BIOL 140 Lab--Osmosis and The Use of Microscopes
(Two Independent Exercises)

Name _____

Introduction

This week's lab will demonstrate the concepts of diffusion and osmosis, using plant tissue to observe the movement of water across membranes. In addition, students will learn the basic aspects of using a microscope. For the microscope portion of the lab, use a clean sheet of paper to record your answers to the questions and do the requested drawings that arise during the lab exercise. There are 14 answers/drawings asked for in the microscope exercise; they are indicated in bold throughout the exercise.

I) Investigating the Osmolarity of Plant Cells

A) Introduction

The process of **diffusion** describes the tendency for molecules to move across a membrane or other barrier from regions of high concentration to regions of low concentration. This is not active transport; the energy driving diffusion comes from the intrinsic kinetic energy in all atoms or molecules. If nothing stops the movement of a dissolved substance (solute), the solute will diffuse until it reaches **equilibrium.** At equilibrium, there is no net movement of solute. Solute still moves in both directions across the membrane, but the flow in each direction is matched by the flow in the other direction.

In living systems, biological membranes act as selectively permeable barriers. They control the movement of substances into and out of the cell. Three major types of mechanisms are used to transport substances across membranes. Selected solutes move across the membrane by **passive diffusion** (also called simple diffusion). This means these molecules move from regions of high concentration (which may be inside or outside the cells) to regions of low concentration (which may be inside or outside the cell). In **facilitated diffusion**, molecules move down a concentration gradient (from a region of high concentration to a region of low concentration) with the assistance of a membrane protein. Some molecules are moved across membranes through **active transport**, an energy-requiring process that moves molecules against a concentration gradient.

Water molecules can move freely across biological membranes; the diffusion of water across a membrane is called **osmosis**. Just as solutes move from regions of high concentration to regions of low concentration, so do water molecules. However, this can be confusing at first. Keep in mind that when we speak of concentration, we usually mean the concentration of solutes in the solution. A solution with a high concentration of water has a low concentration of solutes, and vice versa. Don't let this confuse you.

Not all membranes are equally permeable to all substances, and few substances cross membranes as easily as water does. Consequently, there are many situations where the solutes from a solution cannot cross a barrier, but the water can. In these situations, water will move as needed to maintain osmotic equilibrium. For example, if a membrane that is impermeable to sucrose separates a highly concentrated sucrose solution from a solution containing a low concentration of sucrose, the net movement of water will be