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- 1 A student investigated the effect of temperature on water uptake in celery stalks.

Water is transported in the xylem tissue in plant stems.

- Step 1 One celery stalk was placed into a beaker containing **warm** red stain. Another celery stalk was placed into a beaker containing **cool** red stain.

This is shown in Fig 1.1.

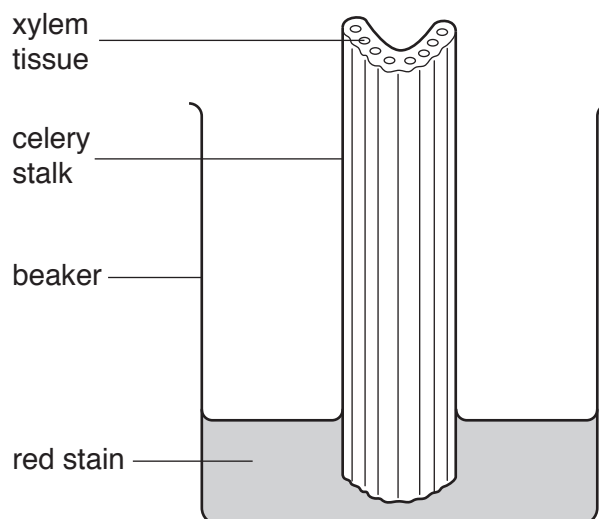


Fig. 1.1

- Step 2 Both celery stalks were left in the red stain for 10 minutes.

- Step 3 After 10 minutes the celery stalks were removed from the red stain.

- Step 4 A 5 mm section was cut from the end of the celery stalk which had been in the **warm** red stain, as shown in Fig. 1.2.

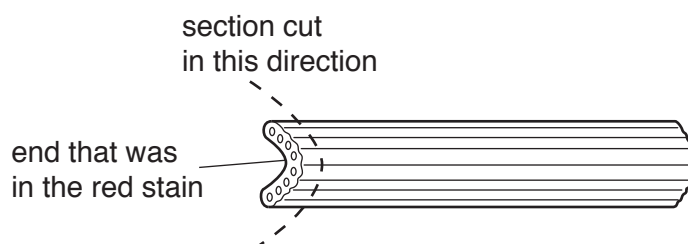


Fig. 1.2

- Step 5 The section was inspected for the presence of the red stain in the xylem tissue in the celery stalk, as shown in Fig. 1.3.

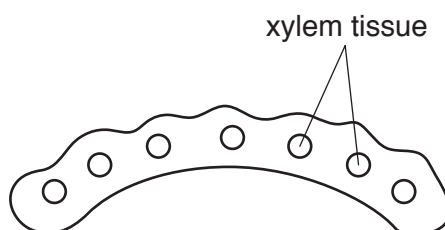


Fig. 1.3

Step 6 If the red stain was visible in the cut section, another 5 mm section was cut and the process repeated until no red stain was visible in the cut section. This allowed the student to estimate how far the red stain had moved up the celery stalk.

Step 7 Steps 4 to 6 were repeated for the celery stalk which had been in the **cool** red stain.

(a) (i) State **one** safety precaution that should be taken while carrying out this method.

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.....[1]

(ii) The student's results are shown in Fig. 1.4.

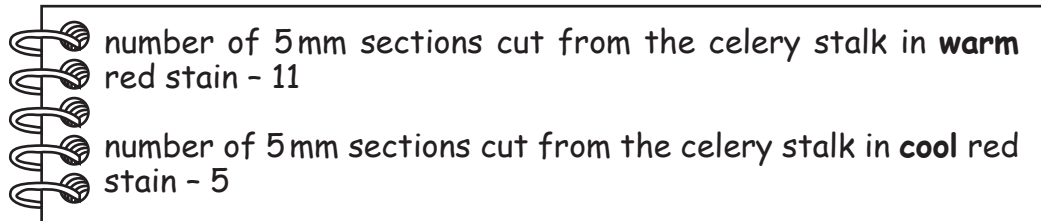


Fig. 1.4

Prepare a table and record your results in your table, in the space provided.
Your table should include:

- the temperature (cool or warm) of the red stain
- the number of sections that were stained in 10 minutes
- the total distance moved by the red stain in 10 minutes.

