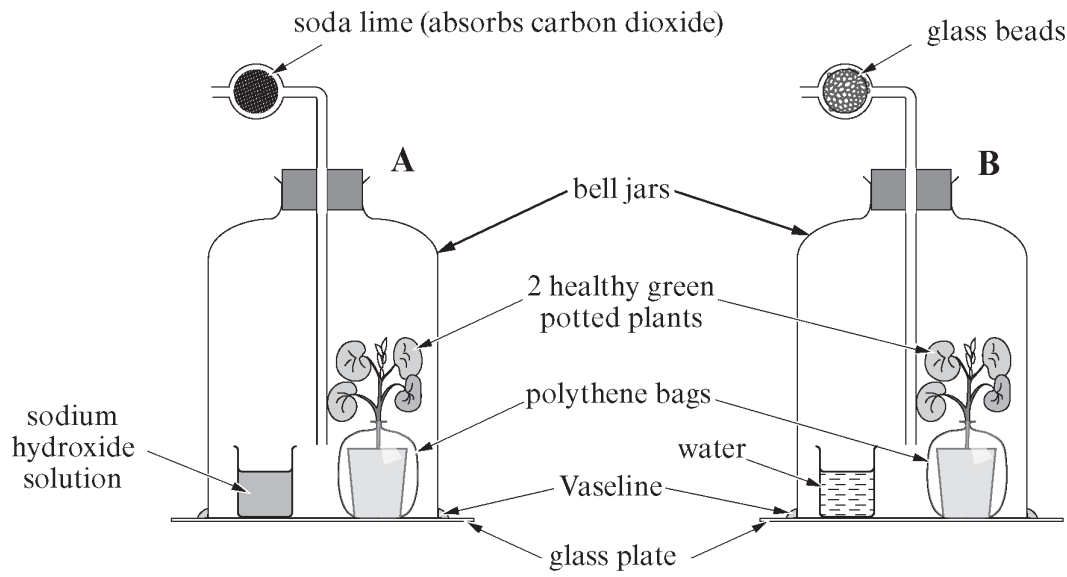
(a) State the purpose of the experiment. [1]

....

(b)

....

....

(iii) the apparatus labelled **B**. [1]

....

....

(iv) the Vaseline. [1]

....

....

6.

The diagram below shows a transverse section through a leaf.

epidermis

= palisade
A ....

xylem

= spongy
B ....

phloem

stomata
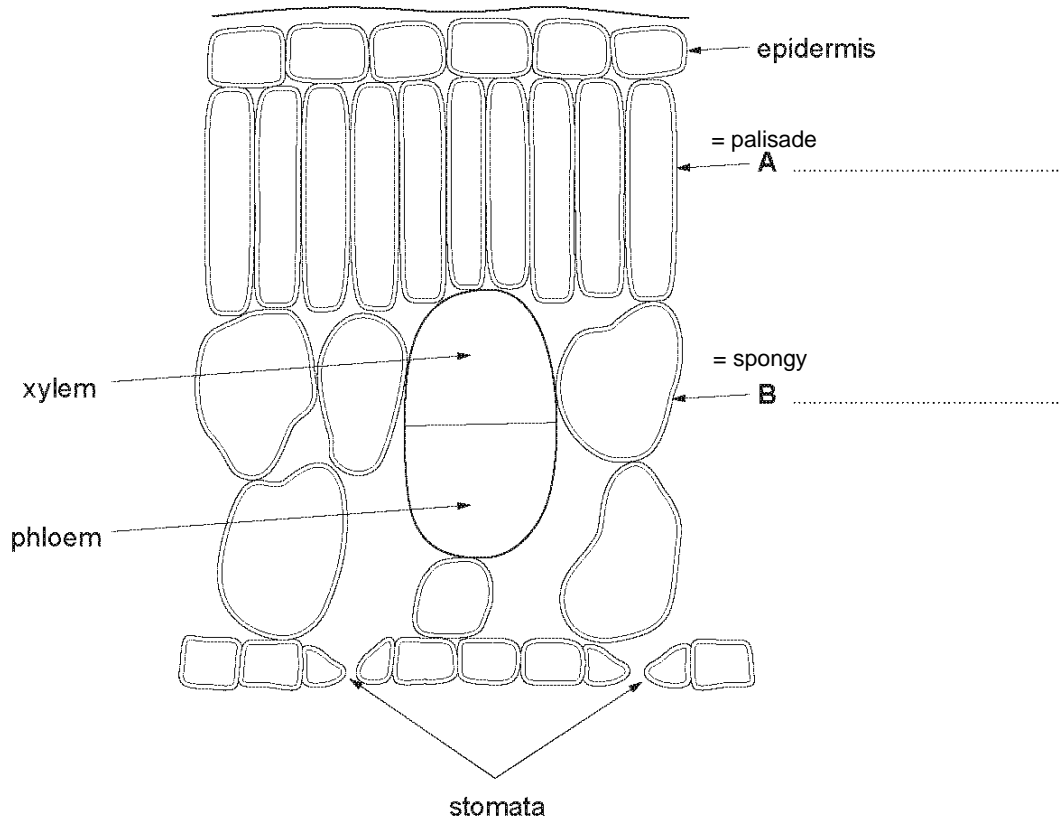
(b) (i) Name the process which occurs in layers **A** and **B** that produces sugars. [1]

