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Candidate Declaration. I have read and understood the Notice to Candidate and can confirm that I have produced the attached work without assistance other than that which is acceptable under the scheme of assessment.

Details of additional assistance (if any). Did the candidate receive any help or information in the production of this work? If you answer yes give the details below or on a separate page.

Yes ☐ No ☐

Teacher Declaration:
I confirm that the candidate’s work was conducted under the conditions laid out by the specification. I have authenticated the candidate’s work and am satisfied that to the best of my knowledge the work produced is solely that of the candidate.

Signature of teacher ................................................................. Date ..........................................

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Section A
These questions relate to your investigation into the effect of concentration of blackcurrant squash on osmosis in potato cylinders.
Use your Task Sheet, your results and your graph to answer the questions.
Answer all questions in the spaces provided.

1 In this investigation, you were given potato cylinders taken from potatoes of the same variety.

Give one reason why this was important. [1 mark]

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2 Complete Table 1 to show how to make 20 cm³ of each concentration of blackcurrant squash. [2 marks]

Table 1

<table>
<thead>
<tr>
<th>Percentage concentration of blackcurrant squash</th>
<th>Volume of 100% blackcurrant squash / cm³</th>
<th>Volume of water / cm³</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>........</td>
<td>........</td>
</tr>
<tr>
<td>........</td>
<td>12</td>
<td>........</td>
</tr>
</tbody>
</table>

3 Potato skin had been removed from the cylinders given to you.

Suggest one reason why the potato skin could have affected osmosis. [1 mark]

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4 In this investigation, you should have used potato cylinders that were all the same length.

Suggest and explain one reason why this was important. [2 marks]

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5 Describe how you would use your results for 100% blackcurrant squash to find the rate of osmosis. [2 marks]

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Turn over for the next question
A student carried out a similar experiment to yours, but she used sucrose solutions instead of blackcurrant squash. Figure 1 shows her results.

**Figure 1**

**6 (a)** Explain the changes in mass of the potato cylinders between A and B.  

[3 marks]

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**6 (b)** Explain why the percentage change in mass of the potato cylinders is the same in solutions B and C.  

[1 mark]

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6 (c) **Figure 2** shows the relationship between sucrose concentration and water potential.

**Figure 2**

![Graph showing the relationship between sucrose concentration and water potential.](image)

Use **Figure 1** and **Figure 2** to work out the water potential of the potato tissue.

Explain how you arrived at your answer.

[3 marks]

Water potential of potato tissue .............. kPa

Explanation ........................................................................................................................................

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Scientists investigated the effect of the water potential of soil water on plant growth. They investigated the effect of this water potential on several plant processes.

Figure 3 shows their results in the form they were presented. The bars show whether or not each process was occurring.

The plants stopped growing when the water potential of the soil water was below $-0.7 \text{ mPa}$. All of the changes in the plants were related to the ability of the roots to take up water from the soil.

**Figure 3**
Resource B

If red blood cells are placed in pure water, water enters the cells by osmosis and they burst. This is called haemolysis. As red blood cells burst they release pigment.

Scientists placed samples of red blood cells in different concentrations of sodium chloride solution for the same period of time. They used red blood cells from four different mammals: dog, guinea pig, rabbit and sheep.

If haemolysis had taken place, the solution turned red. The scientists measured the intensity of the red colour using a colorimeter. The more intense the red colour, the greater the amount of haemolysis.

The scientists calculated the percentage of red blood cells that were haemolysed in each sodium chloride solution.

Figure 4 shows the scientists’ results.
### Section B

Use the information in the **Resource Sheet** and your own knowledge to answer the questions.

Answer all questions in the spaces provided.

Use **Resource A** to answer **Questions 7 to 11**.

<table>
<thead>
<tr>
<th>Question</th>
<th>Description or Task</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>Describe the results in <strong>Figure 3</strong>.</td>
<td>2 marks</td>
</tr>
<tr>
<td>8</td>
<td>Explain the relationship between stomatal opening and photosynthesis.</td>
<td>2 marks</td>
</tr>
<tr>
<td>9</td>
<td>Although photosynthesis is still occurring, plants stop growing when the soil water potential falls below –0.7 mPa. Use information from <strong>Figure 3</strong> to suggest <strong>two</strong> reasons why.</td>
<td>3 marks</td>
</tr>
</tbody>
</table>
10 Most of the water uptake in a root takes place in the region just behind the root tip. Explain why.

[2 marks]

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11 In a root, water passes through the endodermis and enters the xylem. Explain how.

[4 marks]

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[Extra space]

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Use Resource B to answer Questions 12 to 15.

12 Use Figure 4 to give two differences between the results for dog and sheep.

[2 marks]

Difference 1 .................................................................................................................. ...

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Difference 2 .................................................................................................................. ...

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Turn over for the next question
13 Calculate the difference in the percentage of haemolysed cells between sheep and rabbit at a sodium chloride concentration of 0.5%.

[1 mark]

14 Explain the relationship between the depth of the red colour of the solution and how much haemolysis has taken place.

[2 marks]

15 During treatment in a veterinary surgery, any of the mammals in Figure 4 may be given an infusion of sodium chloride solution directly into a vein. The concentration of sodium chloride solution used is 0.9%, rather than 0.5%, regardless of the species of mammal.

Explain the advantage to the vet of using this concentration.

[2 marks]

END OF QUESTIONS