



Lesson Overview

The following activity guide is for use by high school students and educators looking to explore and expand on the concept of **osmosis** both in the classroom and at home. The guide presents an overarching challenge for students to respond to and some supporting activities to integrate cross-curricular priorities and help structure their understanding by providing depth and richness within the learning. There is an extension task to encourage students to apply their understanding to new situations and encourage further thinking.

Osmosis is the movement of solvent molecules from a high concentration to a low concentration through a semipermeable membrane and can be easily demonstrated with eggs. Students will explore how egg membranes react to a range of liquids and draw conclusions about molecular structure.

Lesson Intentions

- Investigate scientific concepts
- Understand how science is used to find solutions to contemporary issues
- Investigate how the process of osmosis can be found in a range of contexts

Teachers Notes

Year 8 Outcomes:

Science Understanding

- Cells are the basic units of living things; they have specialised structures and functions (ACSSU14)
- Chemical change involves substances reacting to form new substances (ACSSU225)

Science as a human endeavour

- Solutions to contemporary issues that are found using science and technology, may impact on other areas of society and may involve ethical considerations (ACSHE135)

Science Inquiry Skills

- Identify questions and problems that can be investigated scientifically and make predictions based on scientific knowledge (ACSIS139)

English

- Use a range of software, including word processing programs, to create, edit and publish texts imaginatively (ACELY1738)

- Create imaginative, informative and persuasive texts that raise issues, report events and advance opinions, using deliberate language and textual choices, and including digital elements as appropriate (ACELY1736)

Year 10 Outcomes:

Science Inquiry Skills

- Formulate questions or hypotheses that can be investigated scientifically (ACSIS198)

English

- Create sustained texts, including texts that combine specific digital or media content, for imaginative, informative, or persuasive purposes that reflect upon challenging and complex issues (ACELY1756)
- Use a range of software, including word processing programs, confidently, flexibly and imaginatively to create, edit and publish texts, considering the identified purpose and the characteristics of the user (ACELY1776)

Main Challenge

Saving Lives with Science:

Using a digital technology such as Keynote, create a documentary about the life saving process of Dialysis. Include how it works, who it affects and the parts of the body that it involves.

Tips:

- Investigate the membranes present in the parts of an egg and their uses in both supporting the development of chicks and maintaining the egg's structure.
- Understand the function of the kidneys and the way they remove toxins from our blood by investigating the efficiency of coffee filters to remove sediments from liquids.
- Research other parts of the body that use osmosis in their function.
- Research the history of dialysis and the medical understanding of kidney function.
- Research other things that pass through our body's selectively permeable membranes and whether these are beneficial or not beneficial to our health. What conclusions can we draw about the structure of our cells from this research?
- Investigate messages in the media which help people to keep their kidneys healthy and functioning throughout their life.
- Investigate other filters which help us to live healthier lives.
- Document your research and the questions you pose as you investigate and answer the main challenge.

Check your understanding with these questions:

1. How do eggs use osmosis?
An egg's shell is porous, allowing for the movement of gases; carbon dioxide is given off and replaced with oxygen. The outer and inner membranes underneath the shell protect the egg (and growing chick) from outside bacteria and stop too much moisture from leaving the egg. The vitelline membrane which encases the egg's yolk is made of different proteins but is also the outer layer of the ovum, functioning as the part of the egg which allows for the conception of a chick and a barrier to the sperm of other species, contributing to prevention of inter-species breeding.
2. How do the kidneys function?
The kidneys are a filter which removes any toxins from our blood, such as salt, minerals and any bad stuff, and combine them with water, releasing the mixture as urine.
3. How does a dialysis machine work?
Dialysis machines remove a person's blood through a tube, run it through filters to remove any waste or toxins, then return it to their body. The dialyzer, the part of the machine responsible for the cleaning, contains thousands of fibres and a cleansing solution which act as a sponge, absorbing any waste material. The waste gets discarded and the clean blood returned to the person.

Supporting Activities

Explore the real world implications of shell osmosis. Track internal changes of an egg over 10 days; weigh and candle eggs on days 1, 5 and 10, noting the weight and position or height of the air pocket. Test the density of the eggs on this date by floating them in water and observing what happens. Students calculate the weight loss of their egg at the end of the 10 days and hypothesise and discuss the implications of this in the egg industry. What could this mean for egg producers? How does this affect sustainability outcomes in food production in Australia? As an extension, students calculate the changing volume of the egg.

The shrinking egg investigation. Make a 'naked egg' by leaving a raw egg in vinegar overnight to dissolve the shell. Put your naked egg in corn syrup for 24 hours and watch what happens. How might you re-inflate your shrunken egg? Hypothesise on what is happening in your egg at a molecular level.

With a partner, stand at opposite ends of a room. Partner A sprays some perfume. Partner B times how long it takes for them to smell the perfume. Investigate the effect of different room sizes on this investigation. Does the time it takes to smell the perfume change with different sized rooms?

Investigate osmosis with apple or potato slices in distilled water and salt water. Investigate the effects of other solutions on the fruit or vegetable slices. Draw conclusions from this investigation.

Extension Opportunity

Contact a medical professional in your local area to get their insight into how the human body uses the process of osmosis. Present your own documentaries and allow them to give feedback on your work.