....

7.

The graphs below show changes in the concentration of two gases, **A** and **B**, in a rock pool in St Brides Bay, Pembrokeshire over a 4-day period. The rock pool has a high biomass of plants.
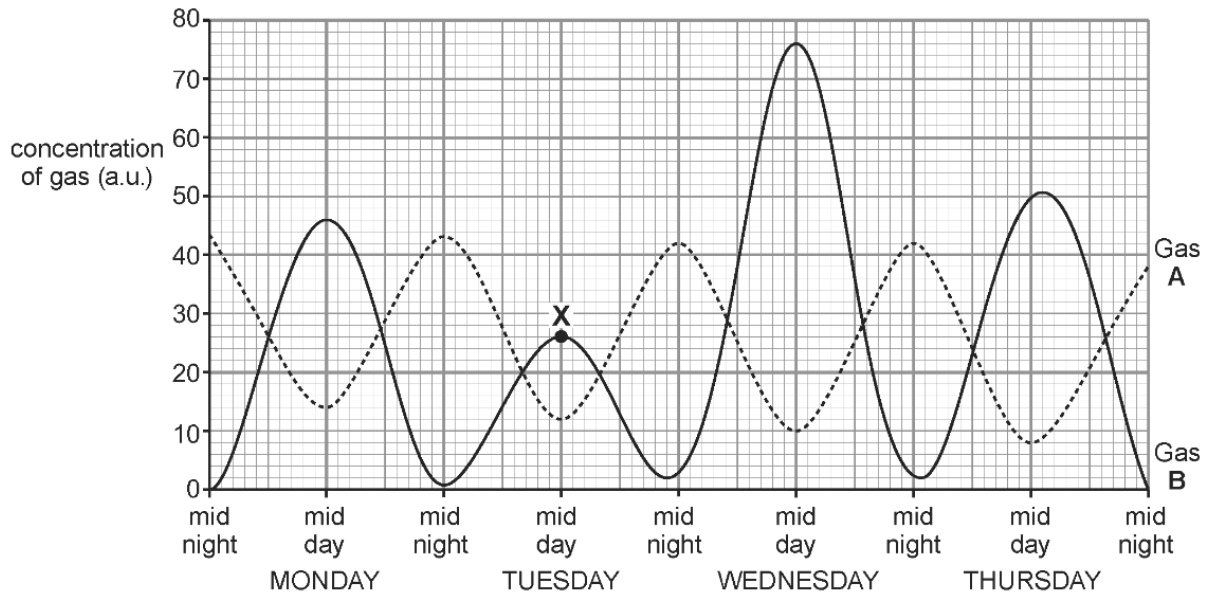
(a) (i) Identify gases **A** and **B**.   [2]

Gas **A** ....

