YEAR 5–6

# Osmosis Investigation

## Hands-on Horticulture

Take Me Home!

In collaboration with Hort Innovation, Primary Industries Education Foundation Australia (PIEFA) has developed a series of practical scientific investigations exploring Australian grown fruit and vegetables.

The **Hands-on Horticulture** resources have been designed to engage students in hands-on Australian Curriculum aligned investigations that explore Australian grown fruit and vegetables. The resources incorporate science understanding and science inquiry skills to provide meaningful learning experiences for primary-aged students. Each resource contains guidance for a teacher-led lesson to be completed in the classroom, along with a '**Take me Home!**' extension activity for students to consolidate their scientific investigation and explore the production of fruits and vegetables.

Students will observe the effects of osmosis on vegetables when they are soaked in different solutions. Students will investigate reversible and irreversible changes through osmosis.

**This resource has been developed by:**

Primary Industries Education Foundation Australia | primezone www.primezone.edu.au The place for all your food and fibre resources

Hort Innovation



# Background information

Osmosis is a natural process where water molecules move from an area with lots of water to an area with less water through a permeable membrane. This happens because the water is trying to balance out the concentration of water on both sides of the membrane. For example, if one side of the membrane has a lot of salt and the other side has pure water, the water will move from the side with pure water to the side with salt to balance out the water concentration on both sides of the membrane.

Osmosis is an important process for the growth and health of plants. This process can lead to reversible and irreversible plant changes, so farmers who grow fruit and vegetable plants must manage their crops carefully.

Water moves from the soil into the roots and throughout the tissues, making the plant healthy and firm. When plants are water deficit they may wilt. This is an example of a reversible change. If the plant gets watered again and the cells regain their water, the plant regains its firmness.



LESSON

# Osmosis Investigation

## RISK ASSESSMENTS

**Note:** Schools are responsible for generating their own risk assessments for activities. Risk assessments should address the potential hazards associated with using fruits and vegetables in the classroom, including food-borne illnesses, allergies, slips/falls, and cross-contamination, and propose control measures such as proper cooking, allergy awareness, accident prevention, and hygiene practices to ensure a safe learning environment for students.



Osmosis Investigation

## LEARNING AREA

Science (Year 5–6)

## AUSTRALIAN CURRICULUM CONTENT

Compare reversible changes, including dissolving and changes of state, and irreversible changes, including cooking and rusting, that produce new substances (**AC9S6U04**)

Investigate how scientific knowledge is used by individuals and communities to identify problems, consider responses and make decisions (**AC9S5H02**, **AC9S6H02**)

Pose investigable questions to identify patterns and test relationships and make reasoned predictions (**AC9S5I01**, **AC9S6I01**)

Plan and conduct repeatable investigations to answer questions, including, as appropriate, deciding the variables to be changed, measured and controlled in fair tests; describing potential risks; planning for the safe use of equipment and materials; and identifying required permissions to conduct investigations on Country/Place (**AC9S5I02**, **AC9S6I02**)

Use equipment to observe, measure and record data with reasonable precision, using digital tools as appropriate (**AC9S5I03**, **AC9S6I03**)

Construct and use appropriate representations, including tables, graphs and visual or physical models, to organise and process data and information and describe patterns, trends and relationships (**AC9S5I04**, **AC9S6I04**)

Compare methods and findings with those of others, recognise possible sources of error, pose questions for further investigation and select evidence to draw reasoned conclusions (**AC9S5I05**, **AC9S6I05**)

Write and create texts to communicate ideas and findings for specific purposes and audiences, including selection of language features, using digital tools as appropriate (**AC9S5I06**, **AC9S6I06**)

## References

Primary Industries Education Foundation Australia. (2021, October 19). VIC Farmer Time-Vegetable Production. www.youtube.com. https://www.youtube.com/watch?v=_o5Z_vHM73M

