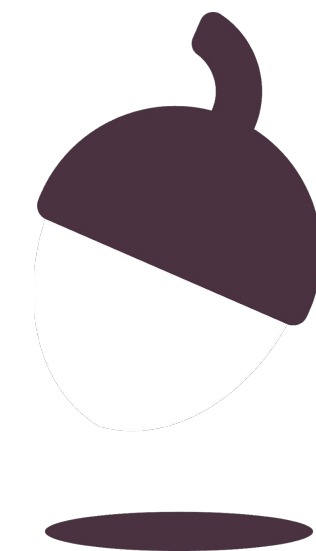Combined Science - Biology - KS4
Cell Biology

Osmosis required Practical Part 2
(Downloadable student document)

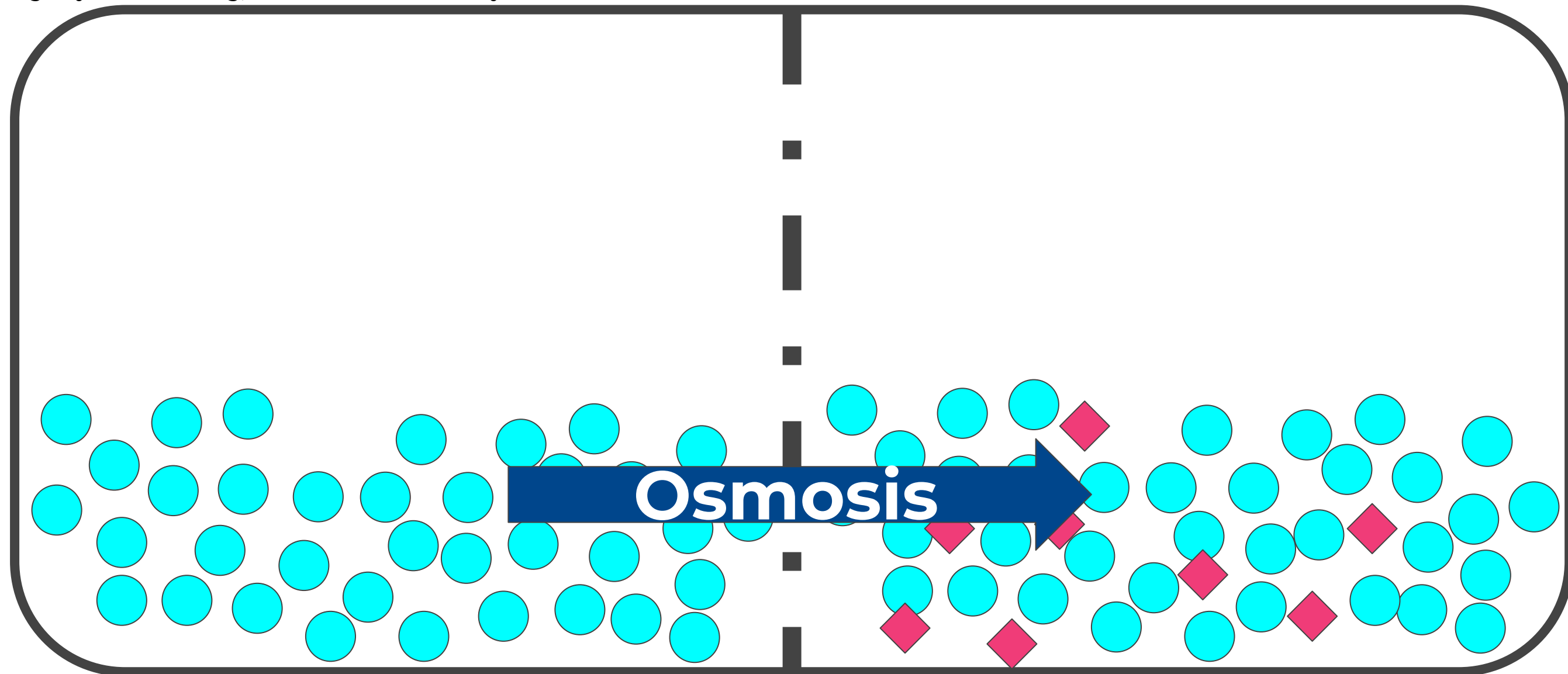Miss Wong

OAK NATIONAL ACADEMY

The set up and the research question

Osmosis

The movement of water from a region of higher water concentration to a region with lower water concentration.

Image by Miss C. Wong, Oak National Academy

Working scientifically as a process

What is the concentration of salt in the cells of a potato?

The concentration is 0.4 molar

Design experimental setup

Different concentrations of salt solution is being used.

Time of potatoes being soaked in the solution.
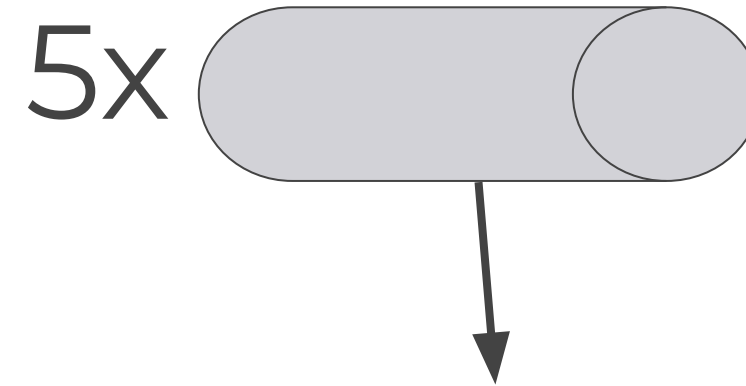
The change in mass and length.