Gas **B** ....

(ii) Explain the results at midday for gas: [4]

A; ....

....

....

B. ....

....

....

(iii) Suggest a reason for the lowest peak at point **X**.   [1]

....

(iv) Calculate the mean maximum concentration of gas **B** over 4 days.   [2]

mean maximum concentration of gas **B** = ... a.u.

(b) Name the limiting factor that can be deduced from the data in the graph.   [1]

....

10

8.

    (a)   **Write out** the **word** equation for photosynthesis. [1]

....

    (b)   The graph below shows how the sugar concentration in maize plants changes during a 24 hour period.
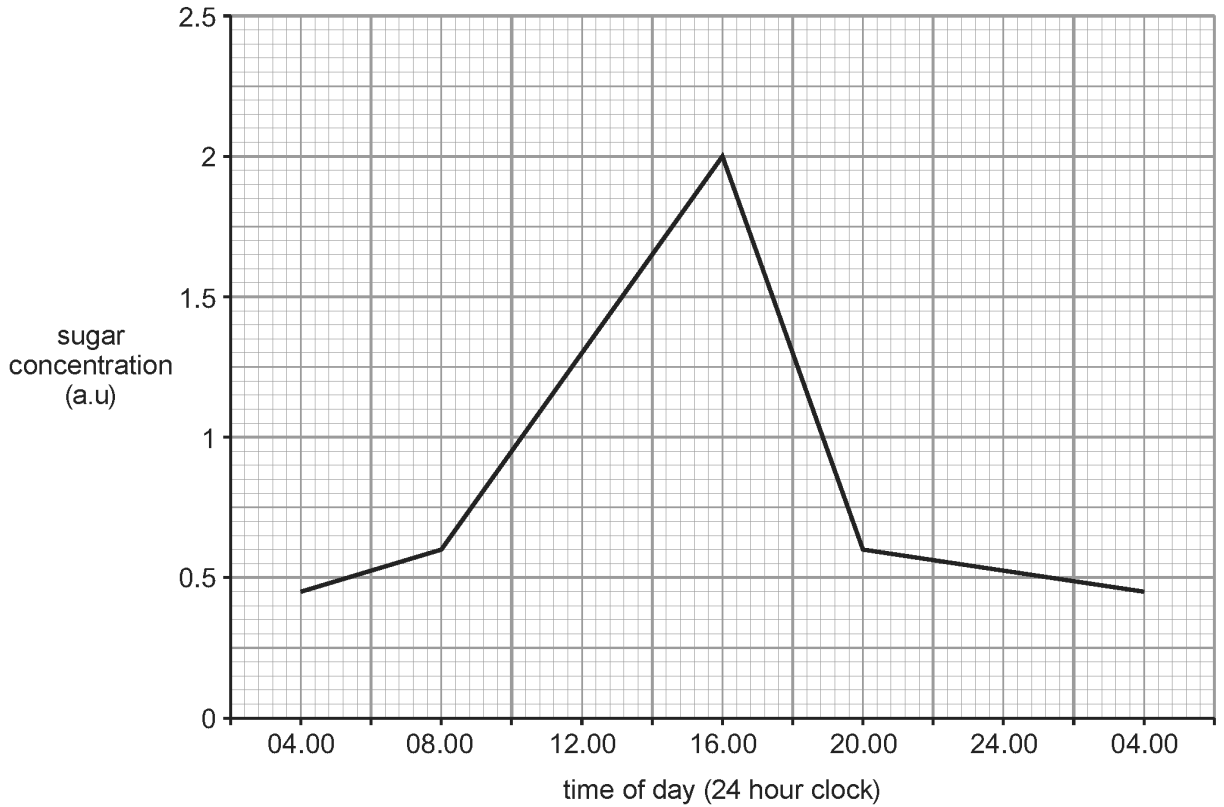
Describe and explain the changes in the sugar concentration between

    (i)   08.00 hours and 16.00 hours. [2]

....

