**Plant Cell - Osmosis Lab**

**Background**:

**Osmosis** **is the diffusion of water** across a selectively permeable membrane. Water moves from a high to a low concentration and the transport of water into and out of a cell does NOT require energy, which makes it **passive transport**. Since cells have water in them and live in water-based environments, osmosis is always occurring. The environments are named based on the comparison of solute concentrations outside the cell vs. inside the cell.

 hypotonic

These three basic environments are:

* **Hypotonic**: If there is a **LOWER amount of solute outside the cell**, then, that means there a higher water concentration outside the cell. 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? \_\_\_\_\_\_\_\_\_\_\_\_\_­­­­­­­­­\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* **Hypertonic**: If there is a **HIGHER amount of solute outside the cell**, then, that means there is a lower water concentration outside the cell. 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? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* **Isotonic**: If the cell’s external environment has the same level of solute as the inside of the cell, then, that means there is also an equal water concentration inside the cell and out. The **water has already reached \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**  so there will be no net gain or loss of water to the cell.

**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 defend against changes to the tonicity in their surroundings.

**Vocabulary:**

* **Plasmolysis** - the shrinking of the cytoplasm of a plant cell in response to the diffusion of water out of the cell and into a hypertonic solution (high solute concentration) surrounding the cell (as shown in the figure to the right). During plasmolysis the cell membrane pulls away from the cell wall as water exits the central vacuole.
* **Turgid** – Distended or swollen due to high water content
* **Turgor** **Pressure** – The pressure that water molecules exert against the cell wall as they fill the central vacuole in a plant cell

**Materials**:

* Piece of red onion
* Slide
* Microscope
* Colored Pencils (optional)
* Tap water w/ pipet
* Salt water w/ pipet
* Distilled water w/ pipet

**Lab Procedures**:

**STEP I: CREATE A DRY MOUNT OF THE ONION CELLS** (5 marks)

1. Carefully peel away the colored layer of the cells from the red onion. This should be a THIN purple layer. Use your fingernail for this.
2. Place the thin, purple onion layer on a dry microscope slide.
3. Use the RED objective (4x objective) to view the onionskin. Look around to find the area with the most number of purple cells visible. Then switch the objective to YELLOW (10x objective). Again, focus in on the section that has the most number of purple cells visible. If you can switch to the BLUE objective (40x objective) without touching the onion skin, do so to get a better view. (\*\*Careful not to have the lens touch the onion skin. If you cannot switch to the 40X objective, that is okay.)
4. **Sketch a drawing of what you see through the microscope and what magnification it is at.**

**STEP II: TAP WATER ENVIROMENT** (5 marks)

1. Place 2 or 3 drops of tap water onto the onion in the middle of the slide.
2. Observe the onion cells for 1 – 3 minutes.
3. **Sketch a drawing below to depict any changes that you observed. Note the magnification.**
4. What type of environment is the onion cell in? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
5. How did the water move? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**STEP III: SALT WATER ENVIROMENT** (10 marks)

1. Use a paper towel and blot the onion cells dry.
2. Place approx. 5 - 7 drops of salt water on the onion cells.
3. Observe the onion cells for 1-3 minutes on low/medium power.
4. **Sketch a drawing below to depict any changes that you observed.**

1. What type of environment is the onion cell in? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. How did the water move? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. **Write a description of what you observed happening. (use the vocabulary term plasmolysis correctly) (5 points)**

**STEP IV: DISTILLED WATER ENVIRONMENT** (10 marks)

1. Blot the onion cells dry with a paper towel.
2. Place 5 – 7 drops of distilled water on the onion cells
3. Observe the onion cells for 1-3 minutes on medium power.
4. **Sketch a drawing below to represent how the cell has changed:**
5. What type of environment is the onion cell in now? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
6. How did the water move? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
7. **Describe what you see and explain what has happened to the cell. (use the vocabulary term turgid and turgor pressure correctly) (5 points)**

**Post – Lab Analysis Questions:** (20 points)

1. When the saltwater was added to the onion cell’s environment, where was the greatest concentration of solute? (2 points)
2. Explain why the water moves out of a cell and into the surrounding environment when placed in a hypertonic solution. (3 points)
3. Explain why the water moves into the cell and out of the surrounding environment when placed in a hypotonic solution. (3 points)
4. Can a plant cell rupture from the intake of too much water? Why or why not? (2 points)
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. (3 points)
6. Explain why putting distilled water into an IV solution that is put into a person’s bloodstream is dangerous in terms of osmosis. (3 points)
7. In icy conditions salt is often applied to roads to melt the ice. After the snow melts you may notice that the grass along the side of the road is dead. **Explain what has happened to the grass using the following vocabulary: Hypertonic, plasmolysis, high concentration, low concentration, osmosis.** (4 pts)