Combined Science - Biology - KS4
Cell Biology

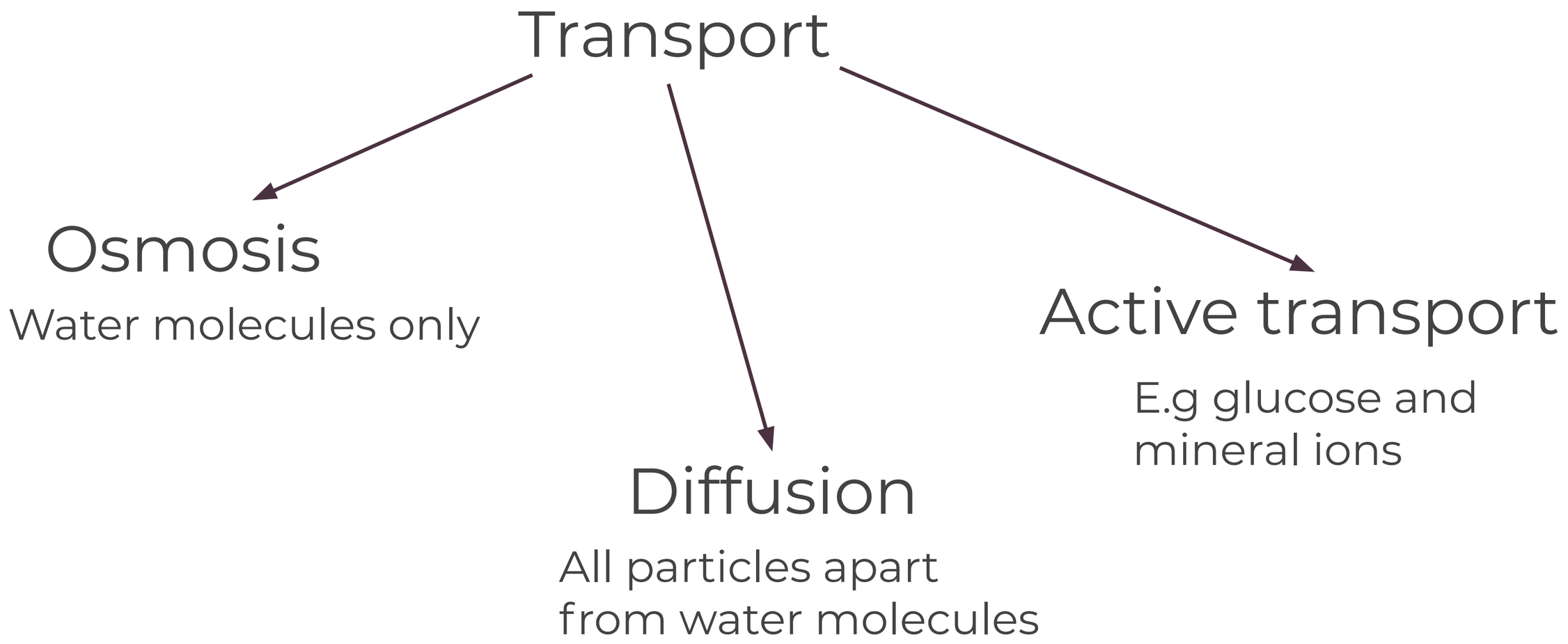
Cell biology review 2

Miss Wong

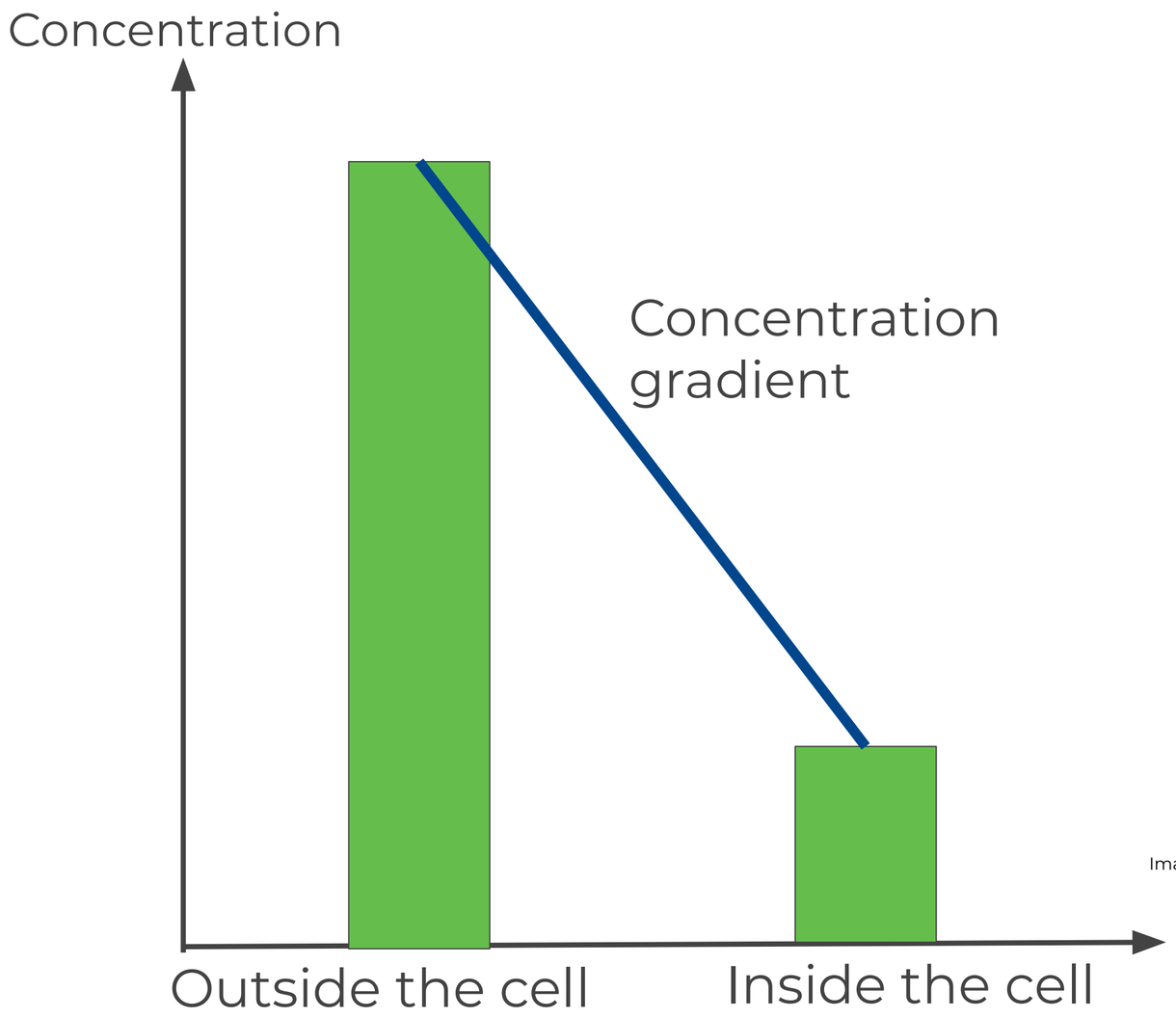
OAK NATIONAL ACADEMY

Transport of materials

