

# KS4 Science

Please watch the following two videos and read the BBC bitesize page.

Attempt the questions in the booklet below. Mr Devaynes has provided you with results to work with as you are unable to do the practical.

You can either type up your answers into a Word document or write your answers on paper.

Please email your completed questions to [admin@cloughwood.cheshire.sch.uk](mailto:admin@cloughwood.cheshire.sch.uk)

<https://www.youtube.com/watch?v=jTDATlaBV-o>

<https://www.youtube.com/watch?v=EPtLWZE4xgE>

<https://www.bbc.co.uk/bitesize/guides/zsgfv4j/revision/9>

## Required practical 3: Investigating the effect of a range of salt or sugar concentrations on the mass of plant tissue (Planning practical)

Osmosis is a special type of diffusion, where water moves across a partially permeable membrane from a dilute solution to a concentrated solution. The cytoplasm inside plant cells is a solution and the cell membrane around it is partially permeable, so osmosis occurs in plant cells.

In this practical you will plan and carry out an experiment. In the experiment you will investigate how the concentration of solution surrounding plant cells affects the movement of water by osmosis into or out of the cells.

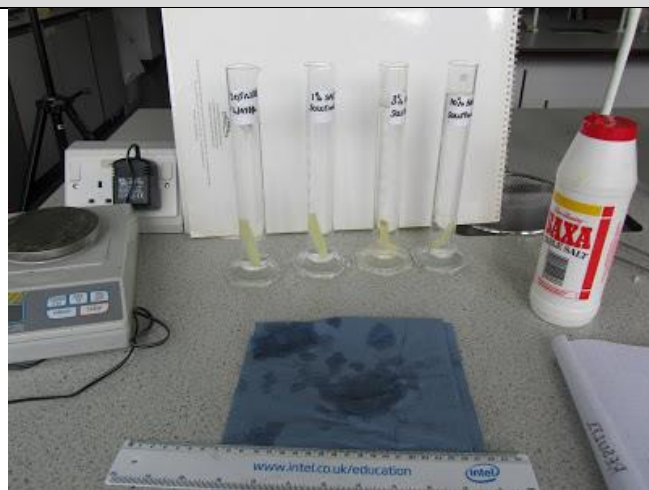
### Equipment list

- Large potato (skin removed)
- Potato chip cutter or a cork borer
- 100 cm<sup>3</sup> sodium chloride solution (5% by mass)
- Distilled water in a wash bottle
- Boiling tube rack and six boiling tubes
- Marker pen
- 10 cm<sup>3</sup> syringe
- White tile, scalpel and ruler
- Forceps
- Paper towels
- Stop clock
- Digital balance

## Safety

- take care with sharp knives

## Diagram



## Method

- 1 Make up six different sodium chloride solutions in the six boiling tubes as shown in the table below.

NaCl concentration / %	Volume / cm <sup>3</sup>		
	Distilled water	5% NaCl solution	Total
0.0	25	0	25
1.0	20	5	25
2.0	15	10	25
3.0	10	15	25
4.0	5	20	25
5.0	0	25	25

- 2 Using the potato chip cutter or a cork borer, cut six chips from your potato.
- 3 Use a ruler, scalpel and tile to cut all of the chips to the same length of 50 mm. Put each potato chip onto a clean square of paper towel which you have numbered in the same way as the boiling tubes.
- 4 Weigh each potato chip, ensuring that the balance is zeroed before use. Record these initial masses in the table below.
- 5 After precisely 20 minutes, remove the chips from the boiling tubes. Blot the chips dry, as before. Then reweigh them. Record these final masses in the table below.
- 6 As the chips will have had different initial masses, to make a fair comparison convert the actual change in mass into a percentage change in mass, using the following formula:

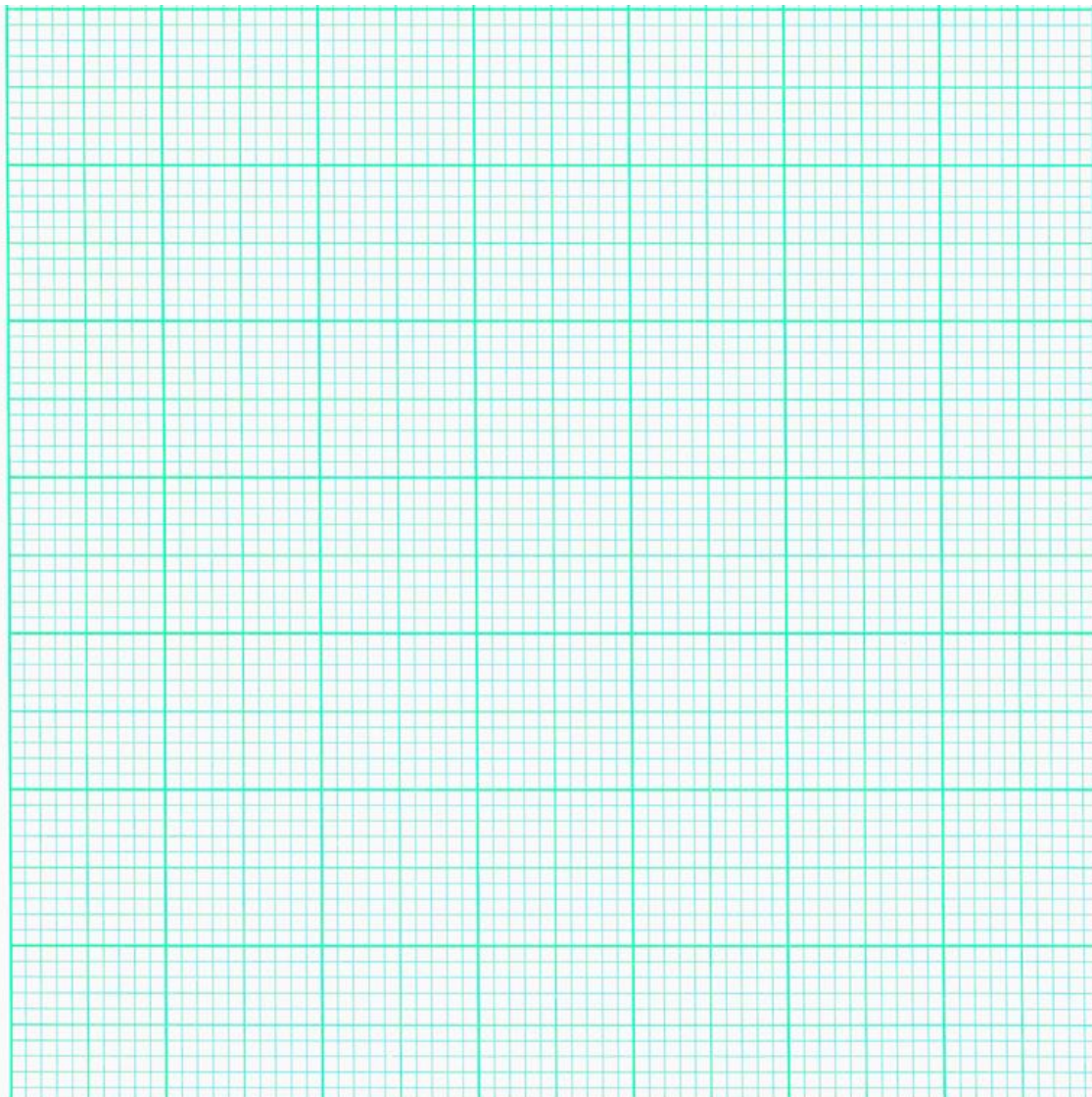
$$\text{Percentage change in mass} = \frac{(\text{final mass} - \text{initial mass})}{\text{initial mass}} \times 100$$

## Results

NaCl concentration %	Mass of chip / g			Percentage change in mass (note if this is + or -)
	Initial	Final	Change	
0.0	2.17	2.15		
1.0	2.16	2.11		
2.0	1.95	1.93		
3.0	2.14	2.12		
4.0	2.13	2.05		
5.0	2.03	1.99		

## Graph

On the graph paper below, draw a graph of percentage change in mass against salt concentration. Think carefully about your y axis before you draw the graph.



## Check your understanding

You can also investigate the effect of other variables on osmosis in plant tissues.

1 Think of such a variable. Explain how you think it might affect osmosis.

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2 Write a method that can be used to investigate how this variable affects osmosis.

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## AQA Exam question

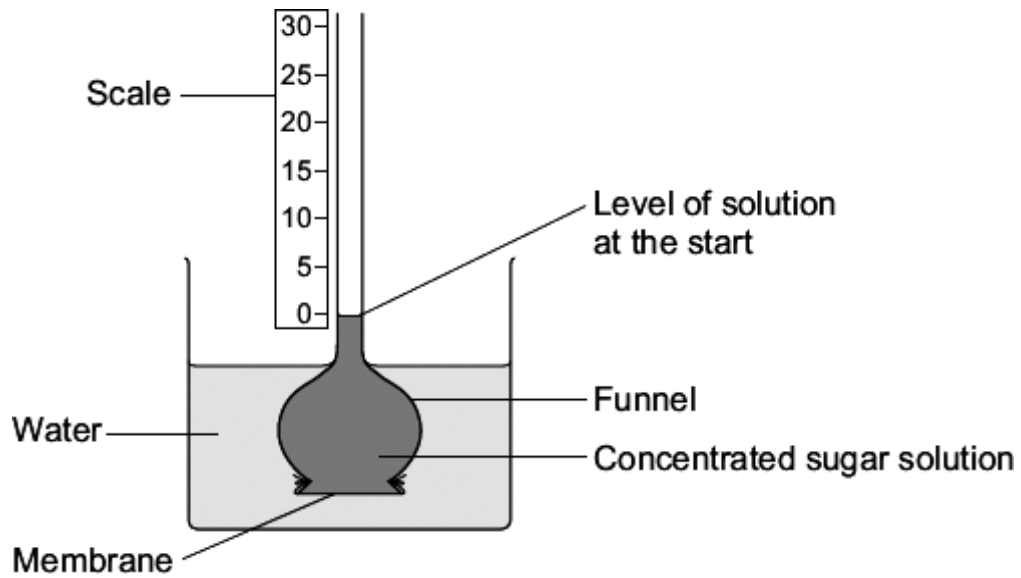
**Q1.** Some substances move through membranes.