Test and collect data ⟶ **Is the concentration of salt 0.4 molar?**

What is the salt concentration inside a potato?

5x

Soaked into different concentration of salt solution

No change

Same concentration

Increase in mass

Decrease in mass

Water entered the cells by osmosis. Concentration of salt must be higher than the solution.

Water left the cells by osmosis. Concentration of salt must be lower than the solution.

Pause the video to complete your task

Quick concept check

How do we find out the concentration of salt in the potato cylinder?

By look for the salt solution that causes no mass change in the potato cylinder. This is because there is no net osmosis of water into and out of the potato.

Resume once you're finished

Pause the video to complete your task

Quick concept check

How do we find out the concentration of salt in the potato cylinder?

Resume once you're finished

Finding the percentage change

Finding the percentage change

Steps 1: find the change

Step 2: apply

$$\text{Percentage change} = \frac{change}{starting\ value} \times 100$$

There is a piece of carrot. The carrot had a mass of 3g before being put completely into water. After one hour, the carrot was removed from the water, blotted dry and weighed. The mass of the carrot was 3.5g. Calculate the percentage change in mass.

The change = 3.5 - 3 = 0.5

Percentage change= 0.5 ÷ 3 x 100 = 16.7%.

Percentage change

$$\text{Percentage change} = \frac{change}{starting\ value} \times 100$$

Concentration of salt solution/ M	Starting mass/ g	Final mass/ g	Change in mass/ g	Percentage change in mass/ %
1	4.92	4.00	-0.92	-18.70
0.75	5.26	4.50	-0.76	
0.5	5.11	4.70	-0.41	
0.25	5.08	5.18	0.10	
0	5.20	5.80	0.60	

When the concentration is 1M,

The percentage change is -0.92 ÷ 4.92 x 100 = -18.70%.

Find the percentage change

$$\text{Percentage change} = \frac{change}{starting\ value} \times 100$$

Concentration of salt solution/ M	Starting mass/ g	Final mass/ g	Change in mass/ g	Percentage change in mass/ %
1	4.92	4.00	-0.92	
0.75	5.26	4.50	-0.76	
0.5	5.11	4.70	-0.41	
0.25	5.08	5.18	0.10	
0	5.20	5.80	0.60	

Answers

Concentration of salt solution/ M	Starting mass/ g	Final mass/ g	Change in mass/ g	Percentage change in mass/ %
1	4.92	4	-0.92	-18.70
0.75	5.26	4.5	-0.76	-14.45
0.5	5.11	4.7	-0.41	-8.02
0.25	5.08	5.18	0.1	1.97
0	5.2	5.8	0.6	11.5

Putting the data on the graph

Working scientifically as a process

What is the concentration of salt in the cells of a potato?

↓

The concentration is 0.4 molar

↓

Design experimental setup

Different concentrations of salt solution is being used.

Time of potatoes being soaked in the solution.

The change in mass and length.

↓

Test and collect data → **Is the concentration of salt 0.4 molar?**

Answers

| Concentration of salt solution/ M	Starting mass/ g	Final mass/ g	Change in mass/ g	Percentage change in mass/ %
1	4.92	4	-0.92	-18.70
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0.25	5.08	5.18	0.1	1.97
0	5.2	5.8	0.6	11.5