....

....

    (ii)   20.00 hours and 04.00 hours. [3]

....

....

....

9.

    (a)   Complete the sentences below. [2]

During photosynthesis chlorophyll absorbs .... energy. Carbon

dioxide and .... are converted into glucose and

....

10.

A photograph of the microorganism *Anabaena variabilis* and diagrams of two other microorganisms are shown below. The length of each cell is also given.

| *Anabaena variabilis*
cell length 16µm | alga
cell length 12µm | bacterium
cell length 1µm |
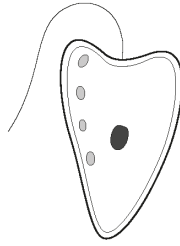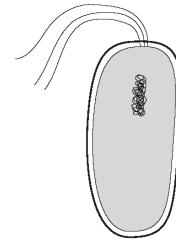
(a) Scientists once thought that *Anabaena* was an alga. Now they think it is a bacterium, as the cell does not have a nucleus.

(b) Cells of *Anabaena* contain chlorophyll and carry out photosynthesis.

(i) Complete the word equation below for photosynthesis. [1]

.... + water ⟶ glucose + ...

(ii) State the function of chlorophyll in photosynthesis. [1]

....

11.

Tradescantia is a plant whose leaves have green and white areas.

Tradescantia leaves

In the experiment below, a *Tradescantia* plant is used in an investigation to demonstrate **three** factors, **A**, **B** and **C**, needed for photosynthesis.

A1 appearance of partly-covered leaf **after starch test**

blue-black areas

area covered by black paper

A leaf partly-covered with black paper

Tradescantia plants

cotton wool

B

green area

white

appearance of leaf before starch test

20% solution of sodium hydroxide

B1

blue-black area

C

brown area

C1

leaf after starch test
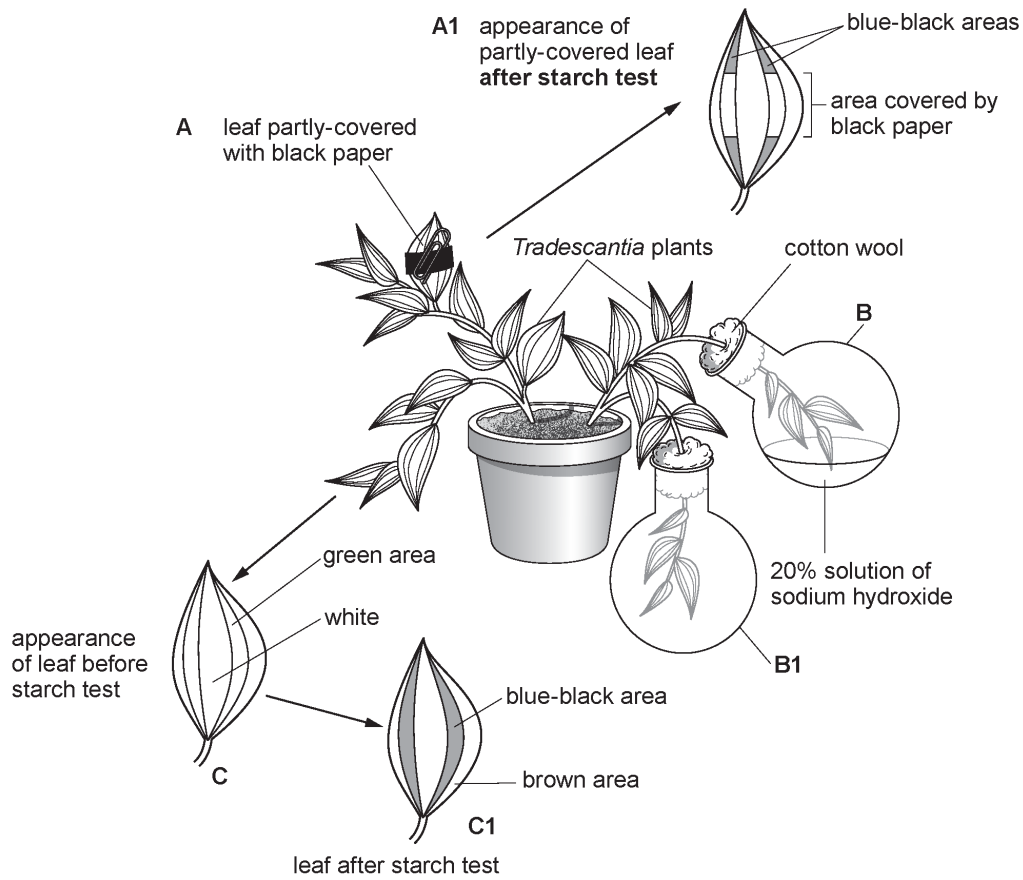
(a) (i) State the factor needed for photosynthesis, which is being demonstrated in each of the following: [3]