Transport into and out of cell



Diffusion



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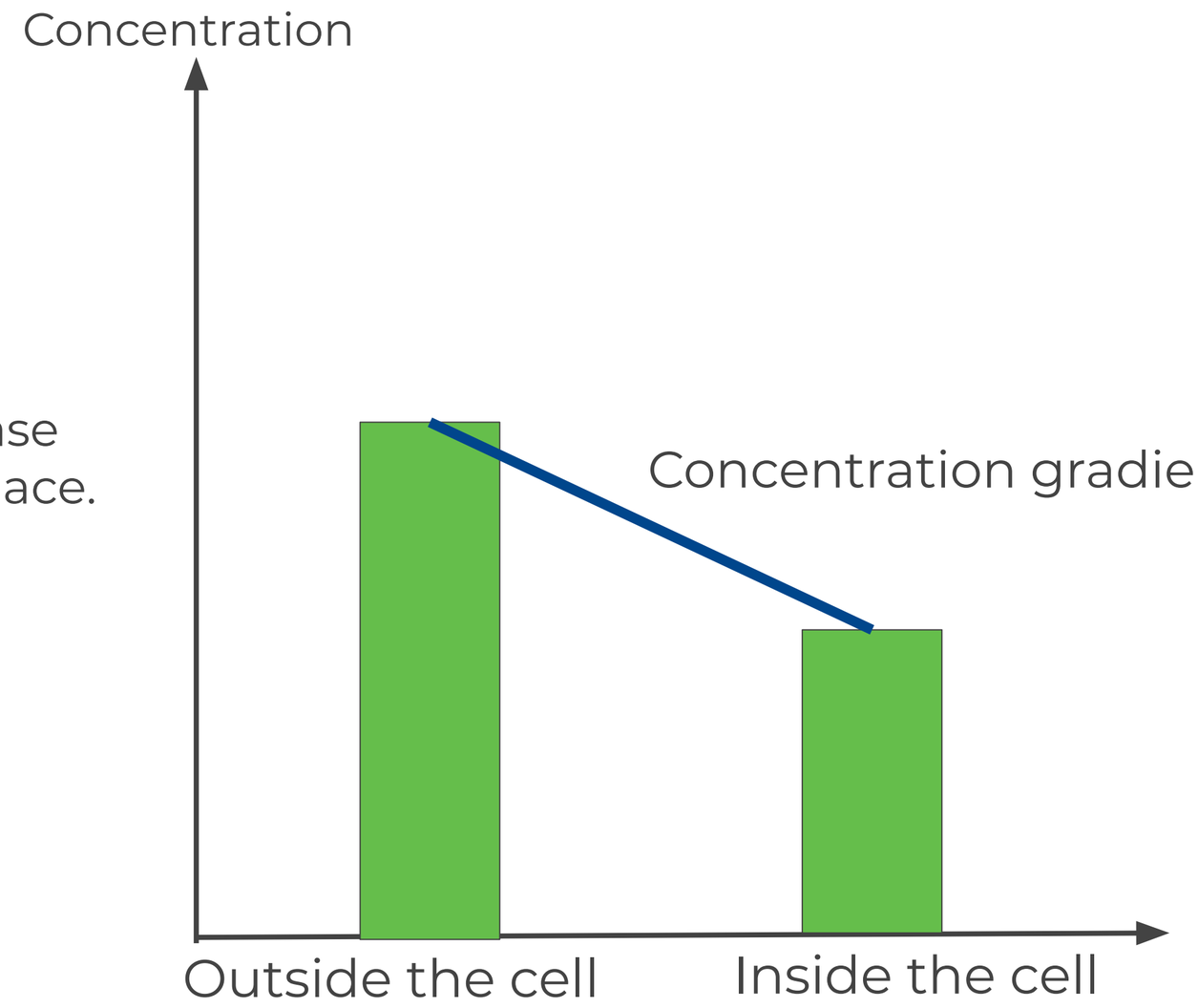
Diffusion

The concentration gradient will decrease as diffusion takes place.