[3]

(iii) Use the data to calculate the rate of movement of the red stain in the celery stalk at each temperature.

Space for working

warm mm per minute

cool mm per minute

[2]

(iv) State a conclusion for these results.

.....

.....

.....[1]

(b) State **two** variables which were kept constant in this experiment.

1

2 [2]

(c) One way of improving the method used in this investigation would be to repeat it a number of times.

Identify **two other** sources of error in this investigation.

For each error, suggest an improvement to minimise the effect of the error.

error 1

.....

improvement 1

.....

.....

error 2

.....

improvement 2

.....

..... [4]

- 2 Fig. 2.1 shows a photomicrograph of a bronchus, surrounded by alveoli and other tissues, in the lung.

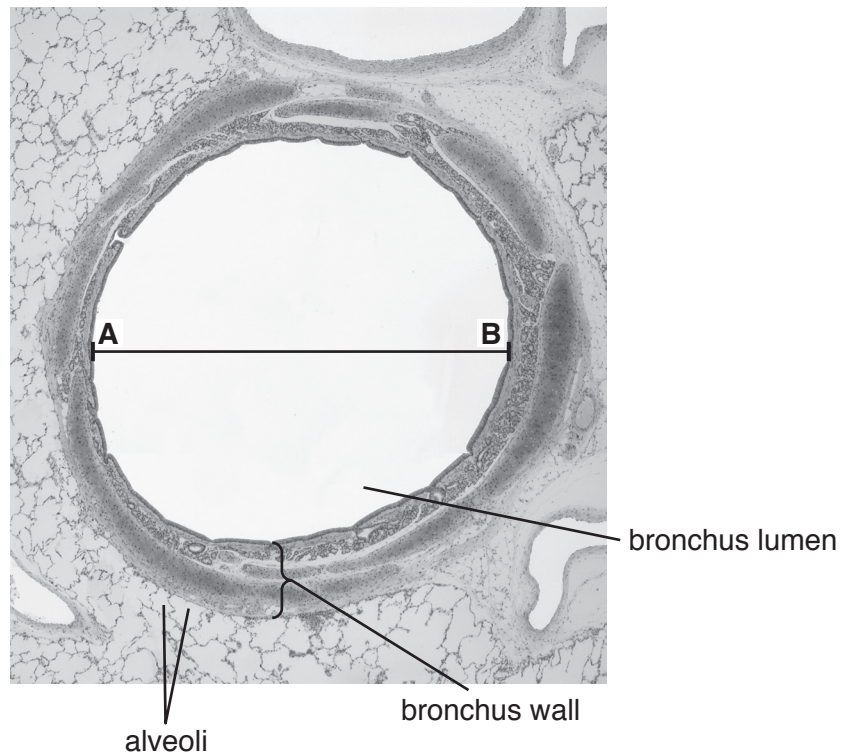


Fig. 2.1

- (a) (i) Make a large drawing of the bronchus shown in Fig. 2.1.

Do **not** include any of the alveoli or other tissues in your drawing. Do **not** label your drawing.

- (ii) The diameter of the bronchus in Fig. 2.1 is shown by the line **AB**.

Measure the length of **AB** on Fig. 2.1. Include the units.

length of **AB** on Fig. 2.1

The actual diameter of the bronchus in Fig. 2.1 is 1.5 mm.

The magnification of the bronchus in Fig. 2.1 can be calculated using the following equation:

$$\text{magnification} = \frac{\text{length of } \mathbf{AB} \text{ on Fig. 2.1}}{\text{actual diameter of the bronchus}}$$

Calculate the magnification of the bronchus in Fig. 2.1.

Give your answer to the nearest whole number.

Space for working.

..... [2]

- (b) A student investigated the effect of exercise on breathing rate.

The breathing rates of five people were measured at rest and after running for different periods of time. The people rested between each period of running.