# Osmosis Investigation

## AIM

**To investigate reversible and irreversible changes through osmosis.**


One carrot

## EQUIPMENT

**Collect these materials before you start the experiment:**


Water


Three clear bowls or jars


Sheets of paper towels


Knife


Vegetable peeler


Kitchen scales


Measuring spoons


Salt

## INSTRUCTIONS

1. With adult supervision, peel and cut the carrot into round, even slices approximately 1–2 cm thick.
2. Take three of the bowls or containers and prepare the following solutions:
   - **Solution One:** Two cups of water (500ml)
   - **Solution Two:** Two cups of water (500ml) with a low concentration of salt (about half a tablespoon of salt)
   - **Solution Three:** Two cups of water (500ml) with a high concentration of salt (about a tablespoon and a half of salt).
3. Divide the slices of carrot into three equal portions. Record your observations about the carrots on your worksheet.
4. Place equal amounts of the carrot slices in each of the three bowls.
5. After four hours of soaking, remove the portions of carrot from each bowl. Complete the remaining activities on the student worksheet.

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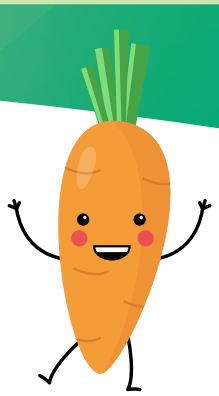
# Osmosis Investigation (cont'd)



**1.** **Describe the colour, size, texture, and flexibility of the carrots at the start of the experiment (before soaking). Record your ideas in the space below.**

**2.** **Use kitchen scales to weigh the total mass of the carrot slices that will be placed in each of the solutions. Record measurements in the '<u>Starting mass (g)</u>' column of the table below.**

| Solution | Starting mass (g) | Final mass (g) |
|---|---|---|
| | | |
| | | |
| | | |

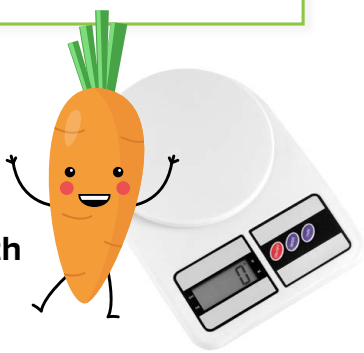
**3.** **Make a prediction about what you think will happen to the carrots after soaking in each of the solutions.**

# Osmosis Investigation (cont'd)

**4.** **Describe the colour, size, texture, and flexibility of the carrot slices after soaking. Record your observations in the space below.**

| | |
|---|---|
| Solution One | |
| Solution Two | |
| Solution Three | |

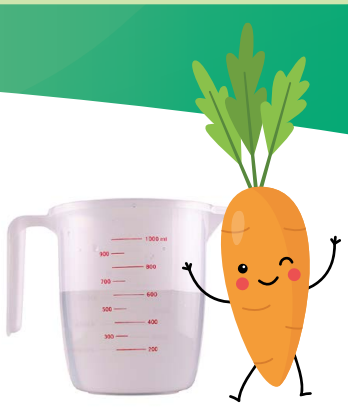
**5.** **Remove the carrot slices from Solution One. Use the kitchen scales to weigh the total mass of the carrot slices. Record measurement in the 'Final mass (g)' column of the table on the previous page. Repeat with the carrot slices in Solution Two and Three.**



a. Which solution caused the carrot slices to **gain** the most weight? _____

b. Which solution caused the carrot slices to **lose** the most weight? _____

# Osmosis Investigation (cont'd)



**6.** **Was the water moving into the carrot slices or out of the carrots in Solution Three? How do you know?**

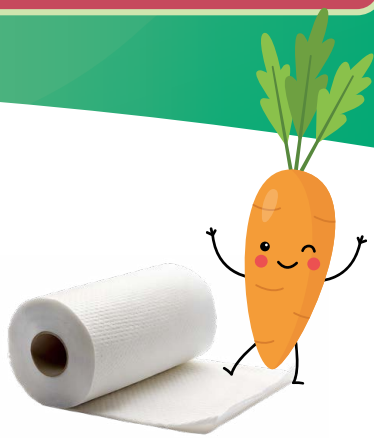
**A reversible change** is a change that **can** be undone, meaning the object can return to its original state or condition.

**An irreversible change** is a change that **cannot** be undone, meaning the object cannot easily return to its original state or condition.

