GCSE Biology B (Twenty First Century Science)

J257/04 Depth in biology (Higher Tier)

Question Set 6

1 Photosynthesis takes place in plants.

(a) Put **one** tick in each row of the table to show the function of each plant structure.

Plant structure	Function		
	Transports sugars made by photosynthesis.	**Carries out the reactions of photosynthesis.**	**Transports water needed for photosynthesis.**
Chloroplast		✓	
Phloem	✓		
Xylem			✓

[1]

Eve is investigating the effect of temperature on

photosynthesis in pondweed.This is her method.

1. Put a piece of pondweed in a boiling tube.
2. Cover the pondweed with sodium hydrogen carbonate solution (a source of carbon dioxide).
3. Put the boiling tube in a beaker of water at one of six temperatures.
4. Use a gas syringe to collect the bubbles of gas released from the pondweed.
5. Record the volume of gas collected in five minutes.
6. She repeats the experiment three times at each temperature.

Fig. 1.1 shows the apparatus Eve uses.

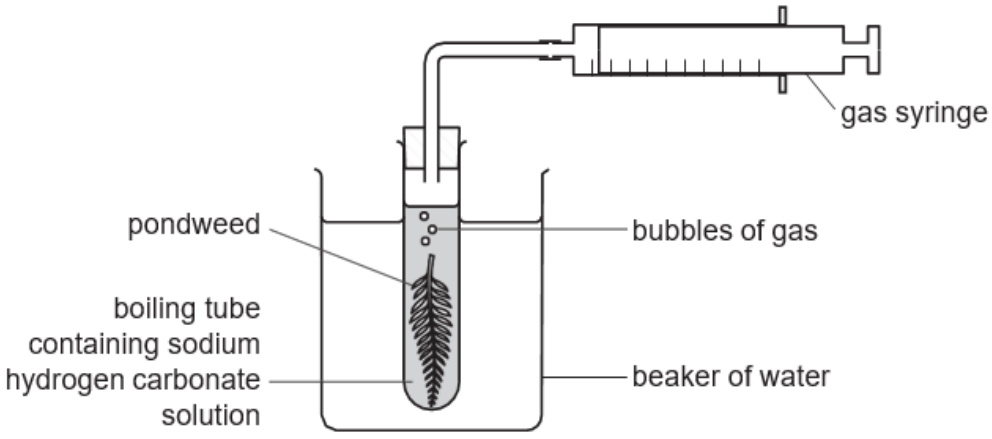

Fig. 1.1

(b) Temperature is the variable that Eve will change.

Write down **one** variable that Eve should control **and** describe how she could control it.

light intensity – maintain the same distance of the experiment from a lamp. **[2]**

(c) After she has finished the investigation, Eve uses her data to plot the graph in **Fig. 1.2**.

