

1 (a) State the balanced chemical equation for photosynthesis.

$$\text{.....} \xrightarrow[\text{chlorophyll}]{\text{light}} \text{.....}$$

[2]

A student investigated the effect of different wavelengths of light on the rate of photosynthesis of the water plant, *Cabomba*.

The student used the apparatus shown in Fig. 6.1.

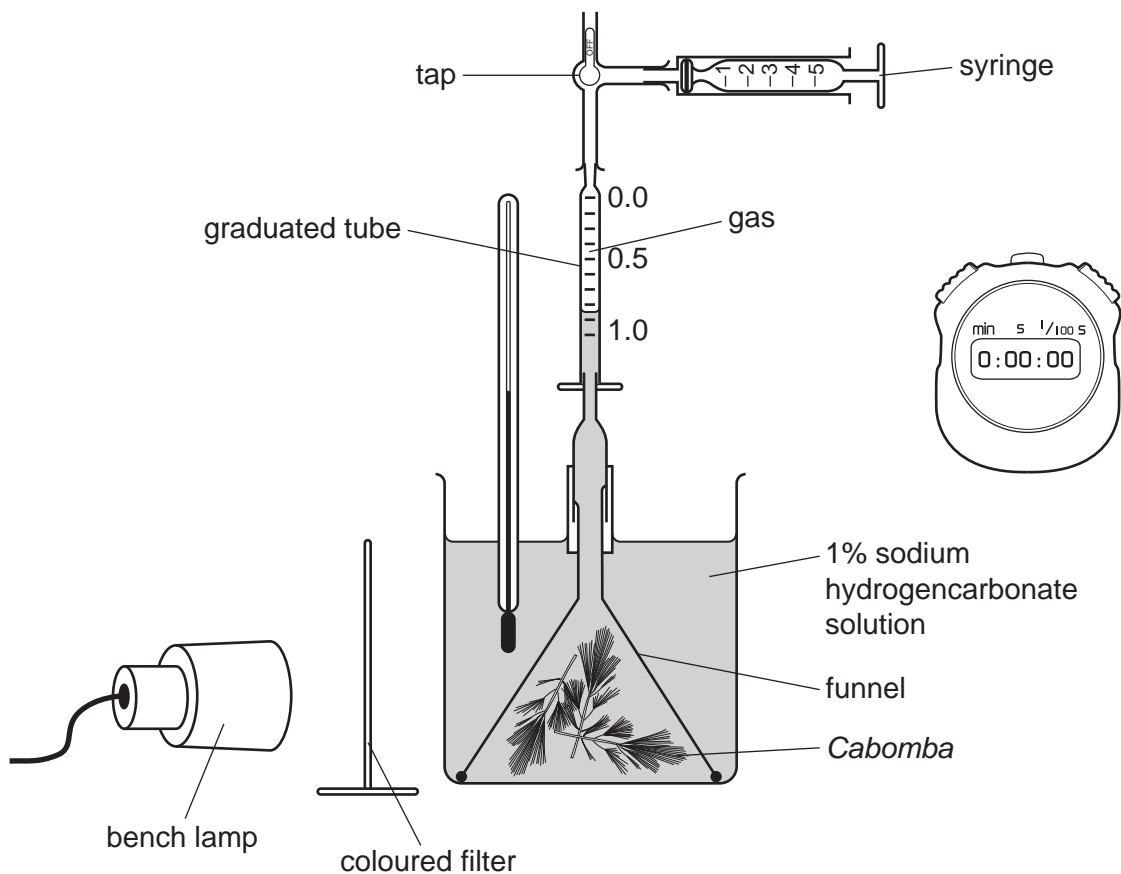


Fig. 6.1

- (b) The student collected the gas produced by the plant for five minutes. The results are shown in Table 6.1.

Table 6.1

colour of filter	wavelength of light / nm	volume of gas collected / cm ³
violet	400	0.80
blue	475	0.80
green	550	0.20
yellow	600	0.40
red	675	0.90

Describe the effect of wavelength of light on the rate of photosynthesis as shown in the student's results in Table 6.1.

You will gain credit if you use data from the table.

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[3]

- (c) State how the student would calculate the rates of photosynthesis from the results in Table 6.1.

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[1]

(d) State why the student:

(i) kept the lamp at the same distance during the investigation,

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[1]

(ii) used sodium hydrogencarbonate solution.

