1 A student investigated the effect of the concentration of salt solutions on osmosis in potato tissue.

The student used three different concentrations of salt solution and potato tissue that had been cut into cylinders.

(a) (i) Using the information in Table 1.1, decide the volumes of **S** and **W** needed to make 50 cm^3 of a 0.5 mol per dm^3 salt solution.

Complete Table 1.1 by writing in the volumes of **S** and **W** needed to make the 0.5 mol per dm^3 salt solution.

Table 1.1

beaker	volume of 1.0 mol per dm^3 salt solution **S** / cm^3	volume of distilled water **W** / cm^3	final concentration of salt solution / mol per dm^3
S1	50	0	1.0
S2	.....	.....	0.5
S3	0	50	0.0

[1]

The student used this method:

Step 1 Label three beakers **S1**, **S2** and **S3**.

Step 2 Use the volumes of 1.0 mol per dm^3 salt solution **S** and distilled water **W** shown in Table 1.1 to make the salt solutions in beakers **S1**, **S2** and **S3**.

Step 3 Put the potato cylinders onto a white tile and cut each potato cylinder into 3 mm discs, as shown in Fig. 1.1. You will need 30 potato discs.

Fig. 1.1

Step 4 Place 10 potato discs in a line next to a ruler, as shown in Fig. 1.2.

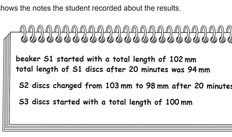

Fig. 1.2

Step 5 Measure the total length of the 10 potato discs.

Step 6 Put the 10 potato discs into beaker **S1**.

Step 7 Repeat step 4 to step 6 with the other potato discs and the salt solutions in beakers **S2** and **S3**.

Step 8 Start the stop-clock and leave the potato discs in the beakers of salt solution for 20 minutes.

Step 9 Remove the 10 potato discs from beaker **S1** and put them onto the white tile, line them up along the ruler, as shown in Fig. 1.2.

Step 10 Measure the final total length of the 10 potato discs.

Step 11 Repeat step 9 and step 10 with the potato discs in beaker **S2** and beaker **S3**.

Fig. 1.3 shows the notes the student recorded about the results.

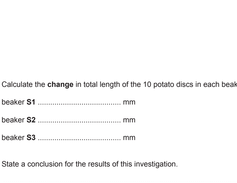

Fig. 1.3

Fig. 1.4 is a diagram showing the actual size of the 10 potato discs from beaker **S3** after 20 minutes.

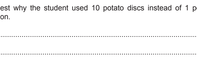

Fig. 1.4

(ii) Measure the total length of the 10 potato discs **in Fig. 1.4**.

S3 total length ..... mm [1]

(iii) Prepare a table and record the results shown in Fig. 1.3 and your measurement in **1(a)(ii)**.

Include the final concentrations of the salt solutions in your table.

[3]

(iv) Calculate the **change** in total length of the 10 potato discs in each beaker.

beaker **S1** ..... mm

beaker **S2** ..... mm

beaker **S3** ..... mm

[1]

(v) State a conclusion for the results of this investigation.

.....

.....

..... [1]

(vi) State the dependent variable in this investigation.

..... [1]

(vii) Suggest why the student used 10 potato discs instead of 1 potato disc in each salt solution.

.....

.....

..... [1]

(viii) Describe **one** safety precaution the student should take when preparing the potato discs.

.....

..... [1]

(b) The student added a few drops of a yellow-brown solution to test one of the potato discs.

The solution changed to a blue-black colour.

Identify the solution added and state a conclusion for this test.

solution .....

conclusion .....

[1]

(c) Fig. 1.5 shows a leaf from a potato plant.

Fig. 1.5

(i) Draw a large diagram of the leaf shown in Fig. 1.5.

[4]

(ii) Line **PQ** represents the length of the leaf in Fig. 1.5.

Measure the length of line **PQ** in Fig. 1.5.

length of line **PQ** ..... mm

The actual length of the leaf is 39 mm.

Using your measurement and the formula, calculate the magnification of the leaf in Fig. 1.5.

$$\text{magnification} = \frac{\text{length of line PQ in Fig. 1.5}}{\text{actual length of the leaf}}$$

Give your answer to **two** significant figures.

Space for working.

.....

[3]

(iii) Fig. 1.6 shows a leaf from a tomato plant. The tomato leaf is narrower than the potato leaf shown in Fig. 1.5.

Fig. 1.6

Compare the leaves shown in Fig. 1.5 and in Fig. 1.6.

Describe **one** visible difference, other than size, and **one** visible similarity.

difference .....

.....

similarity .....

.....

[2]

[Total: 20]