

## OBJECTIVES

1. Observe structure and function of plant cells
2. Define hypotonic and hypertonic solutions
3. Demonstrate cell reactions to hypotonic and hypertonic solutions



## BACKGROUND INFORMATION

Elodea is a freshwater plant commonly used for aquariums and it can be purchased at most pet stores. The leaves of Elodea are only two cells thick and are ideal for the microscopic study of the effects of osmotic solutions. Freshwater is hypotonic to Elodea. A hypotonic solution is a solution that contains less (hypo) solutes than the cytoplasm of the cell. Thus, a hypotonic solution has more water than the cell and water has a tendency to move (diffuse) into the cell. Placing Elodea cells into 100% water, which is more hypotonic than freshwater, also causes water movement into of the cells resulting in the swelling of the cells. In plants the outward pressure of the water produces rigidity of the cell, as the plasma membranes are pushed against the cell walls. Plant cells do not rupture because the cell walls resist the outward expansion of the plasma membrane. A hypertonic solution is a solution that contains more (hyper) solutes than the cytoplasm of the cell. Thus, a hypertonic solution has less water than the cell and water moves (diffuses) out of the cell by osmosis. As water moves out of the cells there is a loss of turgor pressure and the plasma membranes detach from the cell walls as the cells shrink. One of the functions of the cell membrane is to control the flow of materials into and out of the cell. In this investigation, you will observe the effects of placing plant cells in solutions of various concentrations.

## WHAT YOU NEED

- Elodea leaves
- Microscope slides and cover slips
- Microscope
- Distilled water
- Tap water
- 5% salt solution
- 10% salt solution

## WHAT TO DO

1. Prepare a wet mount of an *Elodea* leaf with tap water. Be careful not to get any air bubbles on your slide.
2. Observe the leaf at 40X and record your observations. Increase the magnification to 100X, observe, and record your observations.
3. Remove the slide from the stage of the microscope. Place 2-5 drops of the 5% salt solution on the slide at the edge of the cover slip. Tear off a small piece of paper towel and place the torn edge on the slide at the edge of the cover slip that is opposite the side where the salt solution was placed. The piece of towel should begin to soak up water, drawing the salt solution under the cover slip as it does so.
4. Return the slide to the microscope stage and repeat the observations of the cells at 40X and 100X. Record your observations.
5. Remove the slide from the stage of the microscope. Place 2-5 drops of the 10% salt solution on the slide, using the paper towel as previously.

6. Return the slide to the microscope stage and repeat the observations of the cells at 40X and 100X. Record your observations.
7. Remove the slide from the stage of the microscope. Place 2-5 drops of distilled water to “flush-out” salt solutions. Use paper towel as previously to help draw water across slide.
8. Return the slide to the microscope stage and repeat the observations of the cells at 40X and 100X. Record your observations.

## OBSERVATIONS

Prepare the following sketches

1. *Elodea* leaf with tap water
2. *Elodea* with 5% salt solution
3. *Elodea* with 10% salt solution
4. *Elodea* after distilled water

Be sure to note any changes in colour, size and shape of the cells.

## QUESTIONS/ANSWERS

1. What is the shape of the typical *Elodea* cell? *Rectangular shape.*
2. What are the small green blobs found inside the cells? What is their function? *The green blobs are the chloroplasts. Their function is to perform photosynthesis. The process of turning light energy into chemical energy by using carbon dioxide and water to produce oxygen and carbohydrates.*
3. What happens to the cells as the salt water flows under the cover slip? *The salt water is a hypertonic solution, thus water will move out of the cell. As water moves out of the cells there is a loss of turgor pressure and the plasma membranes detach from the cell walls as the cells shrink.*
4. What happens to the cells when the salt water is flushed out with distilled water? *The cells initially become more turgid (swollen) than return to original size.*
5. *Elodea* normally lives in fresh water. What changes would you observe in the cells of an *Elodea* plant that was suddenly moved from fresh water to salt water? Why? *Answer as question 3.*

## CURRICULUM

### Science21

LS1: The cell is the lowest form of organisation that can perform all activities required for life.

### Senior Biology Key ideas

2. Organelles contribute to the structure and functioning of eukaryotic cells.
11. The external features and internal functioning of organisms together enable an organism to obtain its needs.

## REFERENCES

Link Publishing. 2007. [http://www.linkpublishing.com/video-transport.htm#Elodea\\_-\\_Osmosis](http://www.linkpublishing.com/video-transport.htm#Elodea_-_Osmosis), (accessed 16/04/08).