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[1]

(e) State **three** uses in a plant of the carbohydrate produced in photosynthesis.

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2.....
3.....

[3]

[Total: 11]

2 Fig. 2.1 is a flow chart that shows the events that occur as light travels through the eye.

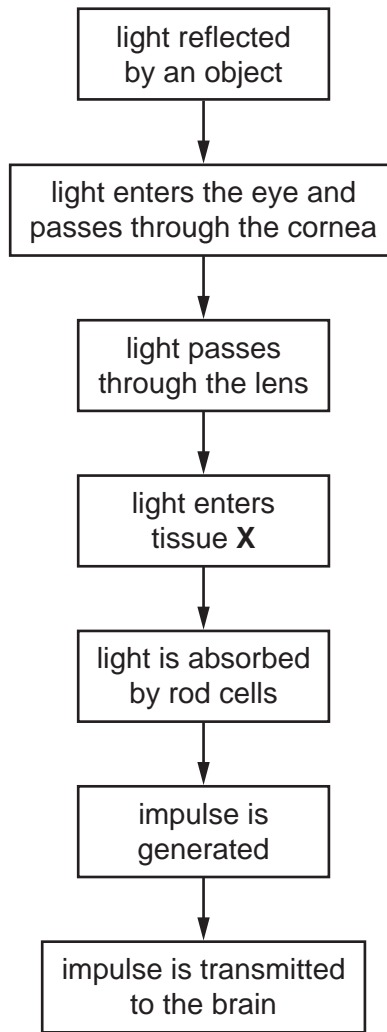


Fig. 2.1

- (a) (i) State the name of the tissue X.
..... [1]
- (ii) State the name of the nerve that transmits impulses from the eye to the brain.
..... [1]
- (iii) State what happens to rays of light as they enter the cornea and the lens.
..... [1]

(iv) Describe the role of rod cells.

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[2]

(b) A plant, *Arabidopsis thaliana*, was placed on its side in the dark. Fig. 2.2 is a series of drawings made of the plant, over seven days, as it responded to a change in its surroundings.

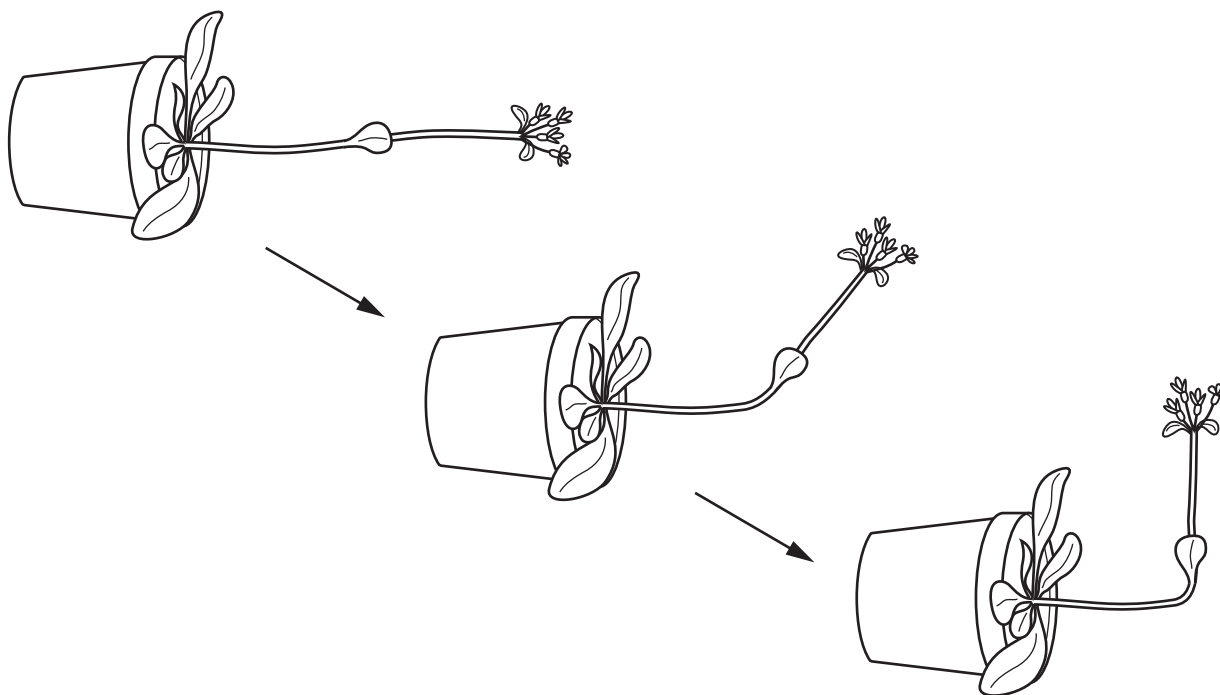


Fig. 2.2

(i) State the stimulus to which the plant responded.