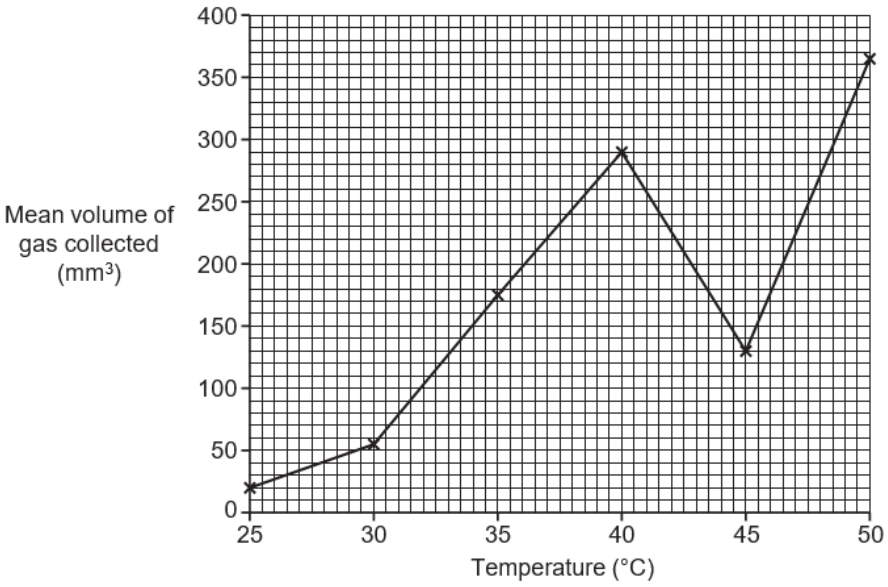

Fig. 1.2

(i) Eve decides to repeat the experiment at 45 °C so that she can take new measurements at this temperature.

Use evidence from **Fig. 1.2** to justify Eve's decision.

Her result for 45°C does not fit the general pattern of results so could be an anomaly. **[2]**

(ii) Here are Eve's new measurements.

Temperature (°C)	Volume of gas collected (mm^3)		
	Repeat 1	Repeat 2	Repeat 3
45	354	360	351

Use Eve's new measurements to complete the graph in **Fig. 1.3**.

[2]

$$\text{Mean} = \frac{354 + 360 + 351}{3}$$

$$= 355$$

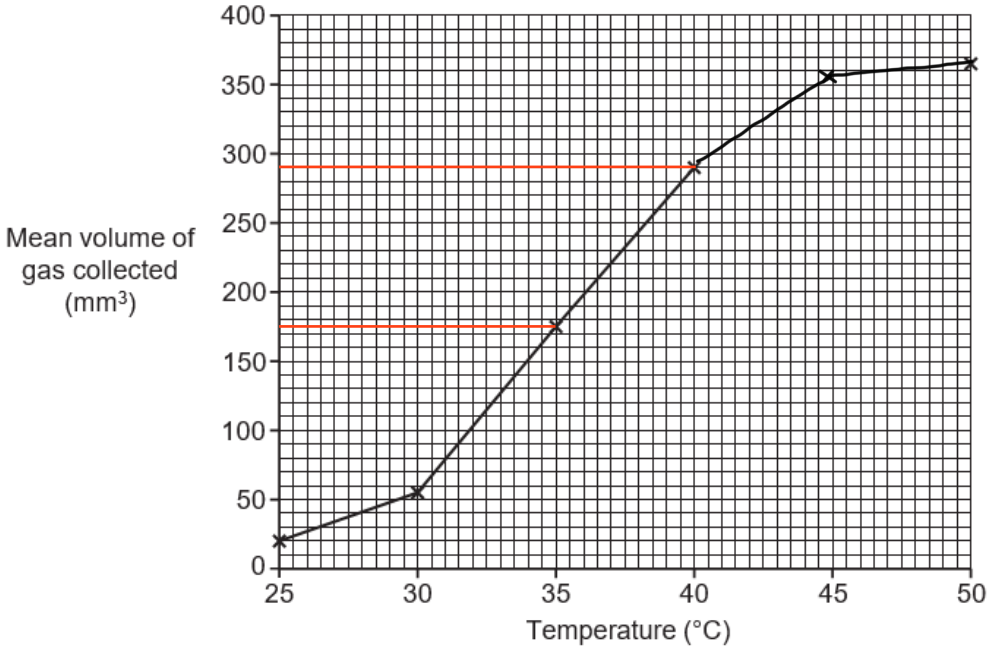

Fig. 1.3

(d) Describe the trend in the data shown in the graph in **Fig. 1.3**.

Use data from **Fig. 1.3** to support your answer.

As temperature increases, the volume of gas increases so the rate of photosynthesis increases. However, after 45°C, the rate increases more slowly - from 45°C to 50°C, the gas volume is increased by 10 mm³ only. The graph starts to level off. **[3]**

(e) The volume of gas collected changed as the temperature changed.

Calculate the change in volume per degree between 35 °C and 40 °C.

290 - 175 = 115

115 ÷ 5 = 23

Change in volume per degree = ... 23 mm³/°C **[2]**

Total Marks for Question Set 6: 12