Dependent
variable

Percentage
change in
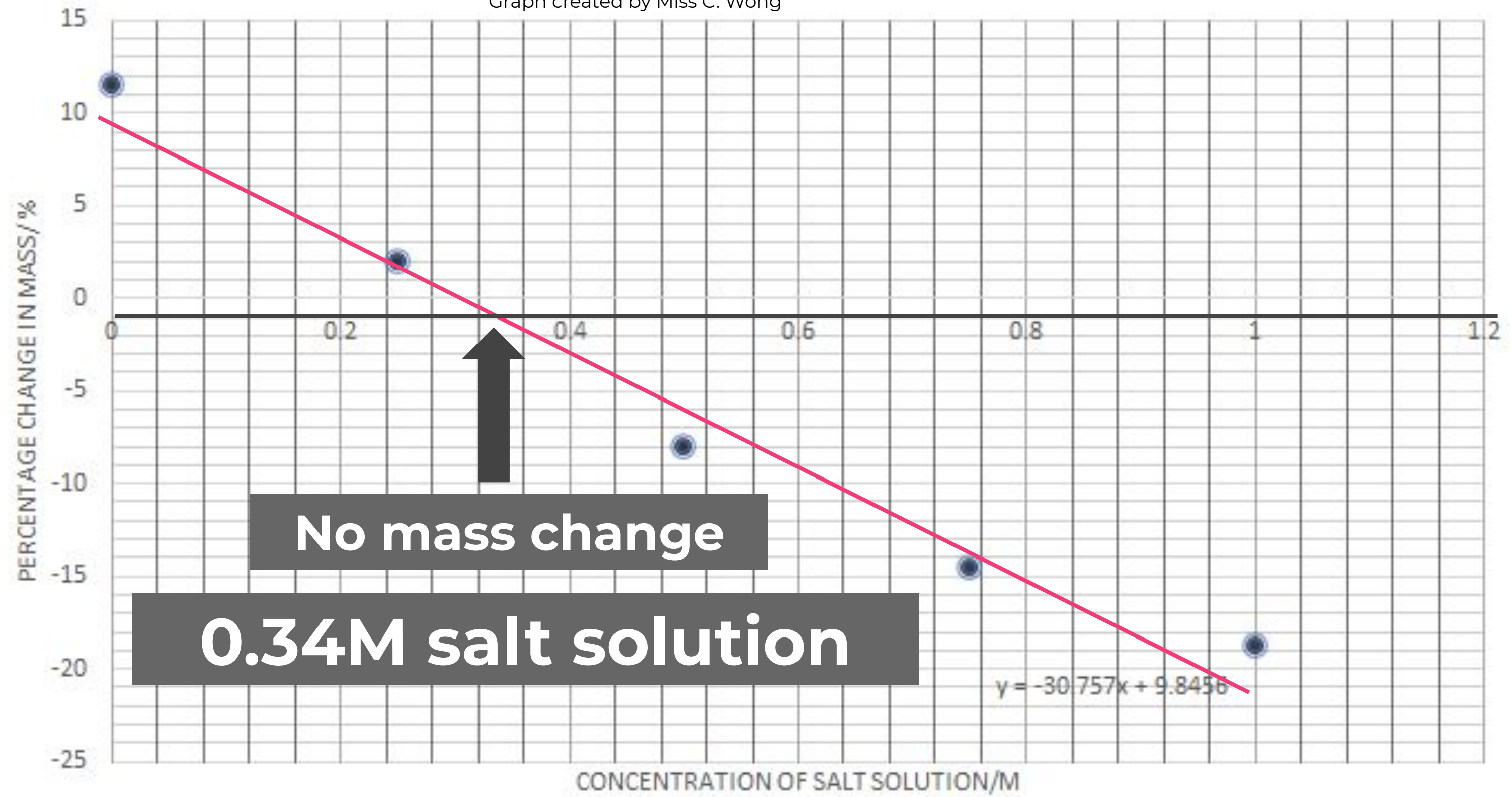mass /%

Independent variable
Concentration of salt solution/M

Percentage change in mass of potato cylinders

Graph created by Miss C. Wong

$y = -30.757x + 9.8456$

PERCENTAGE CHANGE IN MASS/ %

CONCENTRATION OF SALT SOLUTION/M

17

Percentage change in mass of potato cylinders

Graph created by Miss C. Wong

No mass change

0.34M salt solution

$y = -30.757x + 9.8456$
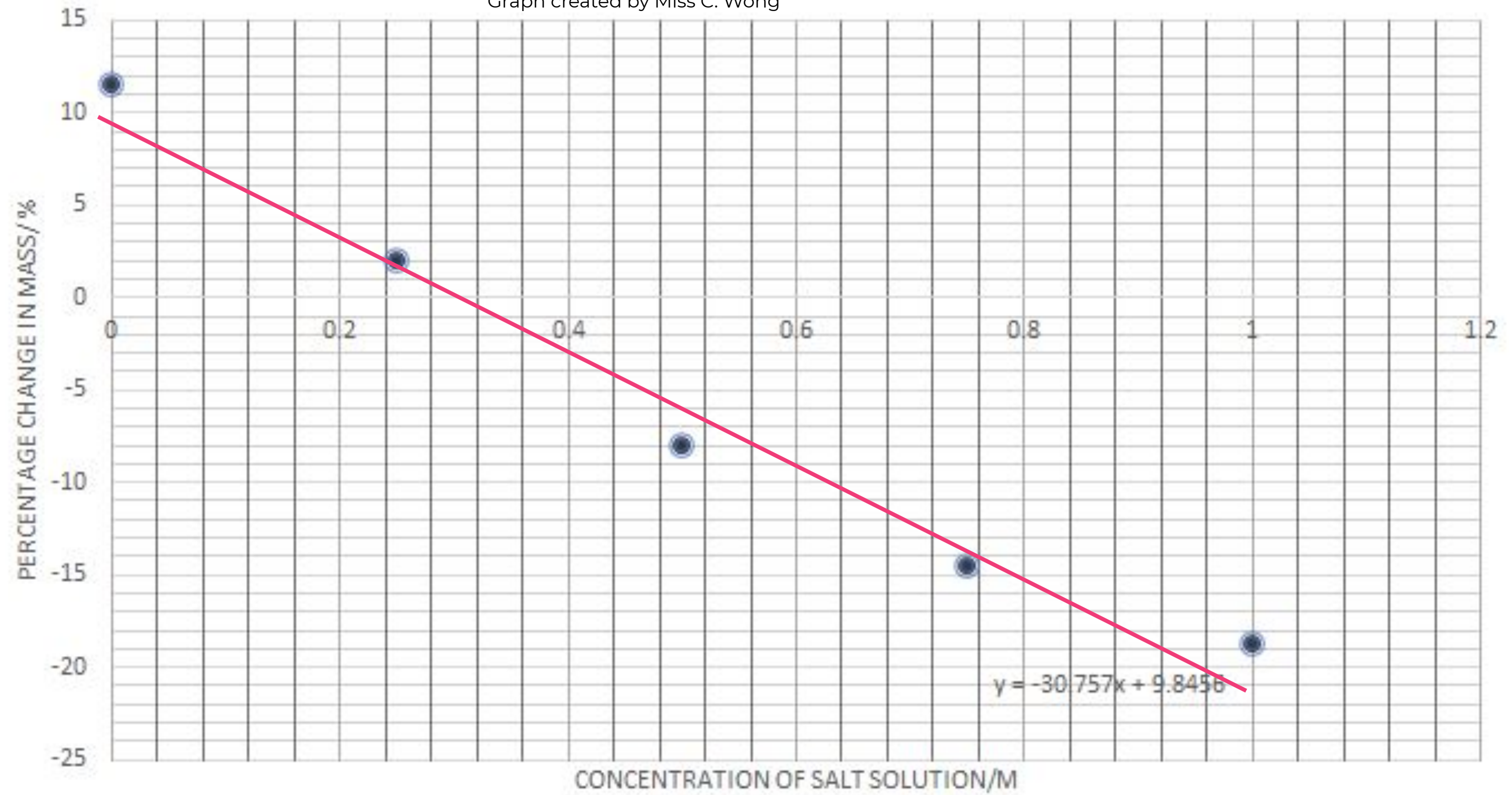
Concluding results and responding to the hypothesis

Working scientifically as a process

What is the concentration of salt in the cells of a potato?

