

## Osmosis Apparatus with Jar and Support #1501-9

### Warning:

- **Not a toy; use only in a laboratory or educational setting.**
- **California Proposition 65 Warning: This product can expose you to chemicals including nickel, arsenic, and lead, which are known to the State of California to cause cancer, birth defects, or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).**



### Introduction

A **solution** is any homogeneous mixture made up of two or more substances. Solutions are comprised of two parts – a **solvent** and **solute(s)**. **Solvents** are the substances in a mixture that are used to dissolve **solutes**, or the substances distinct from the solvent that make up the solution. When water is the solvent in a solution, it is called an **aqueous solution**.

**Osmosis** is a process in which the solvent molecules of a solution with a relatively low concentration of solutes passes through a **semipermeable membrane** into a region containing a solution with a higher concentration of solute particles. A semipermeable membrane is any membrane that blocks some particles while allowing other molecules or ions to pass through it. Osmosis is a vital process in biology, as many membranes in the body are semipermeable so as to allow various molecules to regulate themselves based on the present concentrations of molecules in the biological system.

This apparatus can be used to visually display this process. On the next page you will find instructions on how to set up the apparatus and use it to display osmosis.

### Components

- 1 Double thistle tube
- 1 Beaker
- 1 Y-shaped brace
- 1 Semipermeable membrane (i.e. section of an animal bladder)
- 1 Zip-tie

## Setting Up Your Apparatus

Once set up, this device is able to clearly demonstrate the process of osmosis. Follow the instructions below to ensure that you have set it up properly.

1. Soak your membrane in distilled water until it is pliable. This will help ensure that the seal between the membrane and the thistle tube funnel is tight.
2. Remove one of the screws in the Y-brace and insert the thin part of the thistle tube into the center of the brace. Replace the screw after ensuring that the brace is properly positioned on the thistle tube (the lower funnel-bulb should rest close to the bottom of the beaker without actually touching the bottom.) Use your fingers to tighten the screw on the brace so as to avoid damaging the tube and to allow for easy adjustments.
3. Seal off the top funnel-bulb of the thistle tube with a rubber stopper or a flat sheet of plastic. This seal is only necessary when filling the bottom funnel-bulb, and should be removed once set up is complete.
4. After ensuring that the tube is sealed, flip the thistle tube over and fill it with a solution containing a high concentration of solutes. (**Note:** Only pour in enough liquid to fill the lower funnel-bulb of the thistle tube that you intend to submerge in the beaker.)
5. Wrap your membrane around the bulb of the thistle tube you are submerging and secure it with your zip tie. (**Note:** If you're having trouble getting a tight seal with your membrane, use a rubber band in place of the zip tie before you position the membrane. After it is properly positioned, secure it with your zip tie, and then unwrap or carefully cut the rubber band off.)
6. Place the covered end of the thistle tube into the beaker with the brace resting flat over the beaker's rim. Adjust for height as necessary.
7. Fill your beaker with enough solvent or low-solute-count solution to cover your lower thistle tube funnel-bulb.

## How To Use

After set up, this apparatus can easily be used to visually demonstrate osmosis in action:

1. Select a solution for your experiment. You will fill the thistle tube funnel-bulb with a solution containing a high amount of solutes relative to the solution that you put into the beaker. It helps if the solution is easily visible so that your demonstration is easier to observe. A combination that we find works well is filling your funnel-bulb with **heavy molasses** and filling your beaker with **water**.
2. Set up your device as described above. If you are using our suggestions, introduce your molasses to the thistle tube's funnel-bulb in Step 4 of set up, and use water in your beaker for Step 7 of set up.
3. Observe osmosis. You should, with time, see the solution rise up the thistle tube. Since molasses is an aqueous solution of water, sugar and various minerals, the water in your beaker will naturally move through the membrane towards the solution with a high-solute count (e.g. molasses).