

1

A student investigated the effect of different sugar solutions on potato tissue.

This is the method used.

1. Add 30 cm³ of 0.8 mol dm⁻³ sugar solution to a boiling tube.
2. Repeat step 1 with equal volumes of 0.6, 0.4 and 0.2 mol dm⁻³ sugar solutions.
3. Use water to give a concentration of 0.0 mol dm⁻³.
4. Cut five cylinders of potato of equal size using a cork borer.
5. Weigh each potato cylinder and place one in each tube.
6. Remove the potato cylinders from the solutions after 24 hours.
7. Dry each potato cylinder with a paper towel.
8. Reweigh the potato cylinders.

The table below shows the results.

Concentration of sugar solution in mol dm ⁻³	Starting mass in g	Final mass in g	Change of mass in g	Percentage (%) change
0.0	1.30	1.51	0.21	16.2
0.2	1.35	1.50	0.15	X
0.4	1.30	1.35	0.05	3.8
0.6	1.34	1.28	-0.06	-4.5
0.8	1.22	1.11	-0.11	-9.0

(a) Calculate the value of X in the table above.

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Percentage change in mass = %

(2)

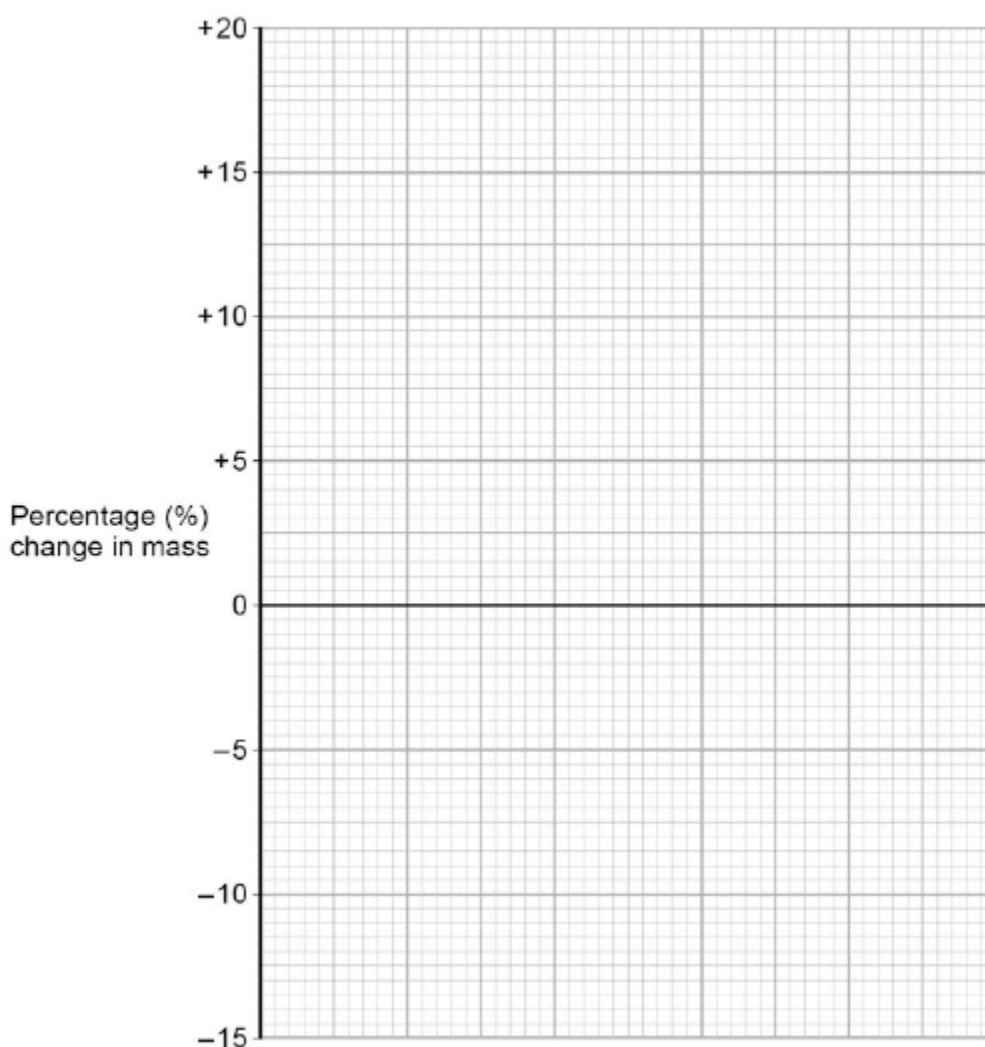
(b) Why did the student calculate the percentage change in mass as well as the change in grams?

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(1)

(c) Complete the graph using data from the table above.

- Choose a suitable scale and label for the x-axis.
- Plot the percentage (%) change in mass.
- Draw a line of best fit.



(4)

(d) Use your graph to estimate the concentration of the solution inside the potato cells.

Concentration = mol dm⁻³

(1)

(e) The results in the table above show the percentage change in mass of the potato cylinders.

Explain why the percentage change results are positive **and** negative.

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(3)

(f) Suggest **two** possible sources of error in the method given above.

1.....

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2.....

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(2)

(Total 13 marks)

Mark schemes

1	(a) $(0.15 / 1.35) \times 100$	1
	11.1 (%)	
	<i>allow 11.1 (%) with no working shown for 2 marks</i>	1
	(b) to allow results to be compared or they had different masses at the start	1
	(c) axis correct scale and labelled	1
	5 points correctly plotted	
	<i>allow ecf from 05.1</i>	
	<i>allow 1 mark for 4 points correctly plotted</i>	2
	line of best fit	1
	(d) 0.5	
	<i>allow 0.45–0.55</i>	1
	(e) (0.0 to 0.4) water moves into cells	1
	(0.6 to 0.8) water leaves cells	1
	by osmosis	1
	(f) any two from:	
	• concentration of solutions	
	• drying of chips	
	• accuracy of balance	
	• evaporation from tubes	2
		[13]