The concentration is 0.4 molar

Design experimental setup

Different concentrations of salt solution is being used.

Time of potatoes being soaked in the solution.

The change in mass and length.
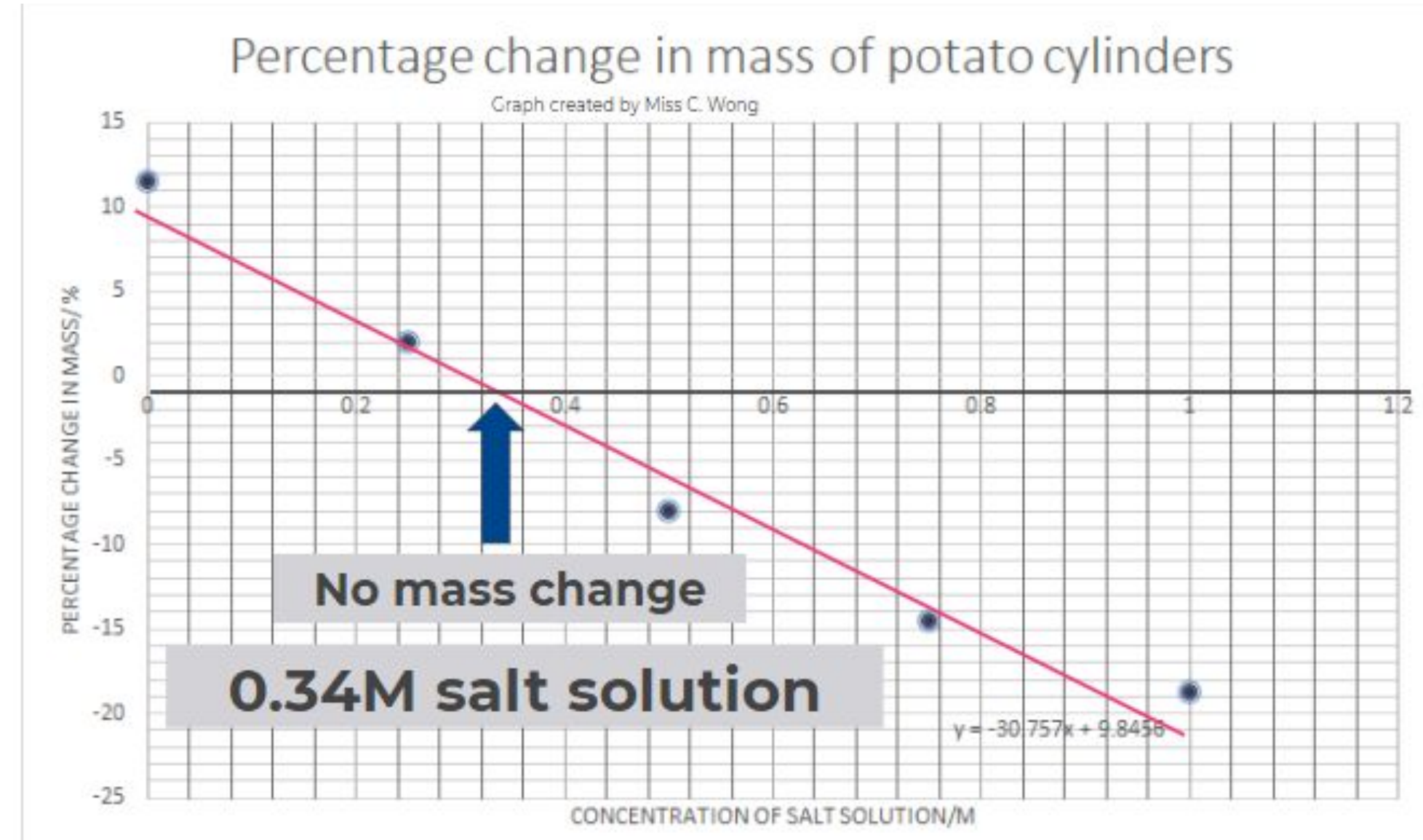
Test and collect data

Is the concentration of salt 0.4 molar?

Respond to the hypothesis and research question.