A student set up an investigation.

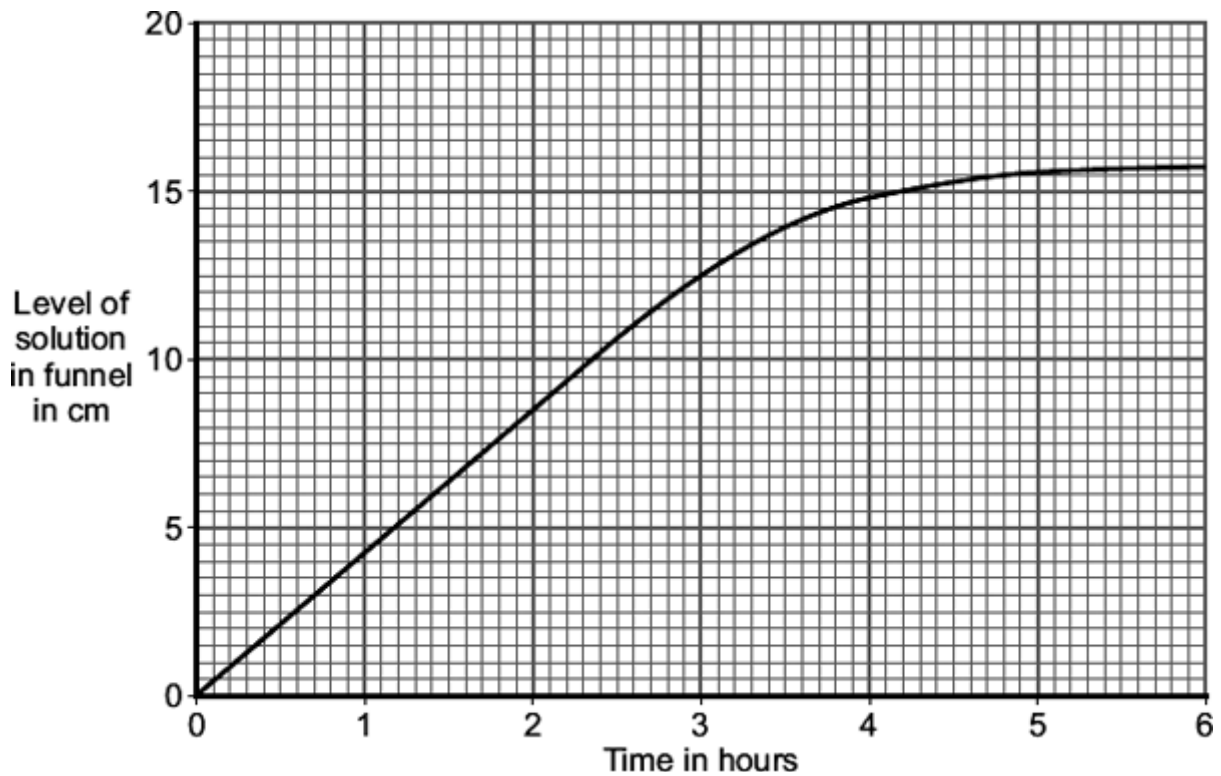
The student:

- tied a thin membrane across the end of a funnel
- put concentrated sugar solution in the funnel
- put the funnel in a beaker of water
- measured the level of the solution in the funnel every 30 minutes.

The diagram shows the apparatus.



The graph shows the results.



- (a) After 3 hours, the level of the solution in the funnel is different from the level at the start.

Explain why, as fully as you can.

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(3)

- (b) The student repeated the investigation using dilute sugar solution instead of concentrated

sugar solution.

In what way would you expect the results using dilute sugar solution to be different from the results using concentrated sugar solution?

Give the reason for your answer.

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**(2)**  
**(Total 5 marks)**