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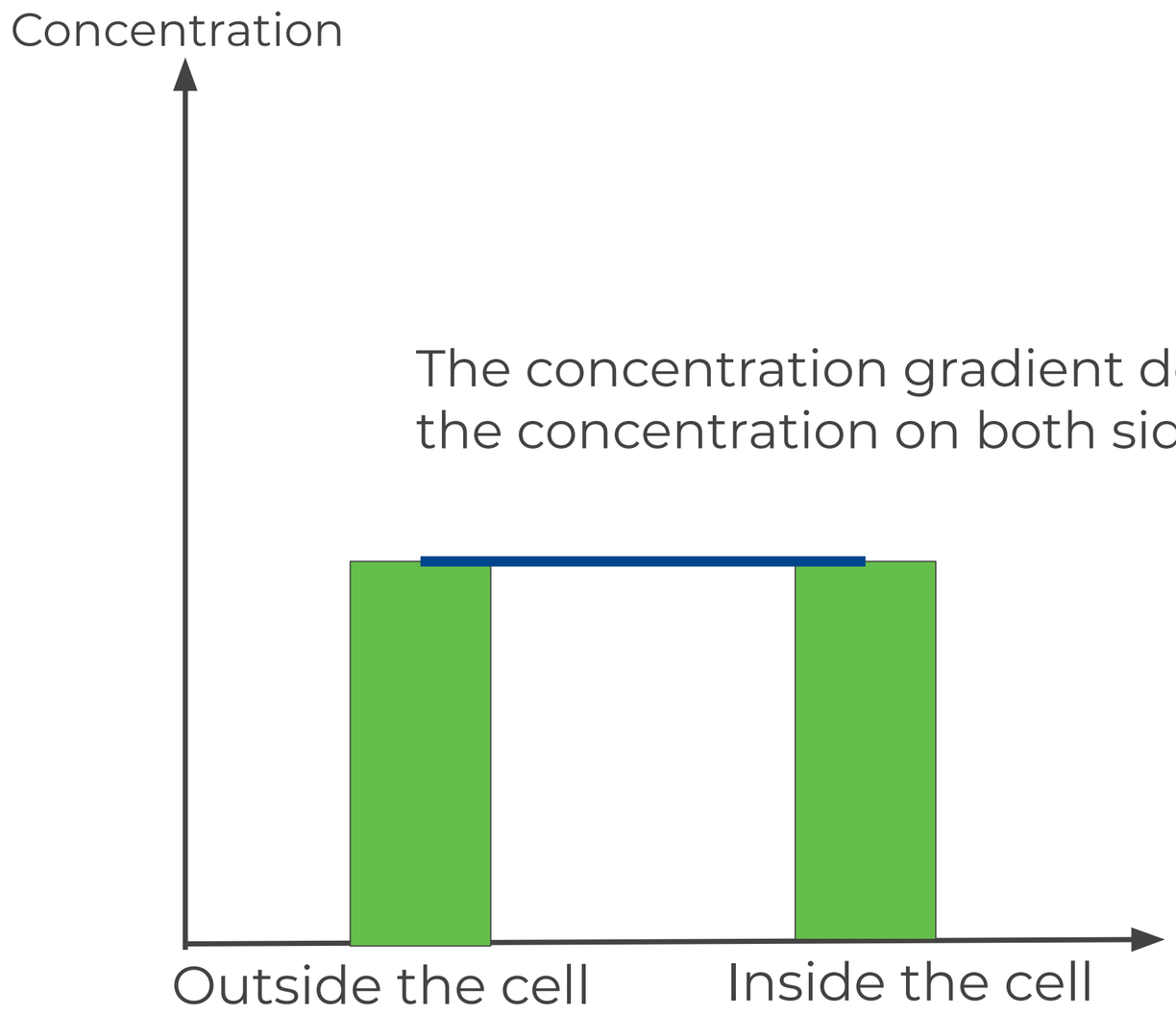
Diffusion



The concentration gradient does not exist when the concentration on both sides are equal.

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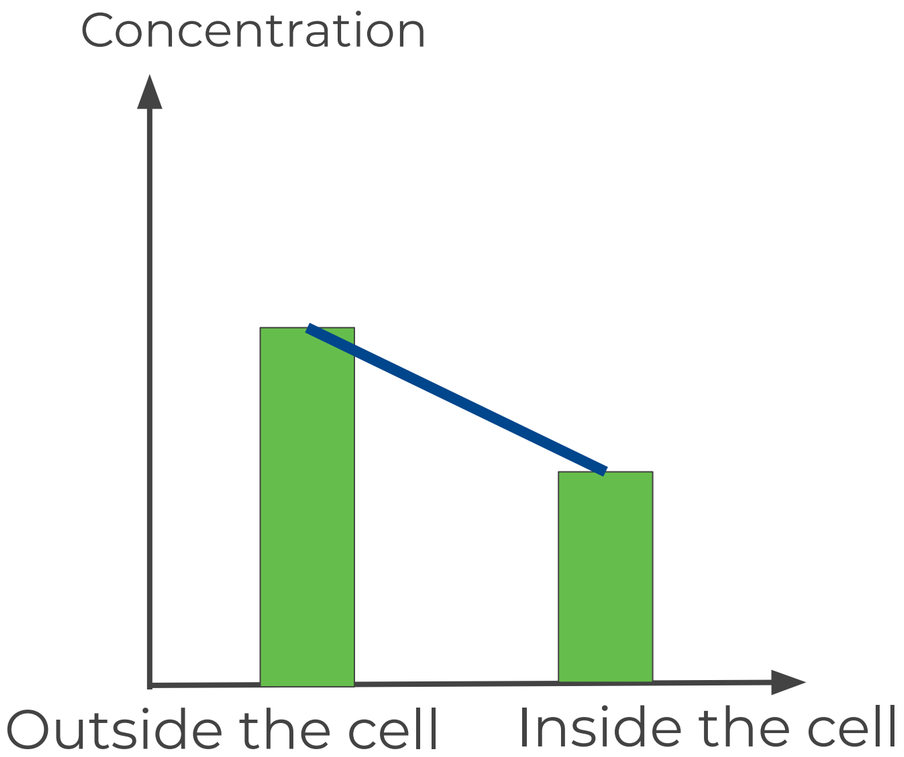
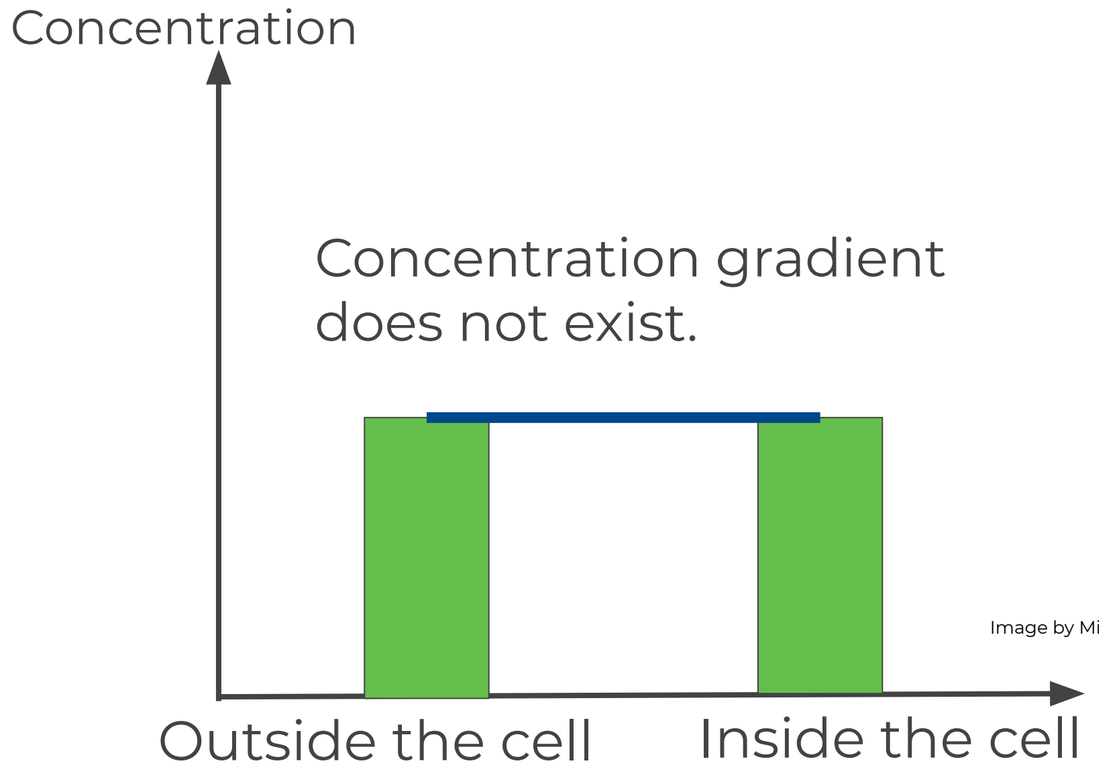
Active transport