What is the concentration of salt in
the cells of a potato?
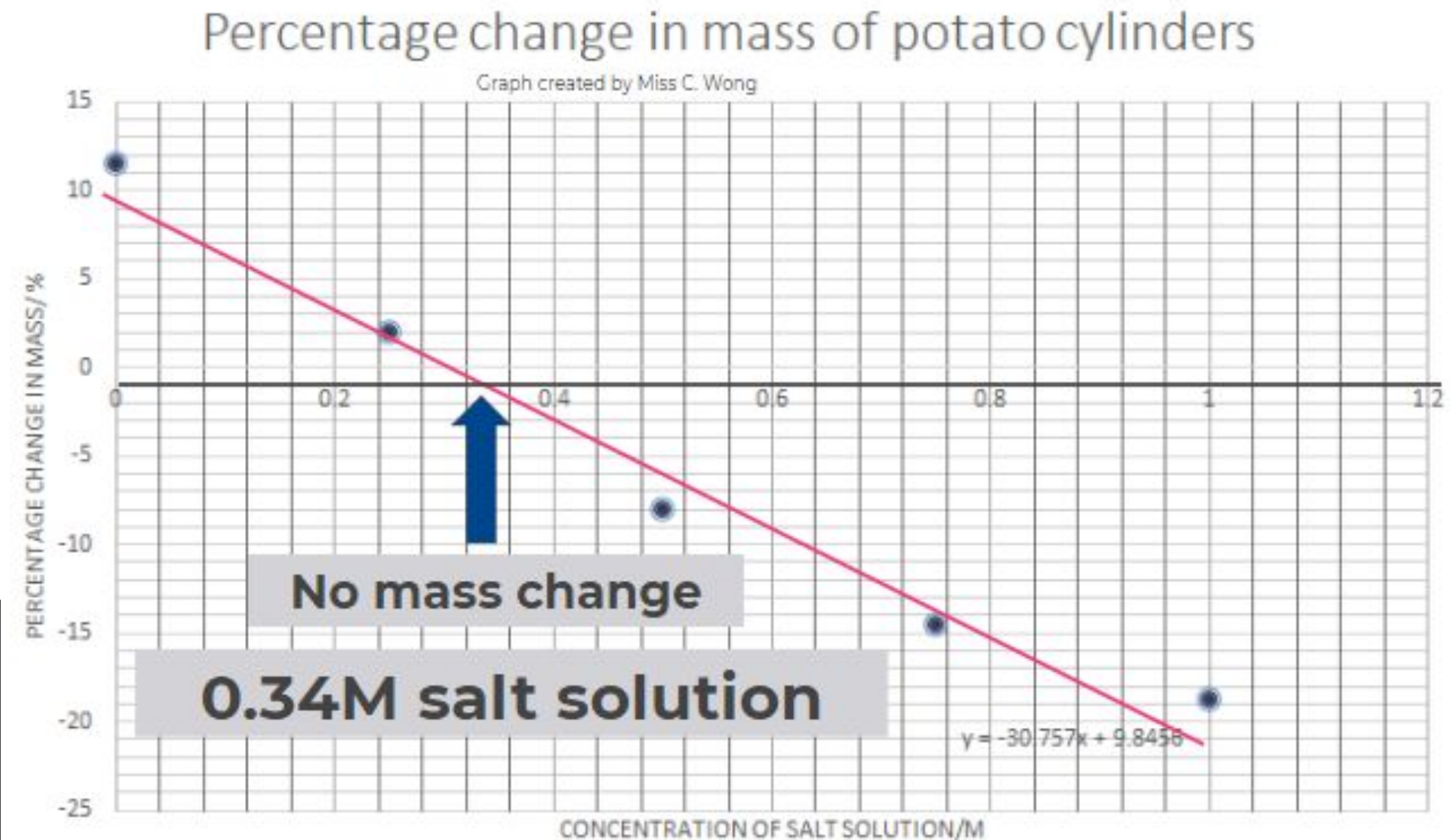
Is the concentration of salt 0.4M?

Respond to the hypothesis and research question.

What is the concentration of salt in the cells of a potato?

The concentration of salt is 0.34M. This is the concentration when there is no change in mass.

Is the concentration of salt 0.4M?

No the concentration is lower than 0.4M.

Percentage change in mass of potato cylinders
Graph created by Miss C. Wong

No mass change

0.34M salt solution

y = -30.757x + 9.8456

CONCENTRATION OF SALT SOLUTION/M

PERCENTAGE CHANGE IN MASS/%

Exam question practice

A student investigates the effect of concentration on osmosis.

He cuts out five potato chips of similar mass. The student measures the mass of each potato chip.

He then places the potato chips in different concentrations of sugar solution.

After 30 minutes he removes the potato chips from the solution. He dries them with a paper towel before measuring the new mass.

The table shows his results.

Concentration of sugar solution (mol / dm^3)	Mass of potato chip (g)		Change in mass (g)	Percentage change in mass
	At start	After 30 minutes		
0.0	2.1	2.7	+0.6	+28.6
0.2	2.2	2.3	+0.1	+4.5
0.4	2.0	1.8	-0.2	-10.0
0.6	2.0	1.6	-0.4	-20.0
0.8	2.3	1.7		
1.0	2.2	1.6	-0.6	-27.3

Calculate the percentage change of mass for the potato chip in 0.8 mol / dm^3 sugar solution.

Record your answer to 1 decimal place.

Answer = -- % [2]

OCR, 2018 J250/07

A student investigates the effect of concentration on osmosis.

He cuts out five potato chips of similar mass. The student measures the mass of each potato chip.

He then places the potato chips in different concentrations of sugar solution.

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0.6	2.0	1.6	−0.4	−20.0
0.8	2.3	1.7		
1.0	2.2	1.6	−0.6	−27.3

Calculate the percentage change of mass for the potato chip in 0.8 mol / dm^3 sugar solution.

Record your answer to 1 decimal place.

