**Diffusion Through a Membrane**

**Background**:

All cells have a cell membrane which is described as being “selectively permeable.” This means that some materials can move easily into or out of the cell through the cell membrane. When a substance passes through the membrane without using any energy from the cell it is diffusion. When water passes through the membrane it is called osmosis. Since cells have water in them and live in water-based environments, osmosis is always occurring.  
 How will the water move, into or out of the cell? Molecules, including water, all move from areas a high concentration to areas of low concentration. To answer the previous question, just think about where the concentration water is higher, inside or outside the cell? Three basic environments exist:

* **Hypotonic**: If the cell’s external environment becomes very watery (dilute) then the outside of the cell will have a higher concentration of water than the inside. Which way will the water move in a hypotonic environment? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* **Hypertonic**: If the cell’s external environment becomes very salty then the inside of the cell will   
  have a higher water concentration. Which way will the water move in a hypertonic environment?   
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* **Isotonic**: If the cell’s external environment has the same level of water concentration as the inside of the cell then there will be no net gain or loss of water to the cell. Water will move at equilibrium.

**Purpose**: Sometimes a cell finds itself in conditions in which it is difficult or impossible to maintain homeostasis. In this activity you will have an opportunity to observe what happens to cells when they can’t adjust to their surroundings.

**Materials**:

* Piece of red onion
* Slide
* Cover slip
* Water with dropper
* Salt water with dropper
* Distilled water with dropper
* Microscope
* Colored pencils

**Lab Procedures**:

**PHASE I : NORMAL CELLS / DRY MOUNT**

1. Carefully slice away the colored layer of the cells from the red onion. This should only be the thin purple layer.
2. Place the thin, purple onion layer on a dry microscope slide (shinny side up – NO WATER, NO COVER SLIP.)
3. View the onion skin on low power and observe the entire onion tissue to find the most purple area and move it to the center of the slide to focus on the most purple area at 10X or 40X (which ever looks most like the photo below).

a) Assuming that the drawing below represents ONE cell, color in this one cell to show the purple area of the onion cell. This drawing represents one cell wall.

 Remember the cell wall will not change

**PHASE II: SALT WATER ENVIROMENT / WET MOUNT**

1. Remove the slide from the microscope and place 2 or 3 drops of salt water onto the onion in the middle of the slide. Place a cover slip onto the slide as directed by the teacher; starting at an angle and dropping it over the onion.
2. Place the slide back under the microscope and focus on the onion cells again under low power. Observe the onion cells frequently for 3 to 5 minutes; even using low power you should be able to see the changes in the onion cell.
3. Choose an area with obvious changes and focus in on it with 10X or 40X. Color the cell below with how the cell appears now. (Use the same magnification as you did in the drawing above if possible.)
   1. **Write a description of what you see and explain what is happening to the cell.**

**PHASE III: DISTILLED WATER ENVIRONMENT / WET MOUNT**

1. Remove the slide from the microscope and place a piece of paper towel on one edge of the cover slip and then drop 7-8 drops of distilled water on the other side of the cover slip. If you do this correctly you’ll see water (salt water) being wicked away from the onion cell by the paper towel as the distilled water is taking its place from the other side. Repeat this until you estimate that the 2-3 drops of salt water you originally put on the slide are on the paper towel.
2. Place the onion cell back under the microscope and focus using low power. Observe the onion cells for 3-5 minutes on low power.
3. Find cells that are noticeably affected and focus in on them using the 10X or 40X (whichever power you’ve used in the past). Color how the cell has changed below:
4. Describe what you see and explain what has happened to the cell.

**Post – Lab Conclusion Questions:**

1. Match the phase of the lab with the type of environment (hypotonic, hypertonic, and isotonic).
   1. Phase I - \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   2. Phase II - \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   3. Phase III - \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. When the salt water was added to the onion cell’s environment, where was the greatest (most pure) concentration of water?
3. Explain why the water moves out of a cell and into the surrounding environment when placed in a hypertonic solution.
4. Explain why the water moves into the cell and out of the surrounding environment when placed in a hypotonic solution.
5. When stranded at sea, many people try to drink the sea water to stay hydrated. Explain why this is not a viable option and why it is dangerous for humans.
6. Roads are sometimes salted to melt ice. What does this do to plants around the roadside and why?
7. If a bowl of fresh strawberries is sprinkled with sugar, a few minutes later the berries will be covered with juice. Why?
8. Why do grocery store owners spray fresh fruits and vegetables with water?