Active transport is the movement of substances from a lower concentration to a higher concentration **across a semi-permeable** membrane **requiring energy** from respiration.





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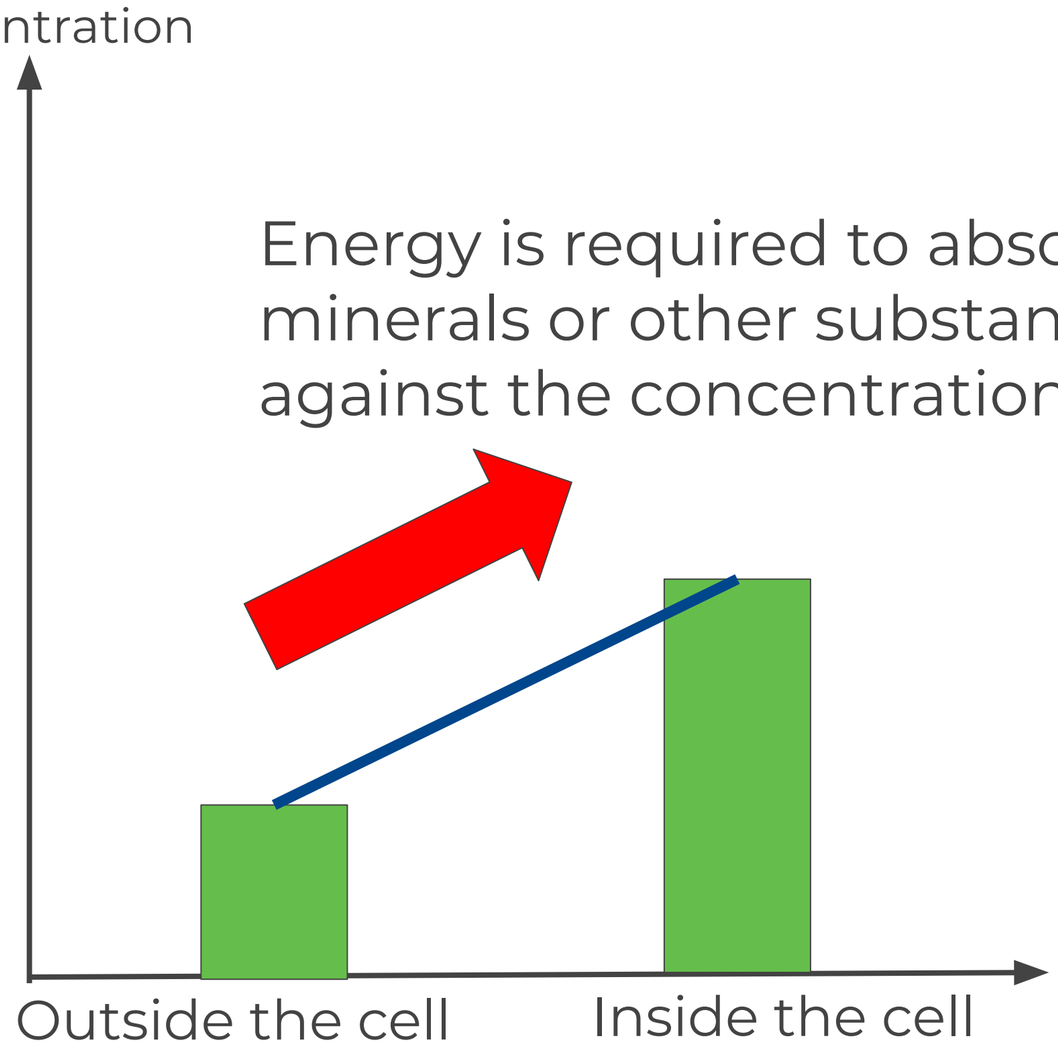
Active transport



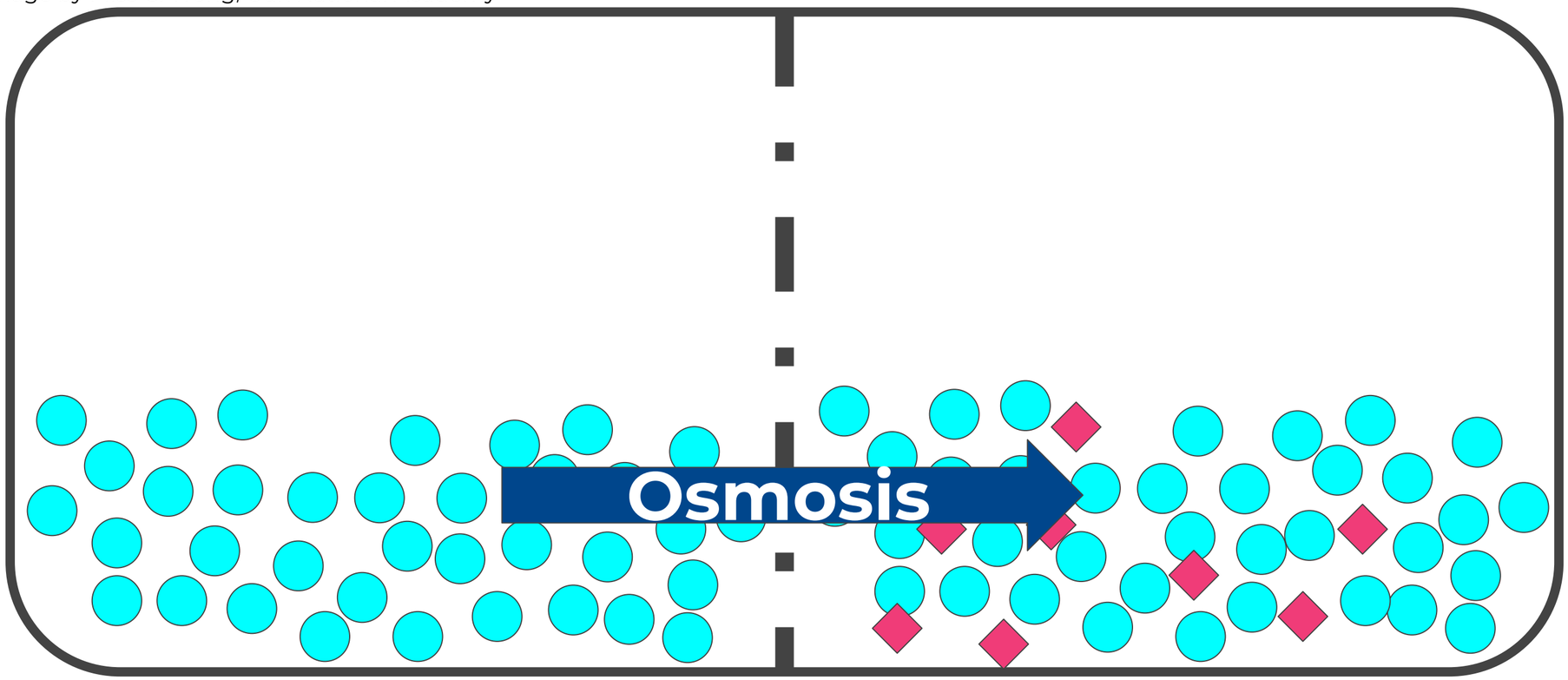
Energy is required to absorb minerals or other substances against the concentration gradient.