**7.** **For each of the solutions, circle if you think the changes to the carrots are reversible or irreversible.**

| Solution One | Solution Two | Solution Three |
|---|---|---|
| Reversible | Reversible | Reversible |
| Irreversible | Irreversible | Irreversible |

# Osmosis Investigation (cont'd)



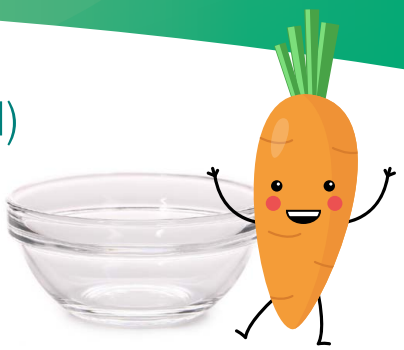
Place the carrot slices that were soaked in **Solution One** onto a piece of paper towel and allow them to dry for four hours.

**8.** **Describe the colour, size, texture, and flexibility of the dried carrot slices in the space below.**

**9.** **Use kitchen scales to weigh the total mass of the carrot slices. Record the answer in the space below.**

**10.** **Was soaking and dehydrating the carrot slices in Solution One a reversible change? Why/why not?**

# Osmosis Investigation (cont'd)



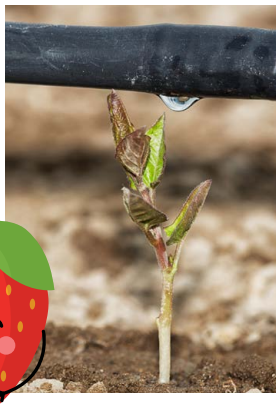
Place the carrot slices that were soaked in **Solution Three** into a bowl or jar of only water and soak it for four hours.

**11.** **Describe the colour, size, texture, and flexibility of the carrot slices after soaking in the space below.**

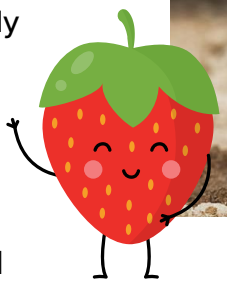
**12.** **Use kitchen scales to weigh the total mass of the carrot slices. Record the answer in the space below.**

**13.** **Was soaking the carrot slices in a high concentration of salt a reversible change? Why/why not?**

# Osmosis Investigation (cont'd)



In Australia, some fruit and vegetable farms use **irrigation** to ensure crops receive the required amount of water as they grow. This is done through systems such as pipes, channels, or sprinklers, which allow farmers to control the amount and timing of water supply to optimise crop growth and yield. Irrigation helps to ensure crops are not over watered or under watered, allowing the plants to continue the osmosis process as a reversible change throughout their life cycle.



**14.** **Research different types of irrigation used on fruit and vegetable farms in Australia. Record a description of each type of irrigation in the spaces below.**

**Drip irrigation**

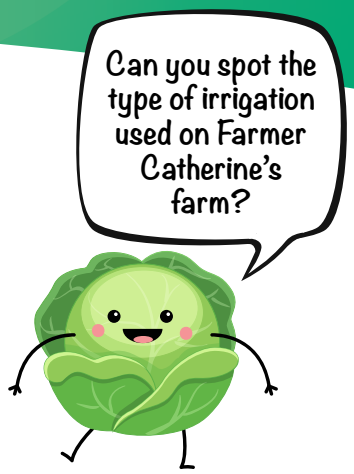
**Sprinkler irrigation**

**Subsurface irrigation**

**Furrow irrigation**



# Osmosis Investigation (cont'd)




Scan the QR codes or click on the link on the link to learn about vegetable production at Velisha Farms in Victoria.

- **VIC Farmer Time – Vegetable Production** (7:54): https://www.youtube.com/watch?v=_o5Z_vHM73M

## 15. After watching the video, identify if the following changes are **reversible** or **irreversible**.

Hail marks on spring onions:

Harvesting crops:

Sun damage to cauliflower:

Irrigating crops:

Fertilising crops:

Seeds growing into plants:

## 16. If a cauliflower is chopped and cooked, is the change reversible or irreversible? Explain your answer.