

2015-2016 Student Edition
Laboratory Manual
Biology

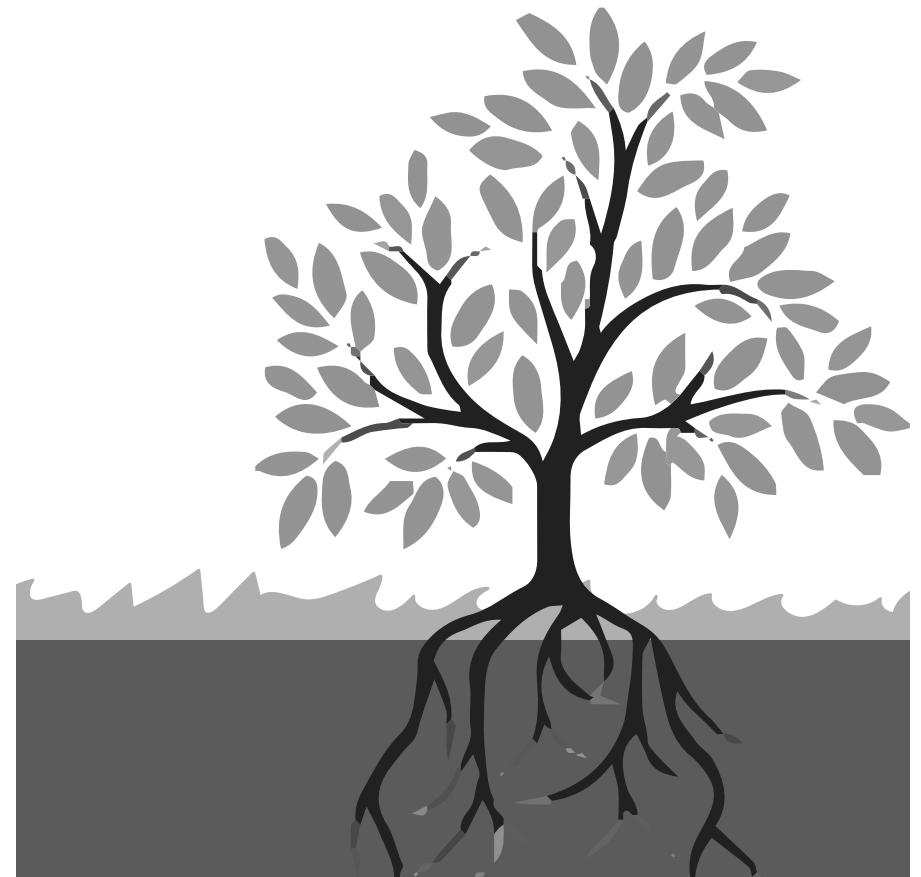


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Getting Started

What is a SeedKit, anyway?

The SeedKit is a low-cost, sustainable, inclusive, and fun science education kit. It comes complete with detailed experiment procedures, useful lab items, and engaging questions.

What is included?

- 6 Biology experiments
- 15 Student Lab Manuals
- 1 Teacher's Lab Manual
- Most items necessary to perform these labs in a classroom of up to 40 students without electricity, running water, or hard to obtain supplies.



Items that are included in the kit are marked with an asterisk in the 'Materials' section of each experiment.

Note on Lab Safety

Keeping Safe and Healthy in the Lab

As you work through this lab manual, you will be able to work with a bunch of different types of materials and lab tools. To make sure that you remain safe while working through our labs, please be sure to follow the following instructions at all times.

Remember: lab safety should always be your #1 priority!

1. Report any accidents, injuries, and breakage of glass or other equipment to your instructor immediately!
2. Wear sensible clothing, including closed-toed footwear. Loose clothing should be secured so that they do not get caught in chemicals. Tie back long hair.
3. Be sure to read the assigned experiment before you start working.
4. Do not taste or smell chemicals unless instructed to.
5. Leave your work station clean and in good order before leaving the lab.
6. Learn how to transport all materials and equipment safely, and learn the locations of all exits and safety equipment.
7. Follow all instructions given by your instructor!

Osmosis: Investigating Cell Processes

Objectives:

- To test osmosis in potato cells in varying conditions
- Observe and record the physical changes on the potato slices after exposure to salt and/or water.

Materials:

- One potato
- 2 water glasses, beakers, or transparent plastic cups
- Fresh water (that doesn't naturally contain salt)
- About 10 tablespoons of salt
- A tablespoon
- A knife or anything sharp enough to cut potatoes
- Ruler or Measuring Tape*
- 3 pieces of paper and a pencil
- Paper towel, tissue paper, or pieces of cloth

Pre-Lab Questions:

1. What is osmosis?
2. Why can't materials other than water pass through the cell membranes?
3. How can we observe this phenomenon? Describe a possible experiment.