This process requires energy and proteins in the cell membrane.

Osmosis

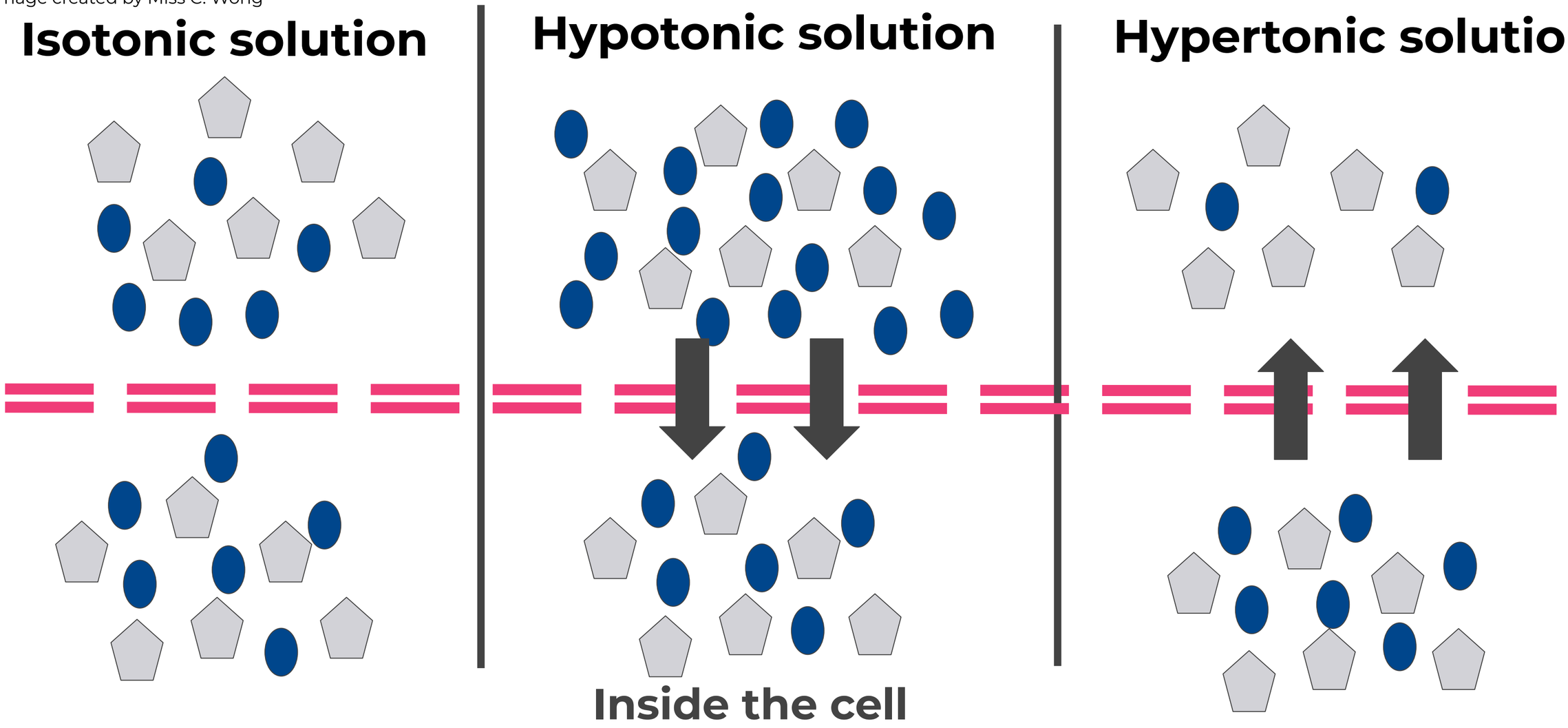
The movement of water from a region of higher water concentration to a region with lower water concentration.

Image by Miss C. Wong, Oak National Academy



Hypotonic, hypertonic, isotonic solution

Image created by Miss C. Wong



Multiple choice quiz

Water goes into root hair cells by....

Osmosis

Diffusion

Active transport

Multiple choice quiz

Root hair cells absorbs mineral ions against the concentration gradient by...

Osmosis

Diffusion

Active transport

Multiple choice quiz

Which two of the following require a cell membrane to occur?

Osmosis

Diffusion

Active transport

Multiple choice quiz

Which two of the following involves the movement of particles down the concentration gradient?

Osmosis

Diffusion

Active transport

Multiple choice quiz

Plasmolysis will happen when a plant cell is put into....

A hypotonic solution

An isotonic solution

A hypertonic solution

Factors affecting rate of transport

Four factors affecting rate of transport

Temperature	The higher the temperature, the higher the rate.
Difference in concentration	The bigger the difference, the higher the rate.
Surface area to volume ratio	The bigger the surface area to volume ratio, the higher the rate.
Diffusion distance	The shorter the diffusion distance, the higher the rate.