A ....

B ....

C ....

(ii) How could the experiment in flasks **B** and **B1** be improved? Explain your answer. [2]

....

....

(iii) Before the apparatus was set up, the *Tradescantia* plant was kept in a dark cupboard for 48 hours. Explain the reason for this. [2]

....

....

12. *(a)* (i) Write the **word** equation for photosynthesis. [2]

....

(ii) State the name of the pigment present in plant cells which absorbs light. [1]

....

Phoebe and Adam used the apparatus below to study the rate of photosynthesis in the pondweed *(Elodea sp.)*.
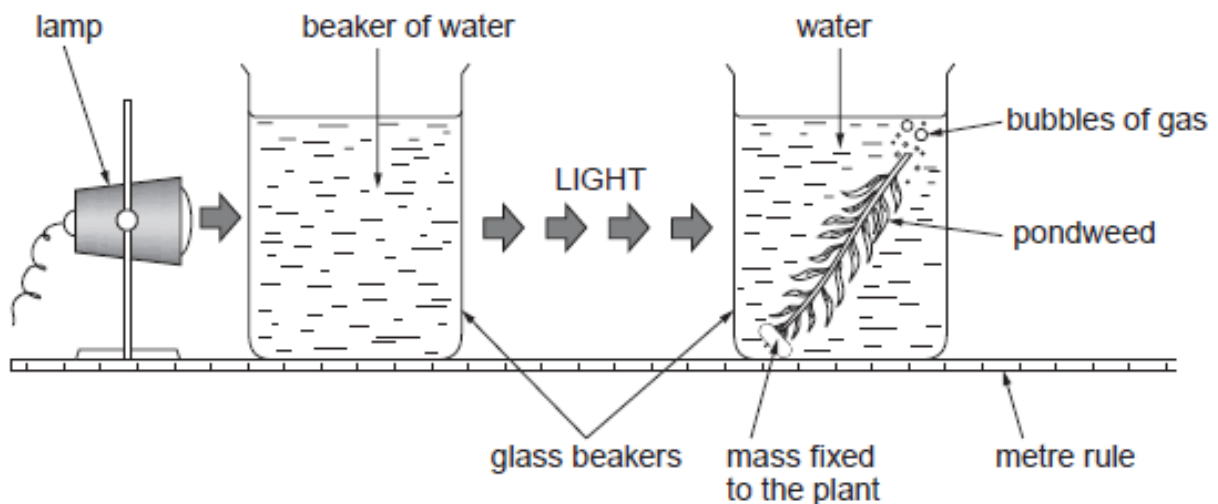
The number of gas bubbles per minute produced by the pondweed was counted at different distances from the light.

The experiment was carried out three times at each distance.

The results are shown below. Means were calculated to the nearest whole number.

