

- 1 A student investigated the effect of different concentrations of salt solution on a hollow plant stem.

They were provided with a 2% salt solution and distilled water. The student used these to make up different concentrations of salt solution.

Step 1 Four test-tubes were labelled **1, 2, 3** and **4**.

Step 2 The information in Table 1.1 was used to make up the four different salt solutions in the test-tubes.

Table 1.1

test-tube	volume of 2% salt solution/cm ³	volume of distilled water/cm ³	final percentage concentration of salt solution
1	0	20	0.0
2	5	15	
3	10	10	1.0
4	20	0	2.0

- (a) (i) Complete Table 1.1 by calculating the final percentage concentration of the salt solution in test-tube **2**.

Space for working.

[1]

Step 3 The contents of each test-tube were poured into four Petri dishes labelled **1, 2, 3** and **4**.

Step 4 A hollow stem was cut into 12 rings using a sharp scalpel. Each stem ring was approximately 2 mm long, as shown in Fig. 1.1.

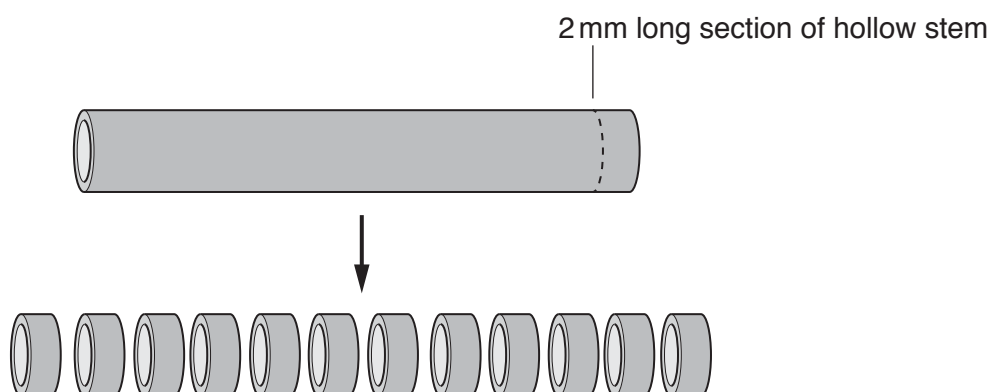


Fig. 1.1

Step 5 Each stem ring was then cut open as shown in Fig. 1.2.

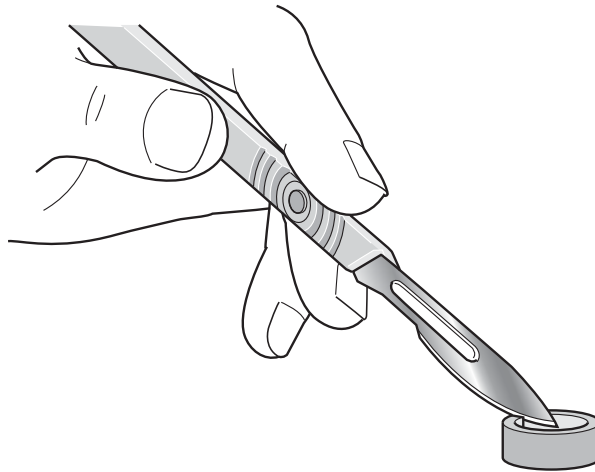


Fig. 1.2

Step 6 Three cut stem rings were put into each of the different salt solutions in the labelled Petri dishes and left for 10 minutes.

Fig. 1.3 shows the appearance of the cut stem rings **after** 10 minutes.