Examples of exchange surfaces

The examples are:

1. Root hair cells.
2. Alveoli
3. Fish lamellae
4. Villi

They all have:

1. Thin walls
2. Large surface area to volume ratio
3. Good blood supply (not in the root hair cell)

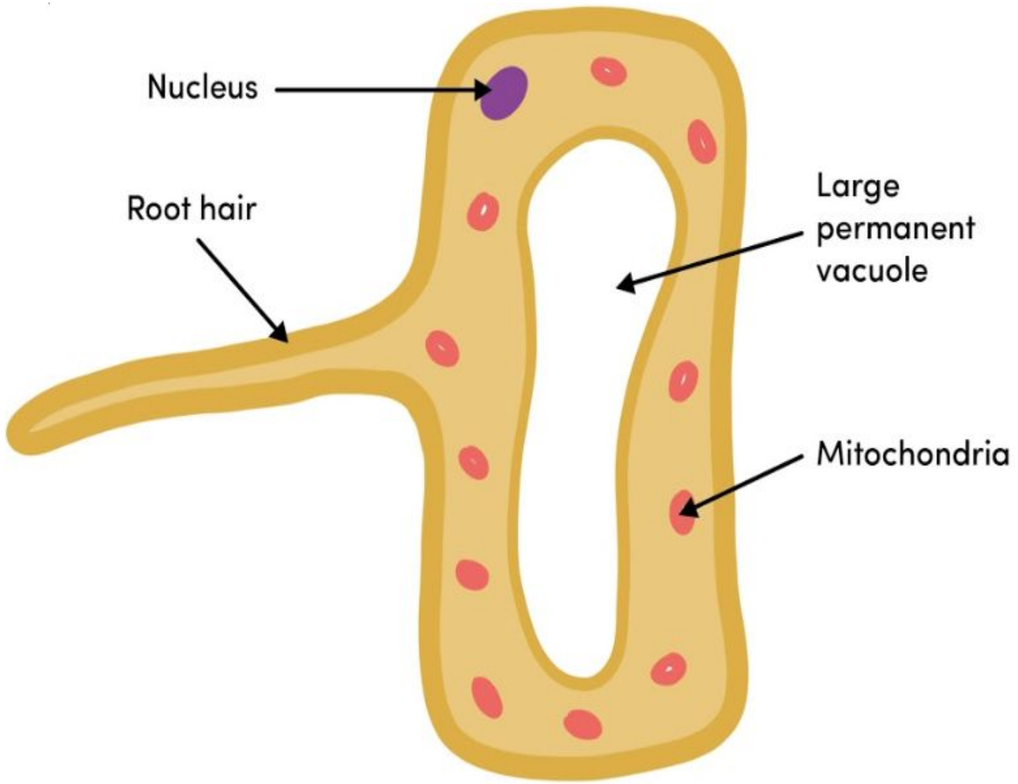


Image: Oak National Academy

Pause the video to complete your task

Quick concept check

Give three common adaptations of the human alveoli and the fish lamellae.

Resume once you’re finished

Pause the video to complete your task

Answer

They both have thin walls, large surface area to volume ratio and they have good blood supply to maintain the concentration gradient.

Resume once you’re finished

Osmosis required practical

Pause the video to complete your task

Quick reminder

1. Independent variable is the one you _____.
2. Dependent variable is the one you _____.
3. Control variable is the one you _____.

Resume once you're finished

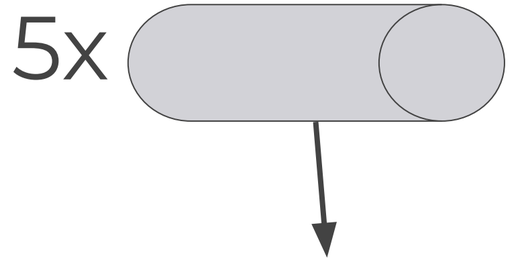
Pause the video to complete your task

Answers

1. Independent variable is the one you _____change_____.
2. Dependent variable is the one you ____measure____.
3. Control variable is the one you _____keep the same_____.

Resume once you're finished

What is the salt or sugar concentration inside a plant tissue?



Soaked into different concentration of salt or sugar solution

Increase in mass or length

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

No change

Same concentration

Decrease in mass or length

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

Working scientifically as a process

What is the concentration of salt or sugar in the cells of a plant?

↓

The concentration is 0.4 molar

↓

Design experimental setup

Different concentrations of salt solution being used.

Time of plant tissue being soaked in the solution.

The change in mass and/or length.

↓

Test and collect data → **What is the concentration of salt or sugar?**

Results table

Concentration of sugar solution/%	Starting length/cm	Final length/cm	Change in length/cm	Percentage change in length/ %
4	6.00	5.20		
3	6.00	5.70		
2	6.00	6.10		
1	6.00	6.40		
0	6.00	6.90		

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 length of 6 cm before being put completely into 5% sugar solution. After five hours, the carrot was removed from the water, blotted dry and weighed. The mass of the carrot was 5.1 cm. Calculate the percentage change in mass.

The change = 5.1 - 6 = -0.9

Percentage change= -0.9 ÷ 6 x 100 = -15.00%.