Distance of lamp from pondweed (cm)	Number of bubbles per minute			
	Test 1	Test 2	Test 3	Mean
10	19	32	25	25
20	14	20	20	18
30	11	15	17	....
40	7	10	13	10
50	5	9	11	8

(b) **Complete the table** opposite by calculating the mean number of bubbles for a distance of 30 cm. **Write your answer in the table.** [2]

(c) State the relationship between the distance of the lamp from the pondweed and number of bubbles produced per minute. Explain your answer. [3]

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(d) Explain why a beaker of water was placed between the lamp and the pondweed. [1]

....

....

(e) State how you could improve the accuracy of this investigation. [1]

....

13.

(a)   (i)   Complete the word equation for photosynthesis below.

$$\text{...................................} + \text{...................................} \xrightarrow{\text{light}} \text{glucose} + \text{oxygen}$$ [2]

(ii)   Name the substance in plant cells which absorbs light.   [1]

....

(b)   Students investigated photosynthesis in a plant. They used a data logger to monitor the oxygen given out by the plant at different light intensities, as shown in the diagram below. They used the same plant for the same time at each light intensity.
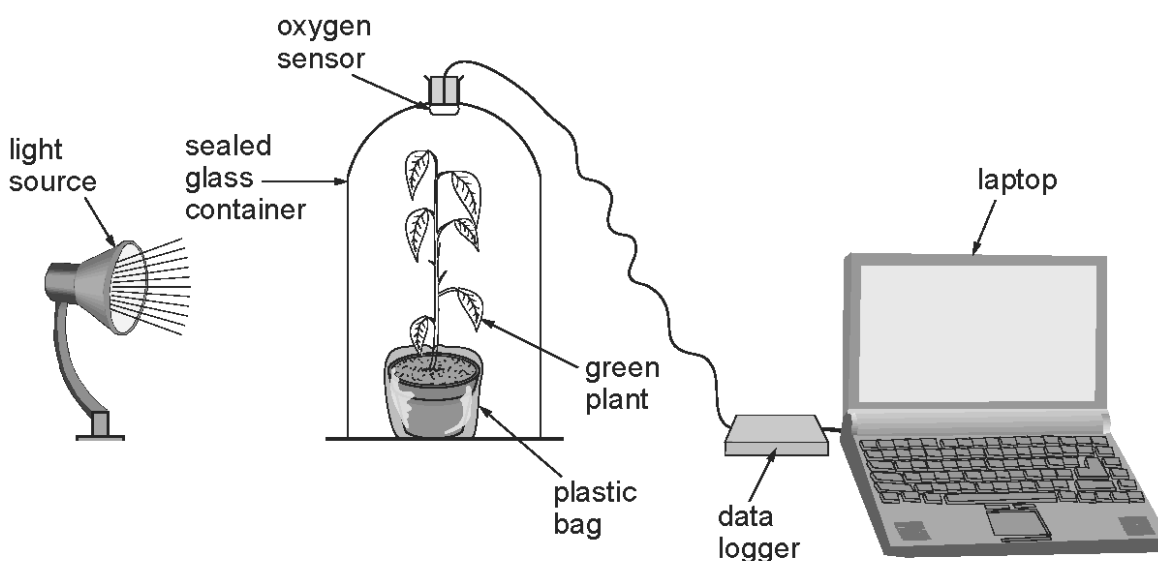
The results of the investigation are shown in the table below.

Light intensity (a.u.)	Oxygen level (a.u.)
10	5
15	7
20	11
25	20
30	29
35	34

(i)   Draw a line graph of the data above on the grid opposite by:

I.   choosing a suitable scale for light intensity;   [1]

II.   plotting the points shown above;   [2]

III.   joining your plots, using a ruler.   [1]
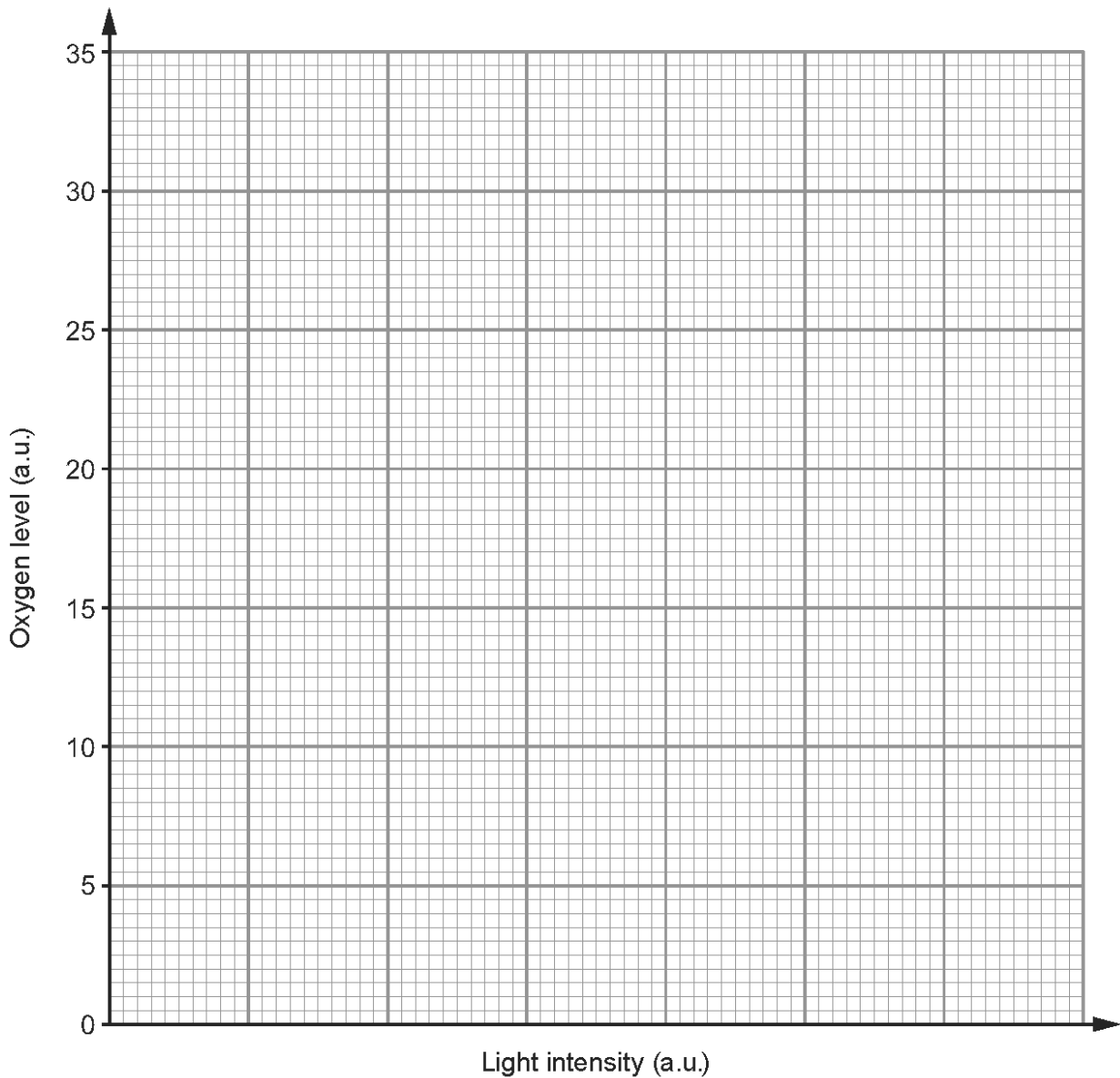
(ii) Use your graph to answer the following questions.

    I. How does the concentration of oxygen change as light intensity increases? [1]

....

    II. Which change in light intensity shown below causes the greatest change in the oxygen concentration? **Circle** the correct answer. [1]

    12 – 15 a.u.   22 – 25 a.u.   32 – 35 a.u.

(iii) State **one** way in which the students tried to make their investigation a fair test. [1]

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14.