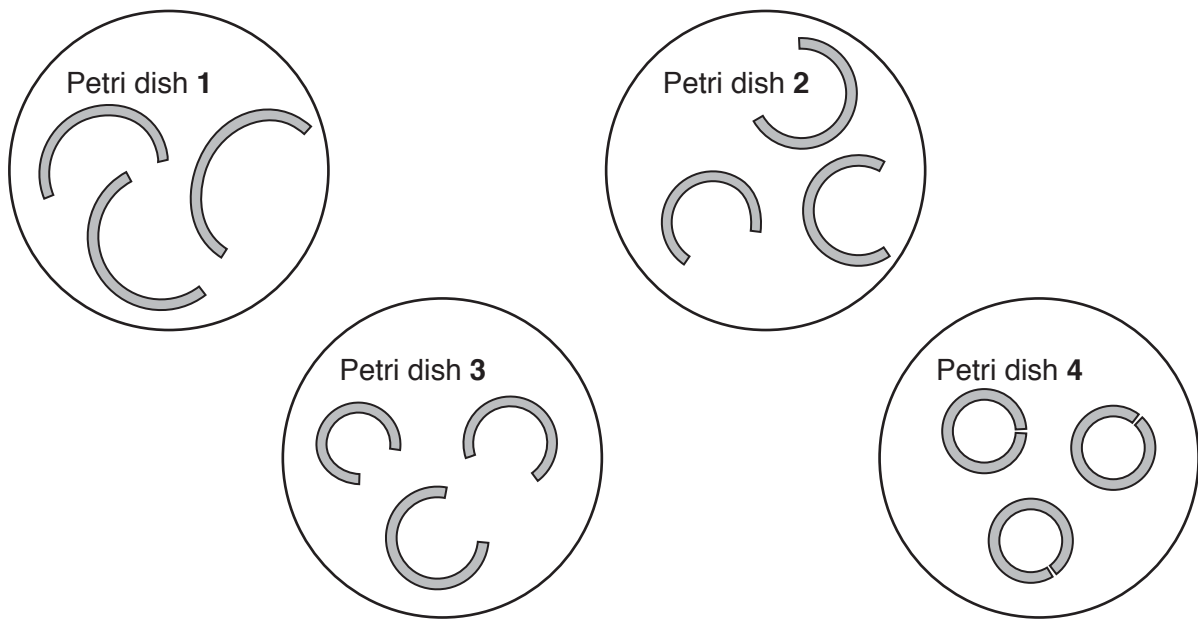


Fig. 1.3

Step 7 The distance between the two cut ends of each stem ring can be measured, as shown in Fig. 1.4.

In the example shown in Fig. 1.4 the distance is 12 mm.

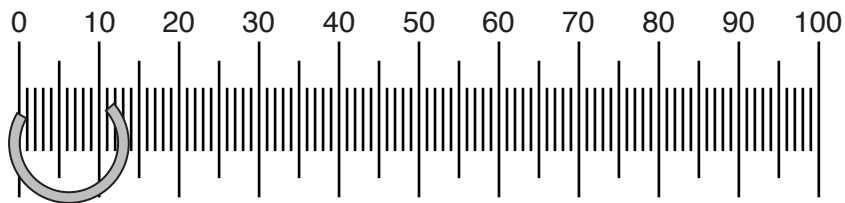


Fig. 1.4

- (ii) Measure the gap between the cut ends of all of the stem rings shown in Fig. 1.3.

Prepare a table in the space provided and record your measurements in your table.

Your table should show:

- all of your results
- a calculated average for each solution.

[4]

- (iii) Use Table 1.1 and your measurements to describe the results shown in Fig. 1.3.

.....

[1]

- (b) Identify one hazard in step 4 and describe a suitable safety precaution.

hazard

 precaution

[2]

- (c) Explain why more than one ring of the hollow stem was placed into each Petri dish.

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.....[2]

- (d) (i) State the variable that was changed (independent variable) in this investigation.

.....[1]

- (ii) Identify **two** variables that were kept constant in this investigation.

1

2[2]

- (e) There are potential errors in steps 4 and 7.

Identify **two** of these errors and suggest an improvement for each.

error 1

.....

improvement 1

.....

.....

error 2

.....

improvement 2

.....

.....[4]

- (f) Fig 1.5 shows a section through a hollow plant stem observed through a light microscope.

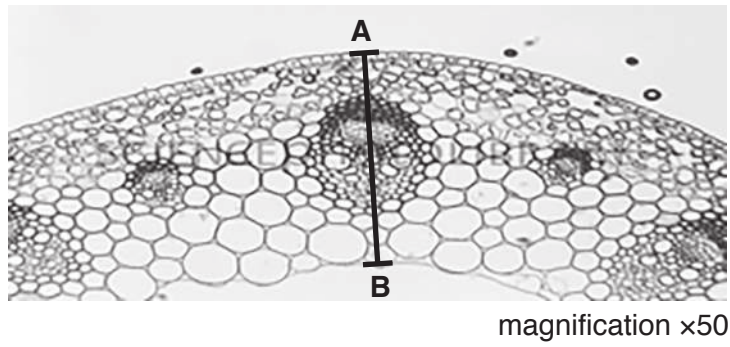


Fig. 1.5

Measure the length of **AB** on Fig. 1.5. Include the unit.

measured length of **AB** on Fig. 1.5

Calculate the actual length of **AB** using the following equation:

$$\text{magnification} = \frac{\text{measured length of } \mathbf{AB}}{\text{actual length of } \mathbf{AB}}$$

Show your working.