Procedure:

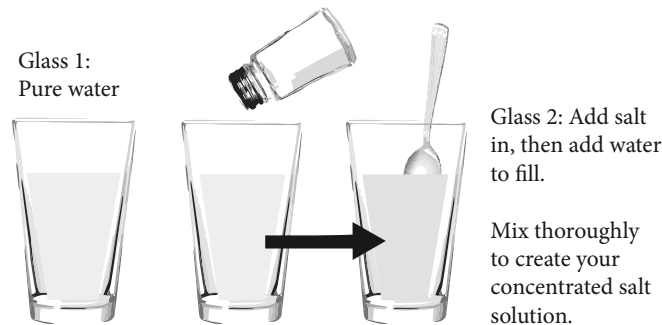
1. Prepare a glass of clean water (no salt). In a different glass of the same size, create a mixture of salt and water by adding as much salt as you can before the salt starts saturating.

This can be done by adding about half the amount of water as in the other glass and adding and mixing salt until it is saturated. Then, adjust the water and salt levels until you have as much water as in the other glass with pure water.

Leave enough space for the slices of potato you'll put in the solutions later.

At this point, you will have two different aqueous solutions of about the same volume but different salt concentrations (one with ~0% salt and one almost saturated).

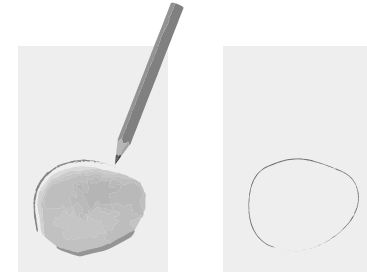
Figure 1. Preparation of Solutions



2. Set the solutions aside for now and peel a raw potato and (from the middle/taller part) cut three pieces of relatively similar sizes. These could be slightly thicker potato chips slices. Make sure the pieces are big enough to observe well but small enough to fit in the glasses available.

3. Gently dab the slices on a paper towel to get rid of excess moisture. Be careful not to squeeze moisture out of the slices. Place each on a blank paper and trace its shape such that the diagram fits the size of each slice. This will help you observe any changes in size after exposing the slices to the different solutions.

Figure 2. Trace the size and shape of each potato slice.



4. Observe and note the color and flexibility (bendability) of each slice. Then place one slice in the glass with pure water and another in the glass with the concentrated aqueous solution of salt. Make sure each slice is completely submerged in the solution. Note the time. You will leave these overnight and observe the changes on the slices.

From what you know about osmosis, predict what will happen to each potato piece. Which, if any, will increase in size? How will the flexibility of each slice change after exposure to their respective solutions? (Answer in post-lab.)

5. To help determine what the salt does to the potato slices, we can expose the third slice to dry salt. Put the potato slice on a paper towel covered with a layer of ground table salt; sprinkle some more salt on top of the slice; and wrap it with the paper towel. Let this sit for about 10 minutes and observe the changes you see on the wetness of the paper towel.

In ten minutes or so, the paper towel should be obviously wet.

Table 1. Changes in physical properties of potato slices after exposure to varying concentrations of salt.

Changes in physical properties	Slice in water (0% salt)	Slice in salt solution	Slice in dry salt (100% salt)
Size			
Flexibility			
Color			
Other Observations			

Post-Lab: Testing Understanding

1. After step 5 in the procedure, where does the moisture/water come from? Why does the potato lose water when wrapped with salt? How does this help us predict what happens to the potato slice in the concentrated salt solution?
2. What size changes do you see in your 3 slices? How does osmosis explain these changes?
3. Why do the slices submerged in salt or a concentrated solution get bendier while the ones submerged in water get firmer?
4. How else could one measure the relative or actual amount of water leaving or entering the potato slices?



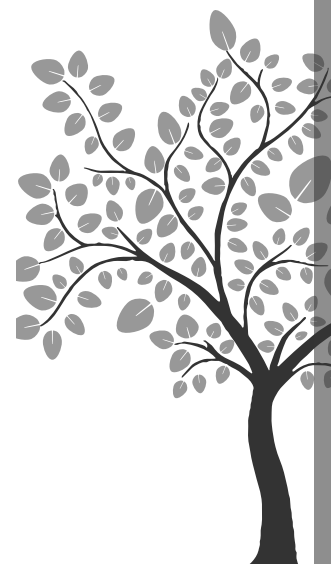
Meet Our Team

We are a team of Wellesley College Students and faculty with varied academic backgrounds in the sciences and arts. Although we all have different interests and talents, we are united by our love and appreciation for science education.

So, after almost two years of hard work, we're super excited to finally bring this kit to you. We hope you enjoy it and learn a lot! Have fun!

Sincerely,

THE SEED KIT TEAM



What do you think about Seedkit? Share your feedback!

Contact us:

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