Change = 1.7 -2.3 =-0.8
0.8 ÷ -0.8 x 100= −26.1 (%)

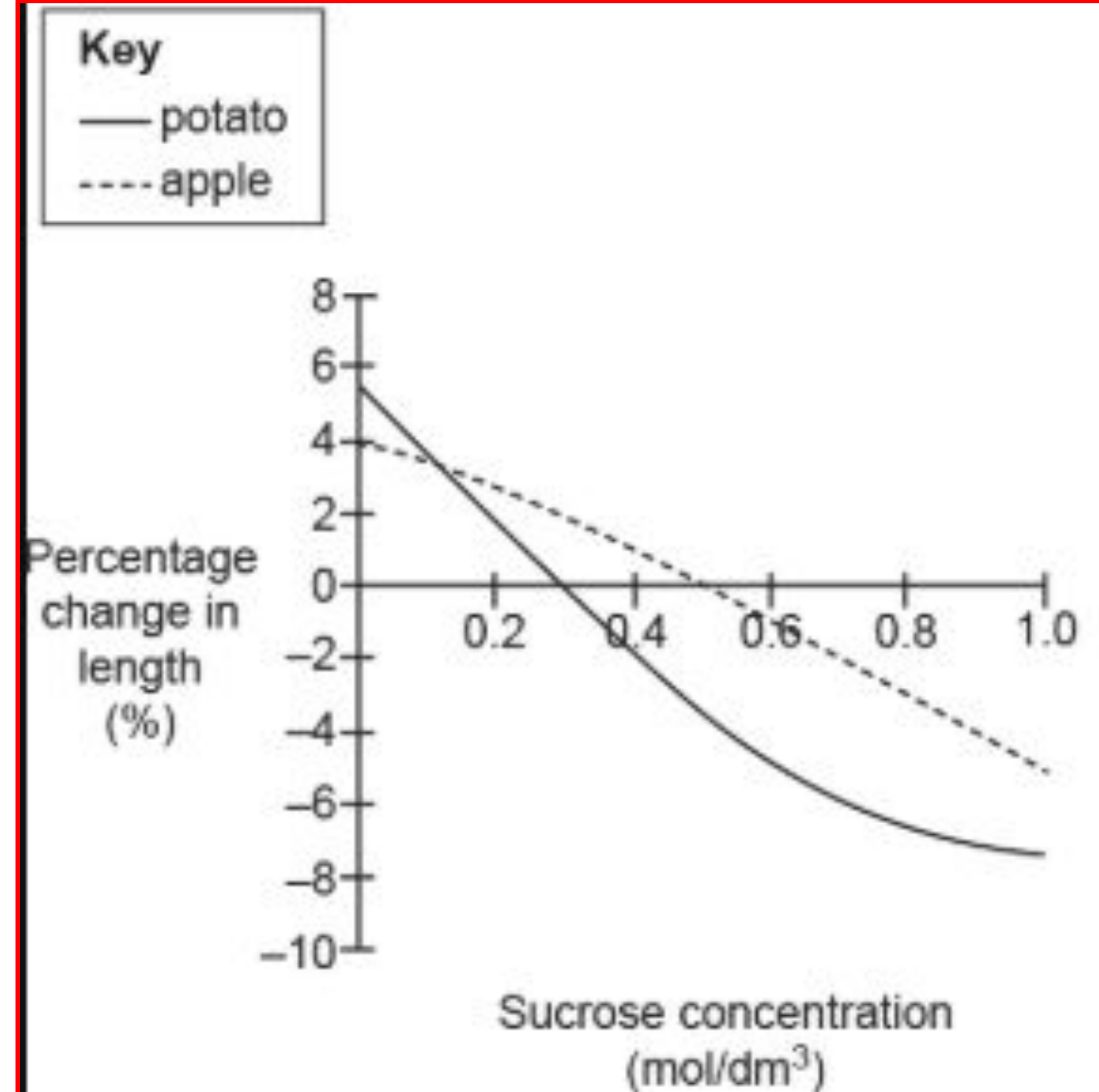Answer = --------------------------------------- % [2]

A student investigates osmosis by placing chips of potato and apple into different concentrations of sucrose solution. The student calculates the percentage change in length for each chip of potato and apple.The graph shows the student's results.

Estimate the concentration of sucrose inside the cells of the **apple**.

A 0.06 mol/dm3

B 0.3 mol/dm3

C 0.5 mol/dm3

D 1.0 mol/dm3

OCR, 2019 J250/01

Key
— potato
---- apple

Percentage change in length (%)

8
6
4
2
0
-2
-4
-6
-8
-10

0.2   0.4   0.6   0.8   1.0

Sucrose concentration (mol/dm^3)

A student investigates osmosis by placing chips of potato and apple into different concentrations of sucrose solution. The student calculates the percentage change in length for each chip of potato and apple.The graph shows the student's results.