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[1]

(ii) Name the growth response shown by the plant.

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[2]

(iii) Explain the advantage to plants of the growth response shown in Fig. 2.2.

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[2]

(iv) Auxins control the growth responses of seedlings.

Explain how auxins control the growth response of *A. thaliana*, shown in Fig. 2.2.

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[4]

[Total: 14]

- 3 A student carried out an investigation to find the effect of carbon dioxide concentration on the rate of photosynthesis of an aquatic plant.

The apparatus that the student used is shown in Fig. 2.1. The student was advised to use a light meter positioned at the same distance from the lamp as the pond plant. The student counted the number of bubbles produced by the cut end of the stem.

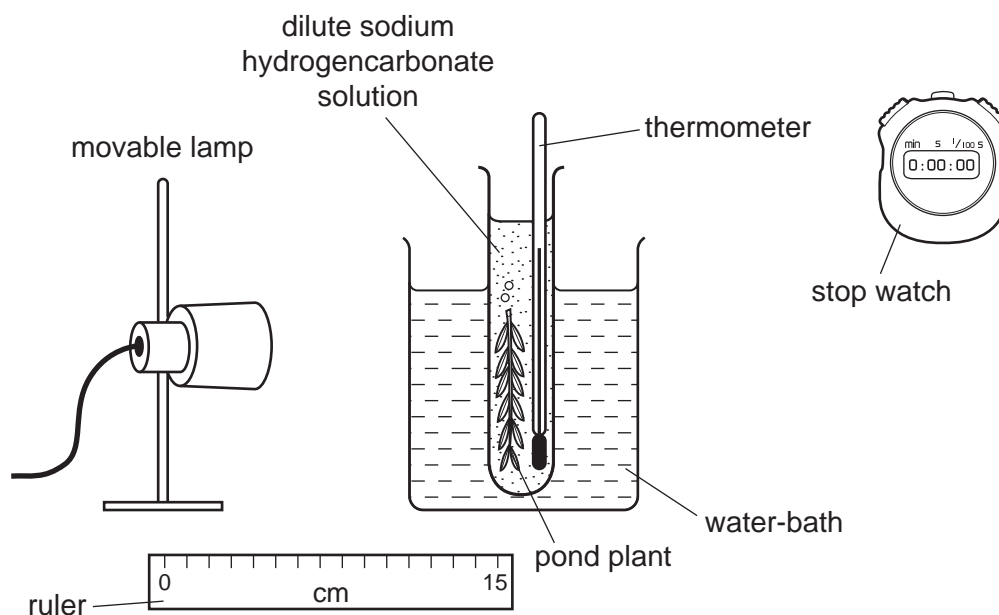


Fig. 2.1

(a) Explain why the student included the following in the apparatus.

- (i) The beaker of water and the thermometer.

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[2]

- (ii) The light meter and the ruler.

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[2]

(b) The results obtained by the student are shown in Fig. 2.2.