Describe the process of photosynthesis with reference to the production of materials in plant cells. In your account, identify relevant limiting factors. [6 QWC]

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15.

In a classroom exercise some students used a computer simulation to investigate the factors affecting the rate of photosynthesis. A well-watered plant, was placed inside a transparent sealed container with a high intensity lamp above the plant. The air in the airtight container was continually monitored in order to measure the rate of O_2 production

- The light intensity of the lamp could be varied between 0 - 100 %.
- The CO_2 concentration of the air inside the sealed container could be varied between 0 – 1000 ppm.
- The temperature inside the sealed container could be varied between 0 – 50 °C.
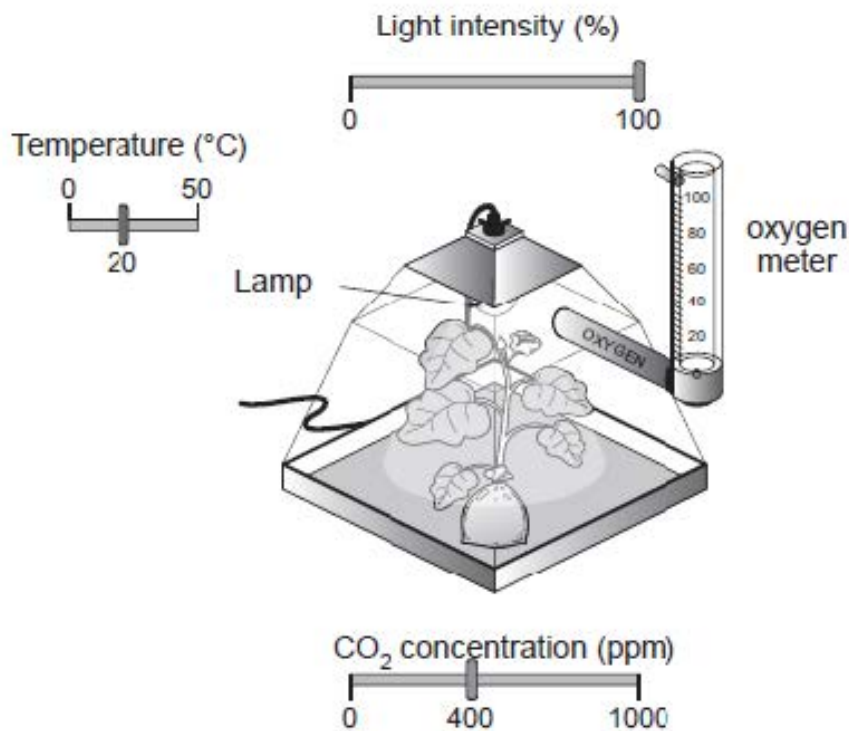
The table below shows the results obtained by one of the students.

Reading number	Light intensity (%)	Temperature (°C)	CO_2 concentration (ppm)	O_2 production (cm^3/h)
1	0	10	0	0.0
2	20	10	200	3.1
3	40	10	200	3.1
4	40	10	400	3.1
5	40	20	400	34.7
6	60	20	400	41.7
7	80	20	400	41.7
8	100	25	400	41.7
9	100	25	600	47.3

(a) Explain how oxygen production can be used as a measure of the rate of photosynthesis.
[3]

....

....

....

....

....

(b) Explain why oxygen production remains at $3.1\,cm^3$/h for readings **2**, **3 and 4**. [2]

....

....

....

....

....

(c) Identify the limiting factor for readings **6**, **7**, **8 and 9** and explain your answer. [2]

....

....

....

....

....

(d) State why the container must be sealed. [1]

....

....

(e) Sian and Dafydd are students who carried out the computer simulation. Sian suggested that they try to set up a 'live version' of the apparatus in the laboratory. Dafydd said that if they did this, a problem could arise which would affect the validity of the experiment. Suggest the problem that may arise and how this could be solved. [2]

....

....

....

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