

Activity sheet

Exploring diffusion and osmosis

Name: _____

Class: _____

Part A KNL: What do we know? What do we need to know? What have we learnt?

In this activity, you will be exploring diffusion using KNL. Summarise your responses in the right-hand column of the table.

K	In Year 8 you identified and explained the properties of solids, liquids and gases. What do you already know about how particles move in the two fluids: gases and liquids?	
	Where is diffusion found in living organisms?	
N	How do diffusion rates compare in gases and liquids? Does the rate of diffusion in a substance speed up or slow down over time?	
L	What have you understood from the two demonstrations?	
	Explain the difference in the diffusion rates. (Hint: Think of the molecular properties of solids, liquids and gases.)	
	Why are large organisms like plants often filled with open air spaces?	

Part B Demonstration of diffusion of a gas

Red litmus paper is an indicator for basic solutions, which make it turn blue. In this demonstration, small wetted squares of red litmus paper are stuck along the inside of a glass tube (2 cm diameter), corked at each end.

Method

- 1 Start the demonstration by introducing a ball of cotton wool soaked in ammonia solution, which is alkaline.

2 Time the rate that the litmus squares change colour. Record your data in the table below.

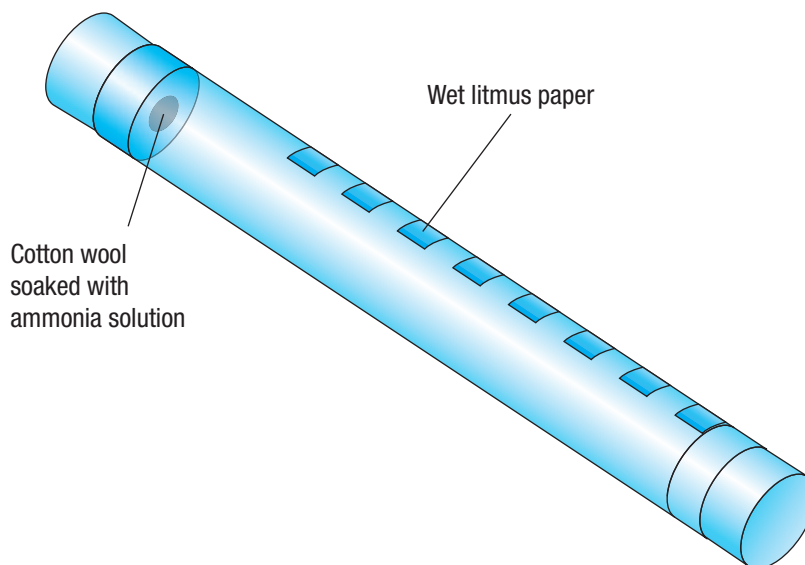


Figure 1 Diffusion of ammonia

Time to reach square (seconds)	Distance (cm)

3 Use a spreadsheet such as Excel to graph your results.

Part C Demonstration of diffusion of a liquid

Gelatin and agarose (agar) are examples of polymer gels.

Your teacher may demonstrate this, or the test tube with the band of coloured gel may already have been prepared.

Method

- 1 Pour the clear gel into a test tube (about 3.0 cm). Let it set.
- 2 Add a narrow band (approximately 0.5 cm) of gel coloured with food dye or methylene blue. Let it set.
- 3 Cover the blue layer with a third layer of clear gel (about 3.0 cm).

- 4 Over several days, measure the width of the coloured band. The increase represents diffusion of the dye through liquid in two directions. Record your data in the table below.

Day	Width of coloured band (cm)	Distance travelled (width of coloured band \div 2)

- 5 Why did you need to halve your results in column 3 in order to compare the results with those in Part B?
- 6 Use a spreadsheet such as Excel to graph your results.

Part D How do concentration differences affect osmosis in tissue?

Osmosis is the movement of water through a membrane. In this investigation, you will describe how the rate of osmosis depends on the concentration of the solutes on either side of the membrane.

Different groups of students should investigate different concentrations of sugar solutions.

Materials

- thistle funnel
- dialysis tubing
- water-proof tape or elastic band
- sugar solution (three different concentrations)
- beaker
- access to tap water
- clock or stopwatch

Method

- 1 Use a thistle funnel to set up this experiment. Make sure the same size and type of thistle funnel is used for all the experiments. Why?
- 2 Cut 20 cm of dialysis tubing (the semi-permeable membrane) before soaking it in water for a few minutes to soften it.

- 3 Cover the head of the thistle funnels with the dialysis tubing, sealing it with water-proof tape or an elastic band.
- 4 Fill the thistle funnels with a sugar solution (e.g. 5, 10 or 20%) and place the covered end in tap water. Record the height of the solution (which should be similar).
- 5 Predict how differences in concentration of the sugar solution and tap water will affect the rate of osmosis.

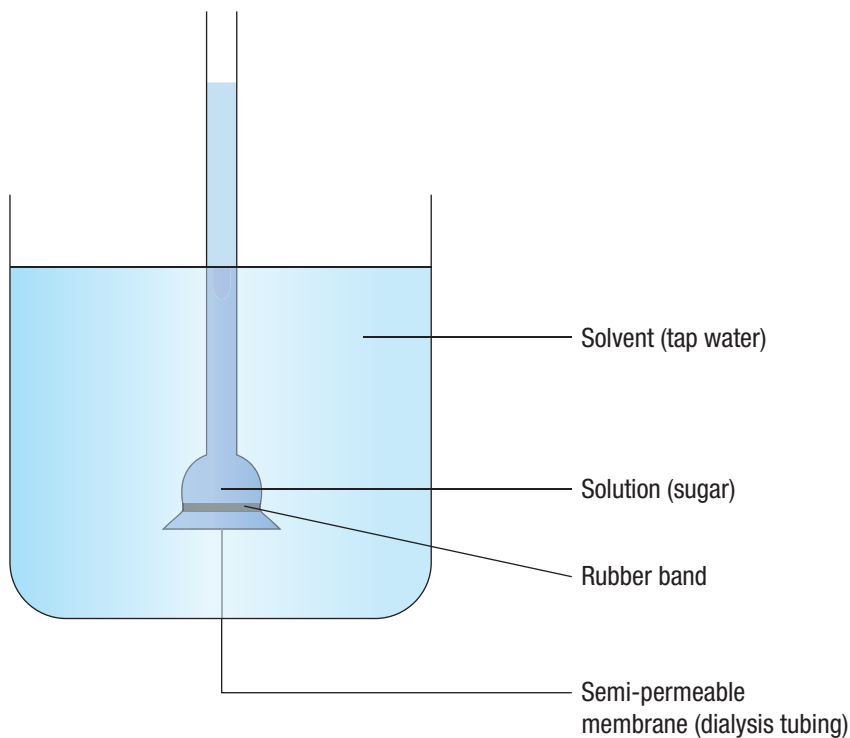


Figure 2 Osmosis

- 6 Be ready to begin timing as soon as you place the device in a beaker of water. Record your data in the results table.
- 7 What do you observe? How do you explain this in terms of osmosis?

4 How is the rate of osmosis and the concentration of the solution related?

5 How did your results compare with your prediction?