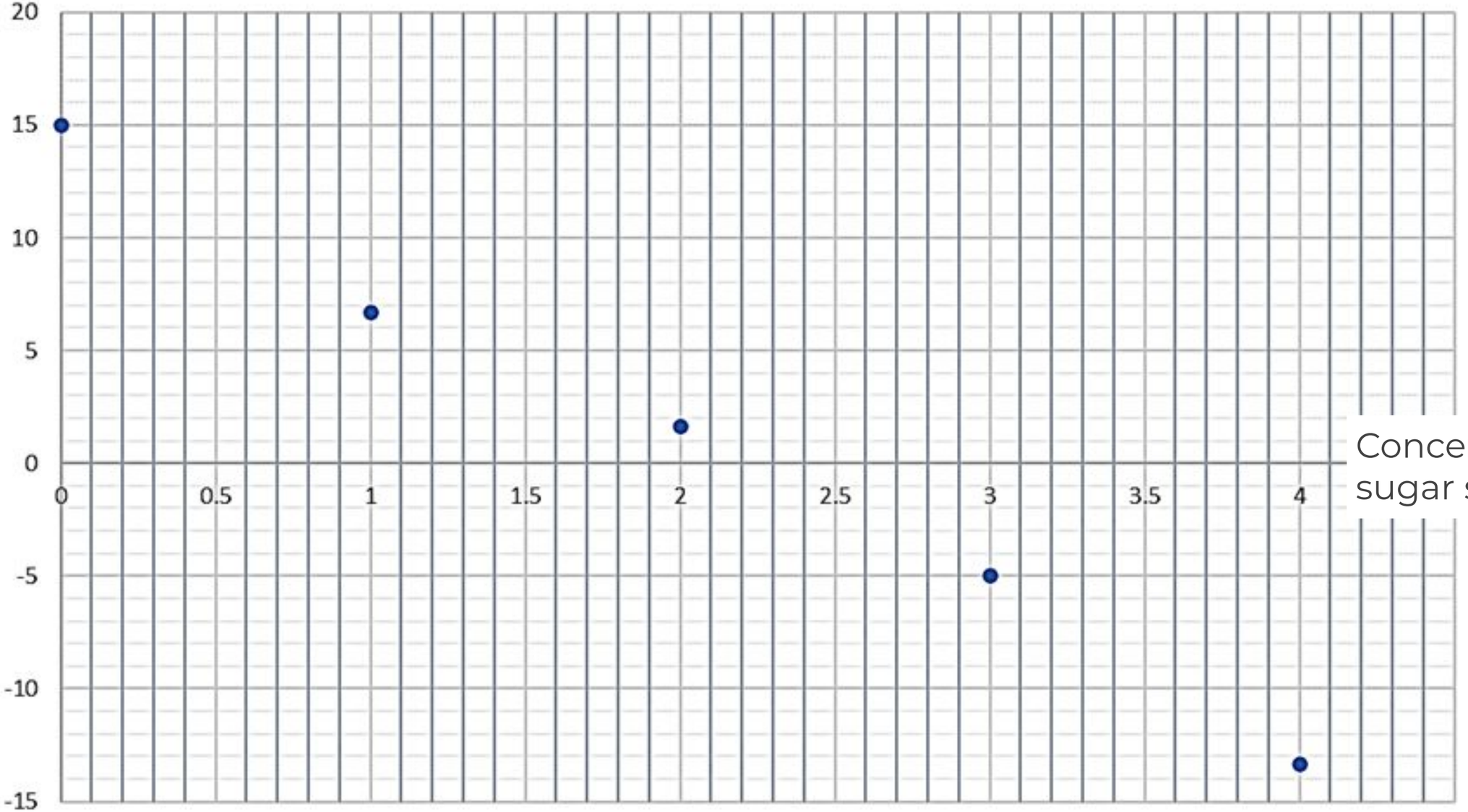
Results table

Concentration of sugar solution/%	Starting length/cm	Final length/cm	Change in length/cm	Percentage change in length/ %
4	6.00	5.20		
3	6.00	5.70		
2	6.00	6.10		
1	6.00	6.40		
0	6.00	6.90		

Results table

Concentration of sugar solution/%	Starting length/cm	Final length	Change in length	Percentage change in length/ %
4	6.00	5.20	-0.80	-13.33
3	6.00	5.70	-0.30	-5
2	6.00	6.10	0.10	1.67
1	6.00	6.40	0.40	6.67
0	6.00	6.90	0.90	15

Title: Percentage change in length of plant tissue in different concentrations of sugar solution



Graph created by Miss C. Wong, Oak National Academy

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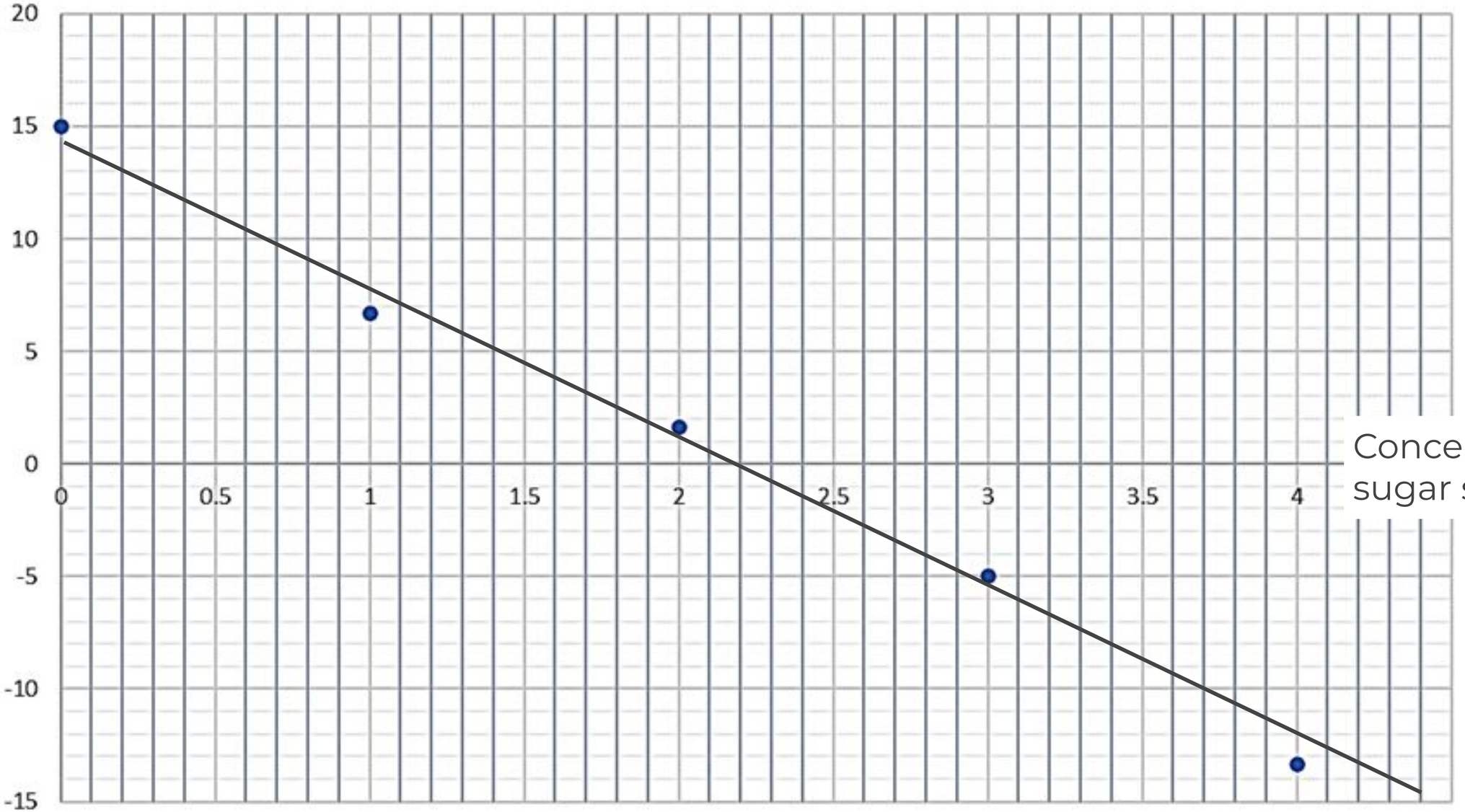

