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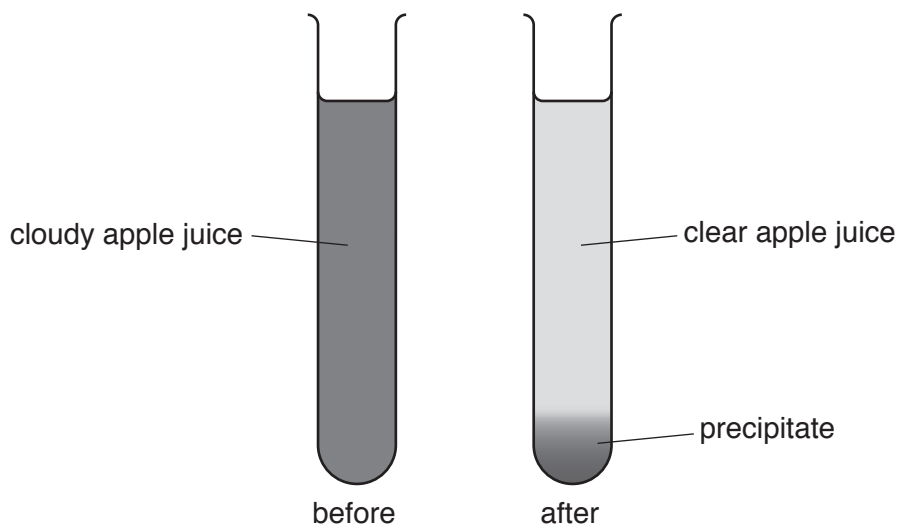
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- 1 Fruit juice can be produced by crushing and squeezing fresh fruit. The juice produced in this way is often cloudy.

The enzyme pectinase is used to produce clear fruit juice. This process is called clarification.

Fig. 1.1 shows fruit juice before and after clarification.



**Fig. 1.1**

A student investigated the effect of pectinase concentration on the clarification of apple juice.

The student was provided with freshly prepared apple juice, water and a 5% pectinase solution.

Step 1 Four test-tubes were labelled **P1**, **P2**, **P3** and **P4**.

Step 2 Syringes were used to add the volumes of water and 5% pectinase solution shown in Table 1.1 to each of the test-tubes.

**Table 1.1**

| test-tube | volume of water<br>/cm <sup>3</sup> | volume of 5%<br>pectinase solution<br>/cm <sup>3</sup> | final percentage<br>concentration of<br>pectinase solution |
|-----------|-------------------------------------|--------------------------------------------------------|------------------------------------------------------------|
| <b>P1</b> | 0.00                                | 1.00                                                   | 5.0                                                        |
| <b>P2</b> | 0.50                                | 0.50                                                   | 2.5                                                        |
| <b>P3</b> | 0.75                                | 0.25                                                   |                                                            |
| <b>P4</b> | 1.00                                | 0.00                                                   | 0.0                                                        |

(a) Calculate the final concentration of the pectinase solution in test-tube **P3**.

Show your working and write your answer, to one decimal place, in Table 1.1.

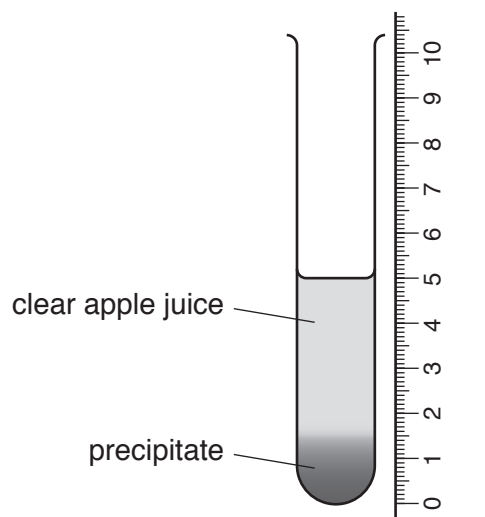
[2]

Step 3 5 cm<sup>3</sup> of apple juice was added to each of test-tubes **P1**, **P2**, **P3** and **P4**.

Step 4 The contents of each test-tube were carefully mixed using a glass rod.

Step 5 A stop-clock was immediately started.