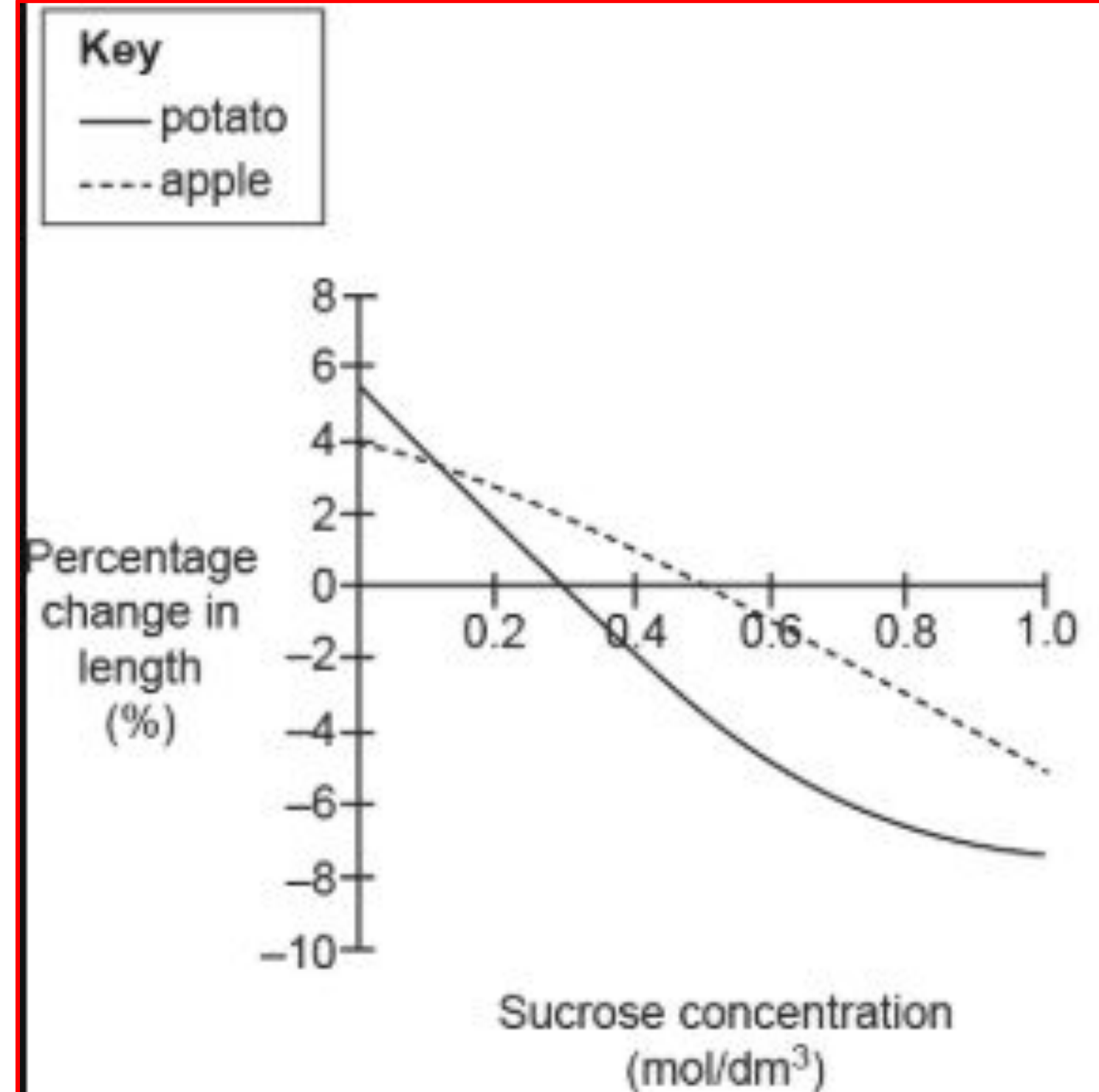Estimate the concentration of sucrose inside the cells of the **apple**.

A 0.06 mol/dm3

B 0.3 mol/dm3

C 0.5 mol/dm3

D 1.0 mol/dm3

OCR, 2019 J250/01

Key
— potato
---- apple

Percentage change in length (%)

Sucrose concentration (mol/dm^3)

Exam style question

Estimate the concentration of sucrose in the potato. Use the graph to help you. (1)