The results are shown in Table 2.1.

Table 2.1

running time /minutes	breathing rate/breaths per minute					
	person					average
	one	two	three	four	five	
0	20	24	22	26	28	24
2	32	31	28	32	32	31
4	39	41	38	42	40	
6	46	52	52	46	44	48
8	48	50	52	46	44	48
10	49	51	51	46	43	48

- (i) Complete Table 2.1 by calculating the average breathing rate for four minutes of running.

Space for working.

[1]

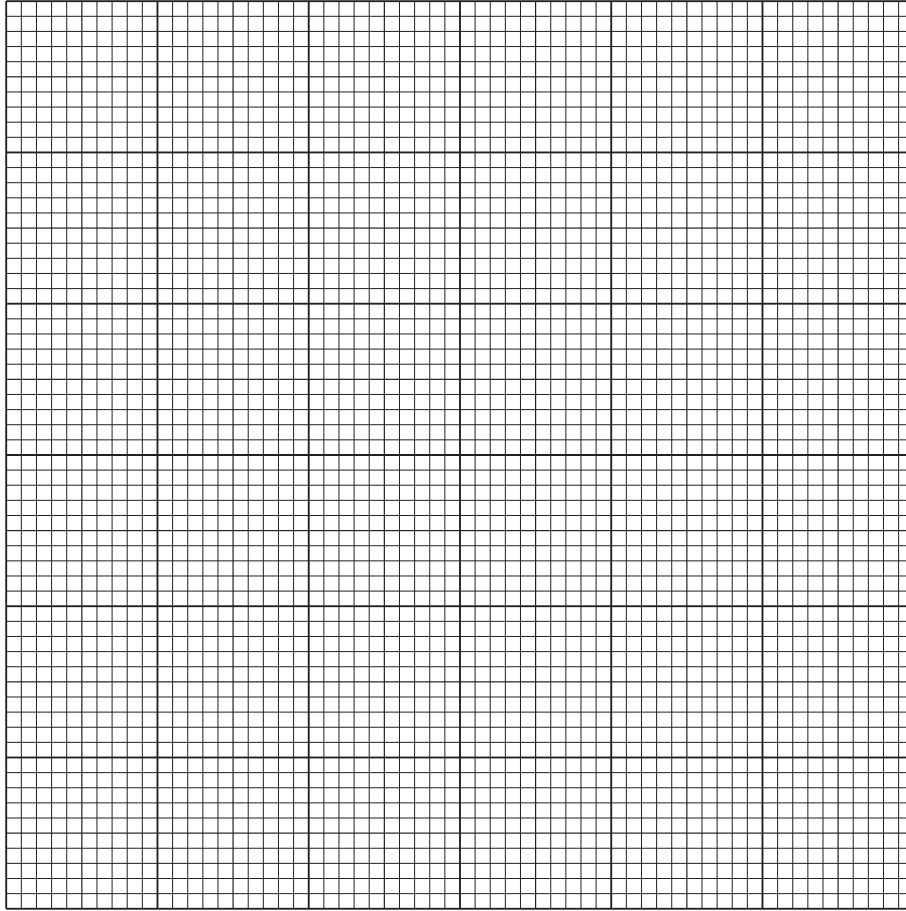
- (ii) The student thought that the result for person two at six minutes was an anomaly.

Suggest what the student should do to determine if the result is anomalous.

.....

[1]

- (iii) Plot a graph, on the grid, to show the relationship between running time and the average breathing rate. Draw a line of best fit.



[4]

- (iv) Use your graph to estimate the average breathing rate for one minute of the running.

Show on the graph how you obtained your answer.

.....[2]

- (v) Use your graph to describe the relationship between running time and the average breathing rate.

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.....[3]

- (c) (i) Suggest **one** safety precaution for this investigation.

.....
.....
.....[1]

- (ii) State **two** variables that should be kept constant during this investigation.

1
.....
2
.....
[2]

- (iii) State the variable that has been changed (the independent variable) in this investigation.

.....[1]

[Total: 21]

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