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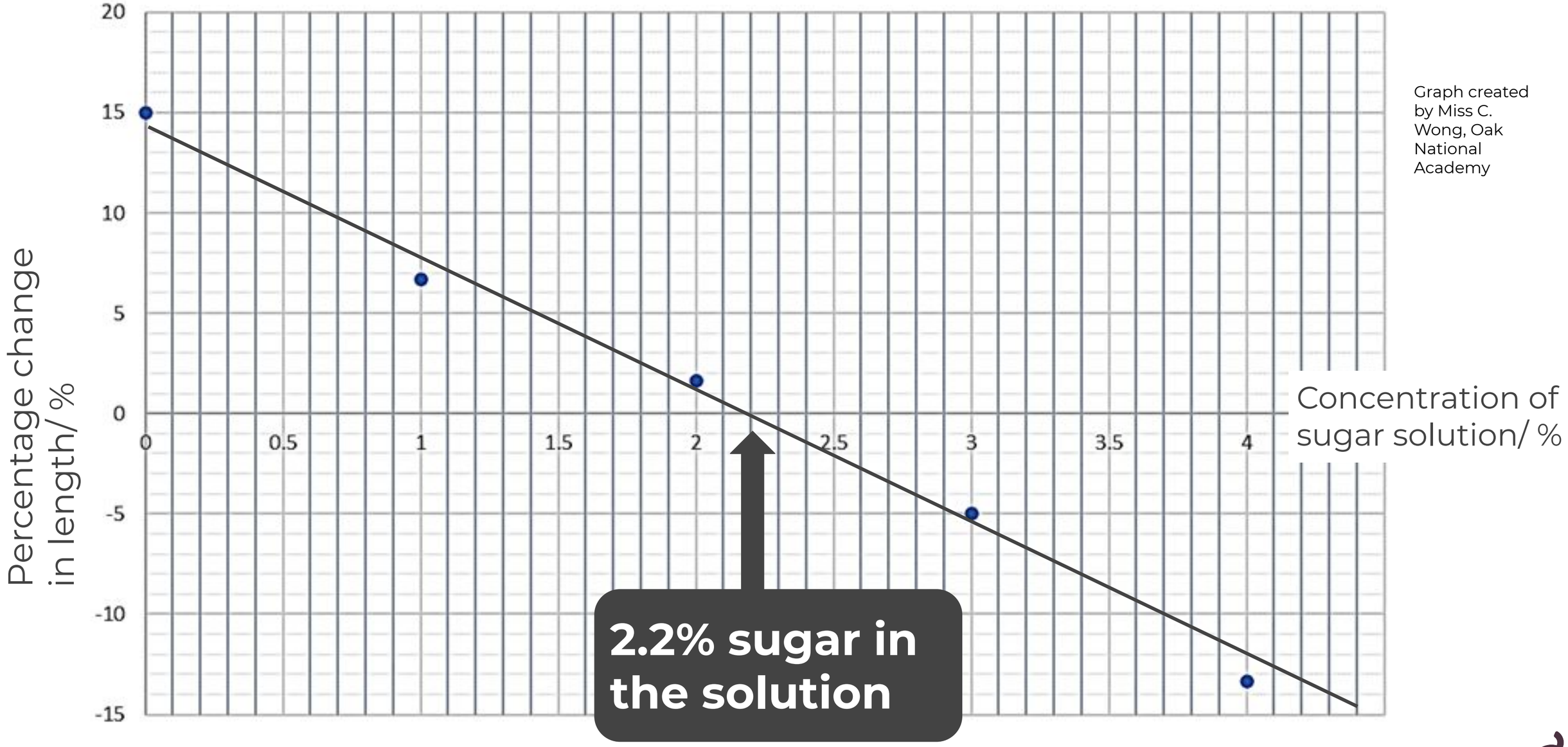

Graph created by Miss C. Wong, Oak National Academy

Pause the video to complete your task

Arrange the following sentences in the right order.

Read the x-intercept.

Find the change in mass or length

Find the percentage change.

Draw the line of best fit.

Plot the data onto a graph.

Resume once you're finished

Independent practise

Independent practise

1. What is the formula to calculate percentage change in mass?
2. Why is percentage change used instead of change in mass?
3. Explain why some potato cylinders showed an increase in mass. For which range was this applicable?
4. Explain why some potato cylinders showed a decrease in mass. For which range was this applicable?
5. Estimate the concentration of sugar inside the potato cells. How can we tell that from the data?
6. How could we improve the estimate of the sugar solution in the cells?

Independent practise

Concentration of salt solution/ M	Starting mass/g	Final mass/g	Change in mass/g	Percentage change in mass/ %
1	6.1	5.2		
0.75	6.3		-0.5	-7.94
0.5	5.9	5.7	-0.2	
0.25		6.4	0.2	3.23
0	5.8	6.4		

Answers to independent practise

1. Percentage change = Change ÷ starting mass x 100
2. To account for differences in starting mass.
3. Some potato cylinders gained mass because the surrounding solution was more dilute than in the cells. Water moved in by osmosis, so they gained water.
4. Some of the potato cylinders lost water by osmosis because the solution surrounding the cells was more concentrated. There was a net outward movement of water through the cell membrane and the cells shrunk, causing a loss of mass.
5. You need to read the point where the line crosses the horizontal axis (the x-intercept).
6. Repeat the experiment using a narrow range of concentration around the estimate from the graph e.g between 0.40 and 0.5M (0.40, 0.42, 0.44, 0.48M).

Answers to independent practise

Concentration of salt solution/ M	Starting mass/g	Final mass/g	Change in mass/g	Percentage change in mass/ %
1	6.1	5.2	-0.9	-14.75
0.75	6.3	5.8	-0.5	-7.94
0.5	5.9	5.7	-0.2	-3.39
0.25	6.2	6.4	0.2	3.23
0	5.8	6.4	0.6	10.34