Explain why both the apple and potato cylinders had an increase in length when placed inside sucrose solution of 0.2 mol/dm^3. (3 marks)
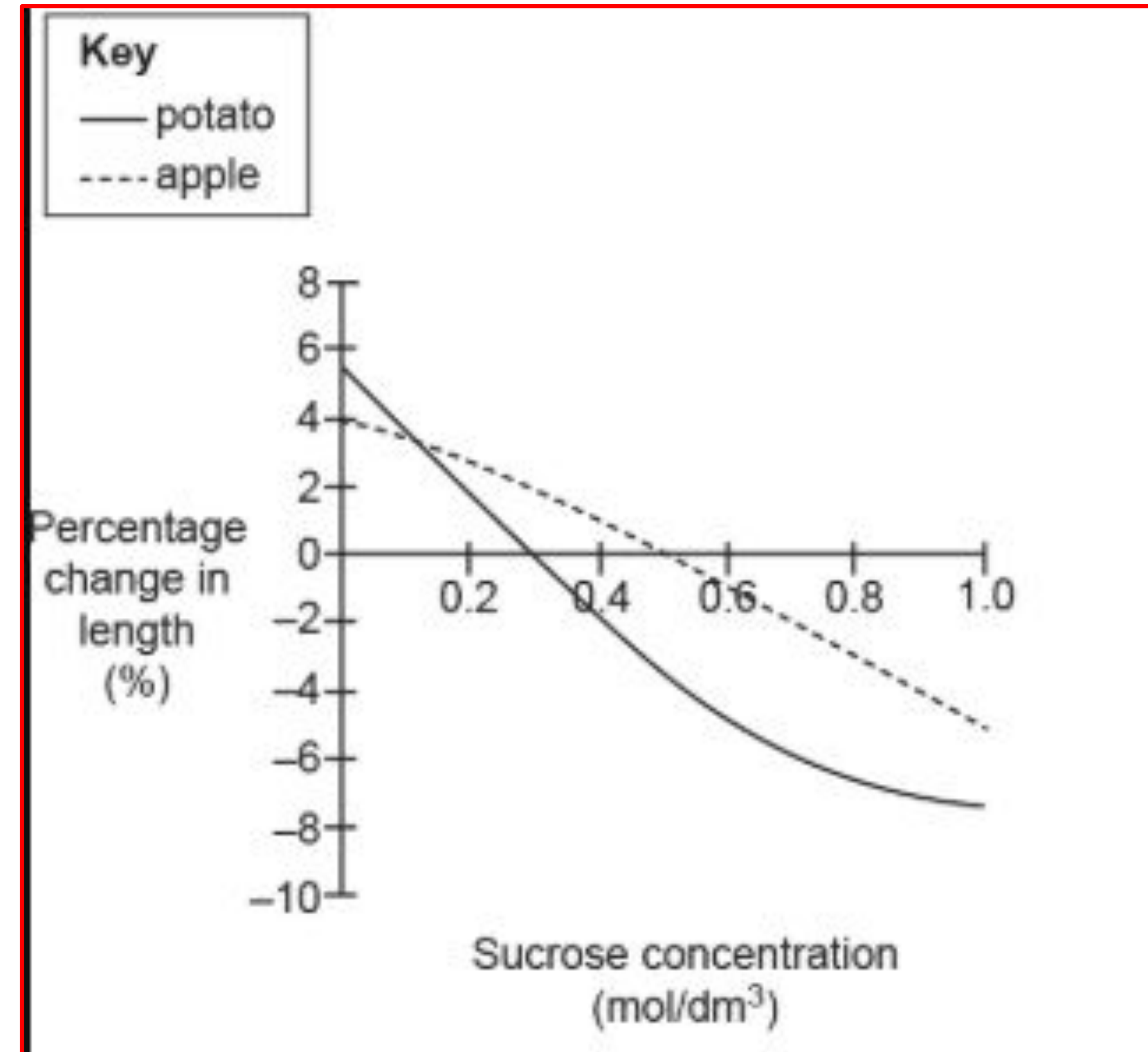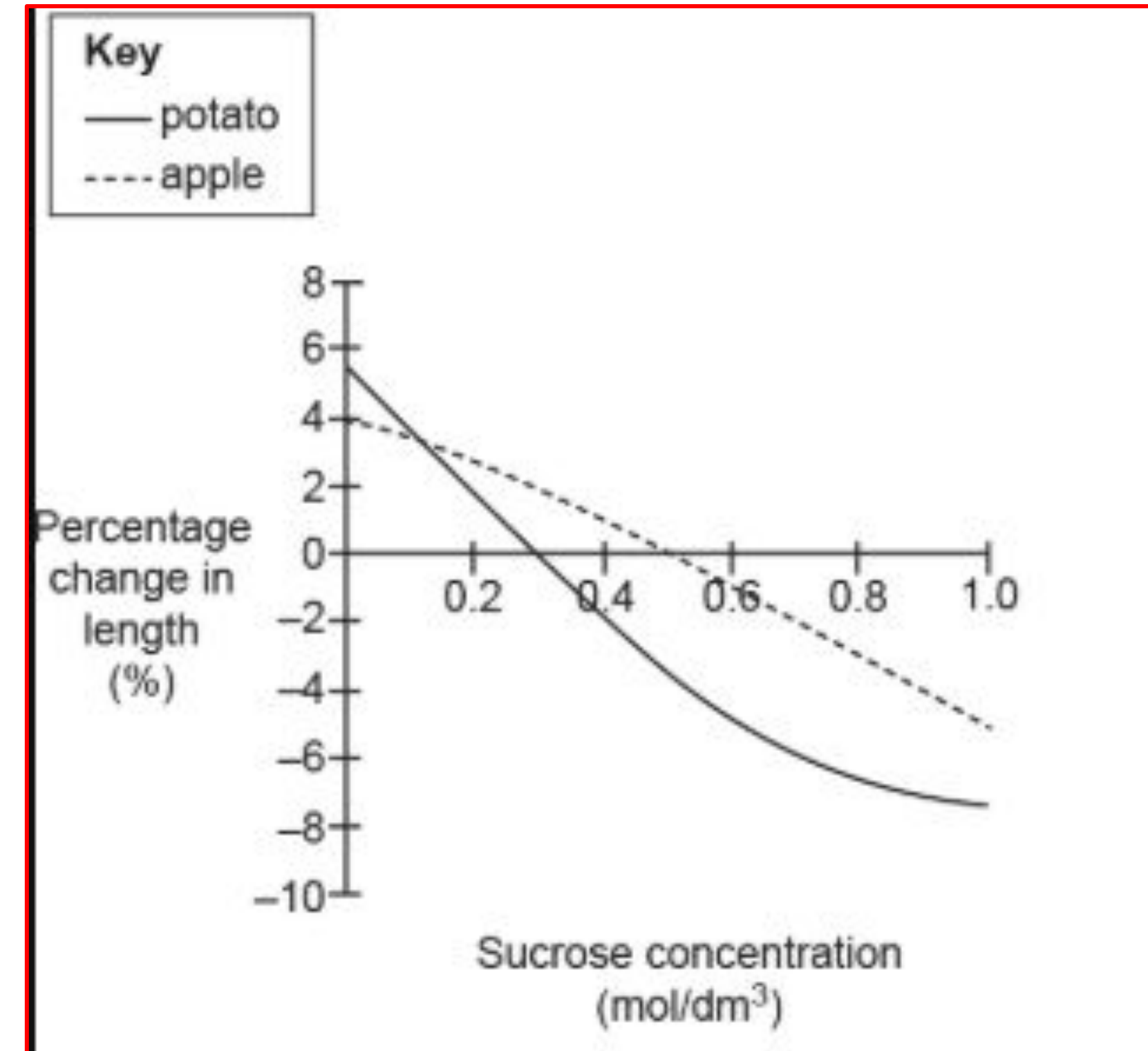

OCR, 2019 J250/01

Exam style question

Estimate the concentration of sucrose in the potato. Use the graph to help you. (1)

0.3 mol/dm^3

Explain why both the apple and potato cylinders had an increase in length when placed inside sucrose solution of 0.2 mol/dm^3. (3 marks)

Water has entered the plant cell by osmosis as the water concentration is higher in the solution than that inside the plant cells.

OCR, 2019 J250/01