Step 6 After five minutes, the height of the precipitate formed was measured using a ruler, as shown in Fig. 1.2. If no precipitate had formed in the test-tube, it was recorded as '0'.



not to scale

**Fig. 1.2**

Care was taken not to shake the test-tubes.

Step 7 After a further five minutes, the student repeated the measurement of the precipitates in the test-tubes.

Fig. 1.3 shows the test-tubes at 0, 5 and 10 minutes.

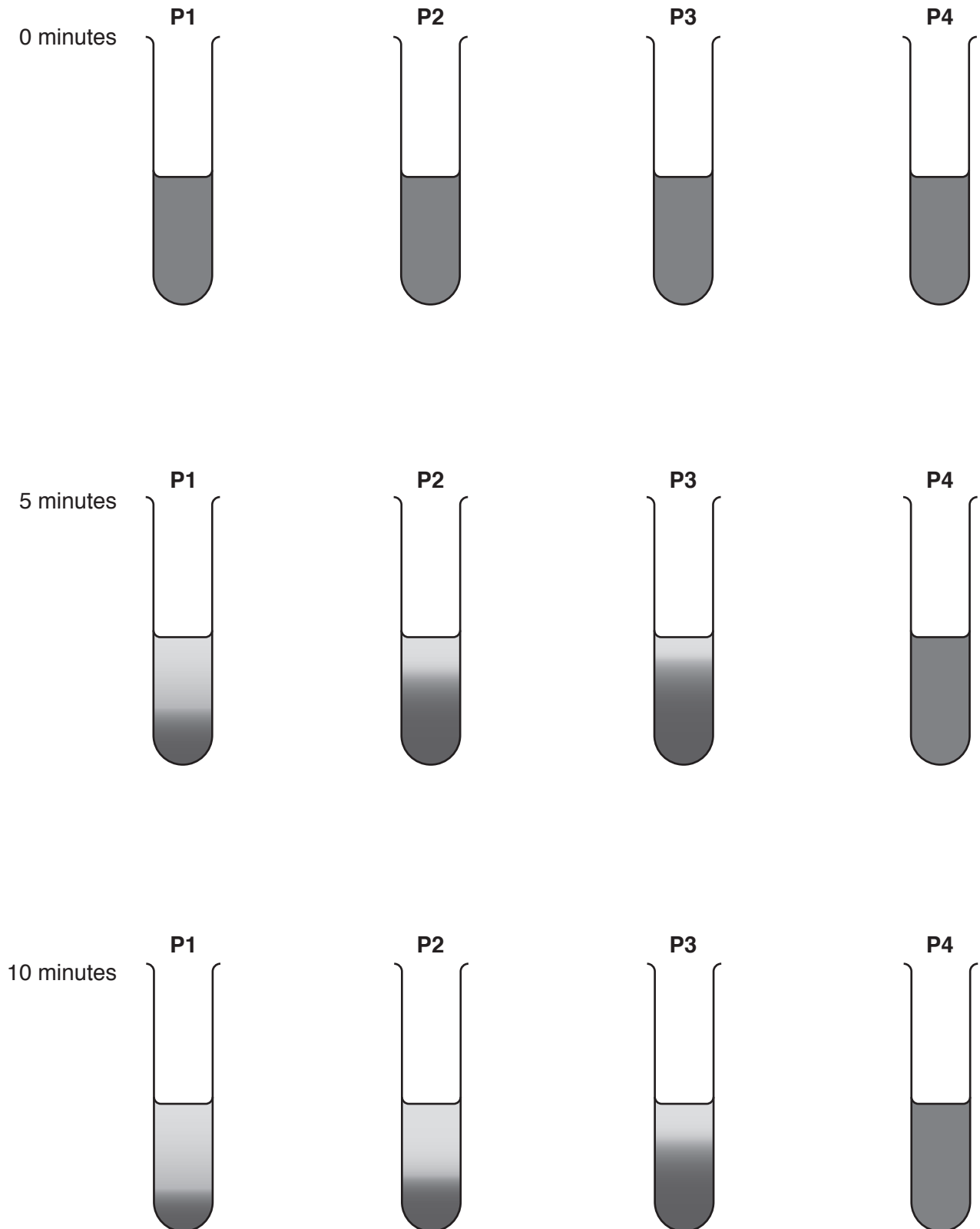


Fig. 1.3

- (b) Prepare a table to record the results.