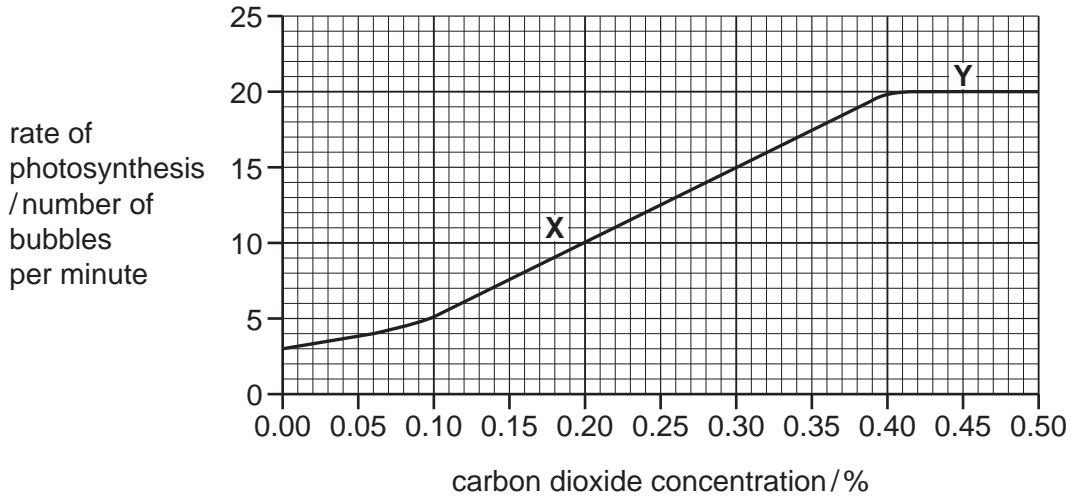


Fig. 2.2

(i) Describe the student's results.

You will gain credit if you use data from Fig. 2.2 in your answer.

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.....[3]

(ii) State the factor that is limiting the rate of photosynthesis in region X of the graph.

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(iii) Suggest **and** explain the reasons for the shape of the graph in region Y.

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.....[4]

(c) Counting bubbles may not be the best way to measure the rate of photosynthesis. The volume of the bubbles is not always exactly the same.

Suggest and explain **one** alternative way of measuring the gas given off to solve this problem.

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.....[3]

(d) Fig. 2.3 shows the carbon dioxide concentration in the atmosphere as determined at Mauna Loa in Hawaii between 1959 and 2013.

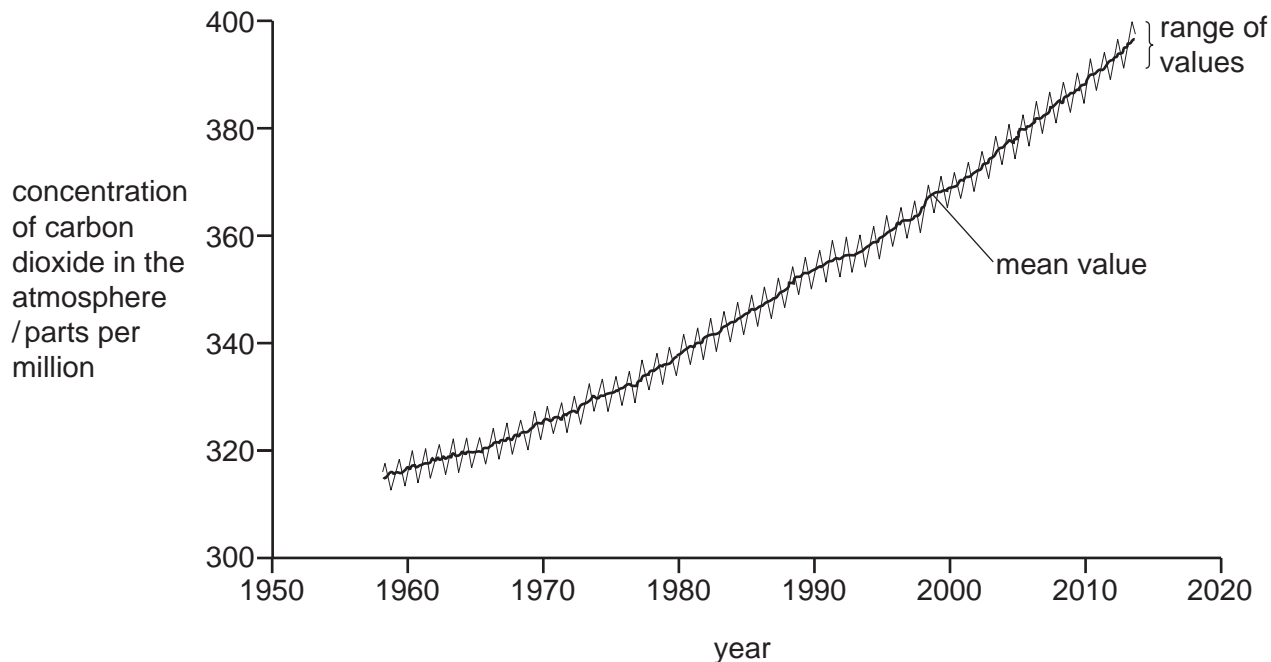


Fig. 2.3

(i) Explain why the concentration of carbon dioxide has increased between 1959 and 2013.

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.....[2]