..... [3]

[Total: 20]

- 2 Fig. 2.1 shows an image of a monarch butterfly, *Danaus plexippus*.

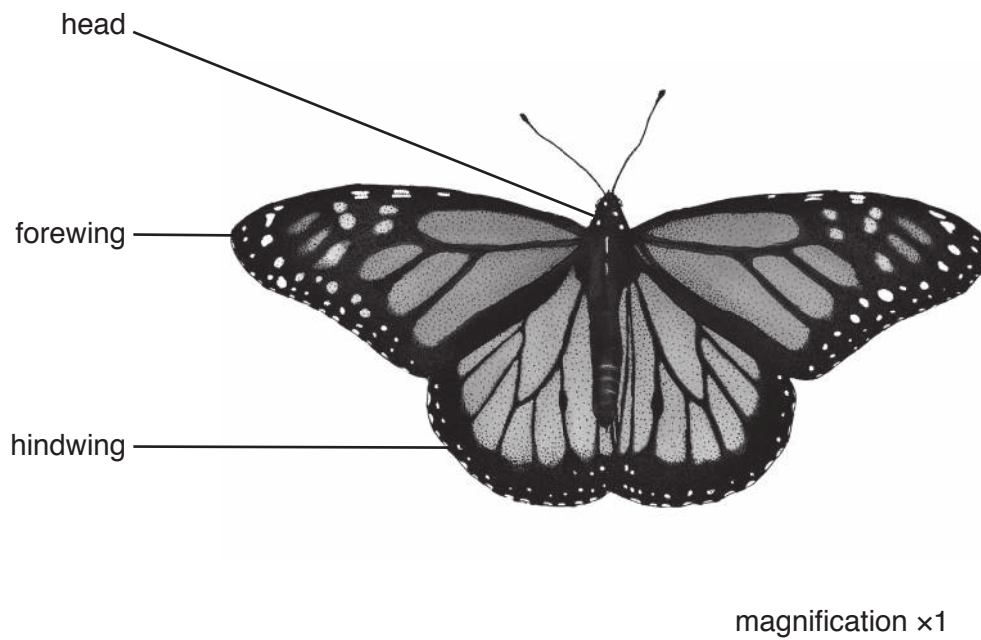


Fig. 2.1

- (a)** Make a large drawing of **one** of the hindwings of the monarch butterfly shown in Fig. 2.1.

(b) Fig 2.2 shows an image of a viceroy butterfly, *Limenitis archippus*.



Fig. 2.2

Describe **one** visible similarity and **two** visible differences between the viceroy and the monarch butterflies' **wings**.

similarity

.....

difference 1

.....

difference 2

.....

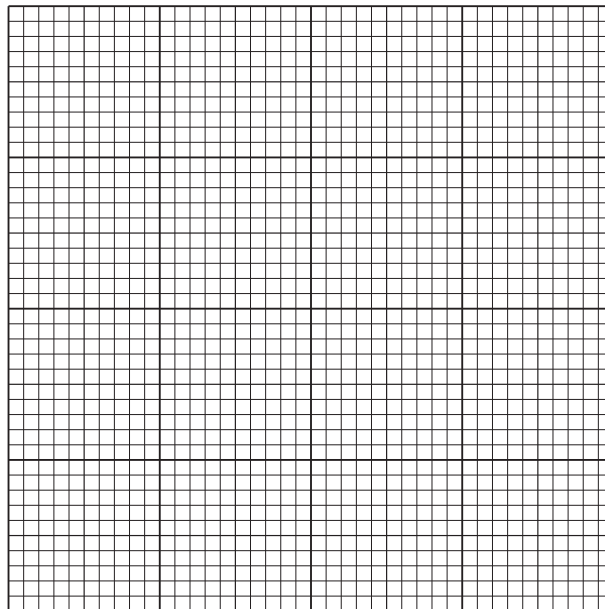
[3]

- (c) A student investigated the relationship between the body mass of monarch butterflies and the length of their forewings. The student recorded the data for five butterflies in Table 2.1.

Table 2.1

butterfly	body mass /g	forewing length /mm
A	0.2	38
B	0.3	42
C	0.5	50
D	0.7	58
E	0.8	62

- (i) Plot a graph on the grid to show the relationship between body mass and forewing length.



[4]

- (ii) Describe the relationship shown on the graph.

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[1]

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