Measure the height of the precipitate in each test-tube in Fig. 1.3.

Record the measurements in your table.

[4]

- (c) State a conclusion for the results.

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.....[2]

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

.....[1]

- (ii) State **two** variables that should have been kept constant in this investigation.

1 .....

2 .....[2]

- (iii) Identify **one** possible error in step 6 and suggest an improvement.

error .....

.....

improvement .....

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[2]

- (e) Explain the purpose of test-tube **P4**.

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[2]

- (f) A student stated the hypothesis:

**“Treating fruit juice with pectinase reduces the vitamin C content of the fruit juice”.**

Plan an investigation to test this hypothesis.

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[6]

(g) Fig. 1.4 shows a cross-section of a tomato fruit.



**Fig. 1.4**

Make a large drawing of the cross-section of tomato fruit.

- (h) A student wanted to find out if tomatoes contained starch.

State the result you would expect for a positive test for starch.

.....[1]

[Total: 26]



- 2 A student investigated the number of petals on the flowers of two species of daisy, species **A** and species **B**.

(a) Fig. 2.1 shows one daisy flower of species **A**.



**Fig. 2.1**

The actual length of petal **XY** of the daisy in Fig. 2.1 was measured by the student as 5 mm.

Measure the length of petal **XY** on Fig. 2.1. Include the units.

length of **XY** on Fig. 2.1 .....

Use the formula to calculate the magnification of the photograph.

$$\text{magnification} = \frac{\text{length of } \mathbf{XY} \text{ on Fig. 2.1}}{\text{actual length of petal } \mathbf{XY}}$$

Show your working.

..... [2]

The student collected 10 flowers from species **A** and 10 flowers from species **B**. They counted the number of petals on each flower.

Fig. 2.2 shows some of the daisy flowers of species **A**.



**Fig. 2.2**

- (b) (i)** Count the number of petals on flowers **9** and **10** in Fig. 2.2 and record the number of petals in Table 2.1.

**Table 2.1**

| flower number            | number of petals |                  |
|--------------------------|------------------|------------------|
|                          | species <b>A</b> | species <b>B</b> |
| 1                        | 16               | 7                |
| 2                        | 15               | 5                |
| 3                        | 13               | 5                |
| 4                        | 20               | 6                |
| 5                        | 20               | 6                |
| 6                        | 15               | 7                |
| 7                        | 17               | 5                |
| 8                        | 15               | 6                |
| 9                        |                  | 6                |
| 10                       |                  | 5                |
| average number of petals | 17               |                  |

- (ii) Calculate the average number of petals for species **B**.

Write your answer in Table 2.1. Give your answer to the nearest whole number.

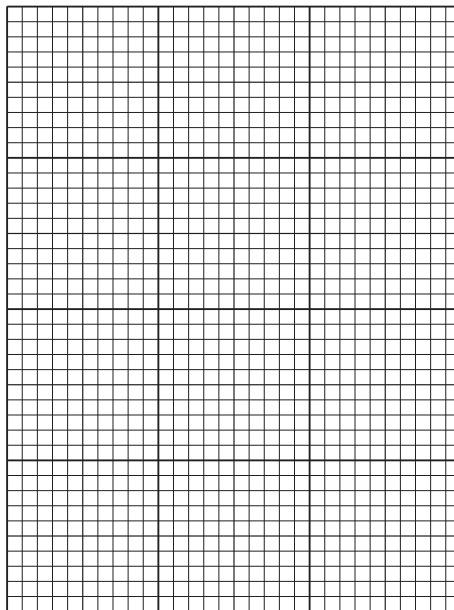
Space for working.

[1]

- (iii) Suggest one method that could be used to ensure that the counting of the number of petals is accurate.

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

- (c) Plot a bar chart on the grid of the average number of petals for species **A** and species **B** from Table 2.1.



[3]

(d) State **two** reasons why the student should have repeated the investigation.

1 .....

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2 .....

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[2]

(e) The student noticed that insects fed on the nectar produced by the flowers.

(i) Describe the test that the student would use to find out if the nectar contains reducing sugars.

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[3]

(ii) State **one** safety precaution that should be taken when carrying out the test for reducing sugars.

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[1]

[Total: 14]

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