**Lab Hypothesis: Water Potential**

AP Biology

Lots to consider in forming your hypothesis. Use all your thinking from the questions below to make a hypothesis about the total change in mass for each of the cells.

1. Consider **membrane permeability**: which solutes is the membrane likely to be permeable to? Justify. Describe any changes in solute concentration within each cell over time.

**2. Molecule size** is inversely proportionate to diffusion rate (think sportscar vs truck). Calculate the molecular weight of each solute, by summing the atomic masses of the atoms. Rank the solutions by molecular weight.

*Ex: H20: 1+1+16 = 18amu*

3. Calculatethe **solute potential** of each of the cell solutions, given their molar concentration and if they ionize in water. Solve, given a temperature of 22C.

*Use: ΨS = -icRT where:*



4. Use the solute potentials from 3 to solve for the **water potential** of each cell. The cells are constructed with some air space, so the pressure potential is 0.

*Use: Ψ = ΨS + ΨP*

5. A greater difference in concentration between the solutions creates a steeper **gradient** and a greater rate of diffusion. Based on water potential, rank the solutions by gradient steepness. Identify also the trial with the greatest water concentration gradient.

6. Consider that the diffusion of both water and solute will affect the **mass** of the cells. Which cells will gain mass due to osmosis? Which will lose mass due to the diffusion of solute?

Qualitatively predict the net change in mass for each of the cells relative to one another (most, least, etc.).

**Discussion Questions**

1. If cells are allowed dehydrate would their water potential increase or decrease? Why?
2. If a plant cell has a lower water potential than its surrounding environment, and if pressure is equal to zero, is the solution hyper- or hypotonic? Will the cell gain or lose water? Explain.
3. How is it cells of freshwater plants can reach a dynamic equilibrium in pure water?
4. Red blood cells do not have a cell wall, yet do not burst in blood. What does this tell you about the water potential of blood compared to the cells? Describe the solution relative to these cells.
5. A fungal cell has a solute potential of -2, and a pressure potential of +2. Describe the net diffusion of the system.

Teacher Notes:

C. 1M Soln’s: 54.44NaCl + water to 1L.

 180g glucose

 342 sucrose

Sucrose is not able to permeate the membrane, therefore its mass changes the most – water in, no solute lost.

Glucose can cross, but its large, therefore slow. Water comes in, glucose slowly diffuses out. 2nd most weight gain

The salt ionizes, and therefore diffuses out of the cell rapidly, as water diffuses in. slight gain.

Water should experience no net diffusion

1. Use yams, turnips, potatoes, beets?

 Sarah says 48hr in the ‘fridge works.

 Otherwise, have them mass the samples from an earlier class.

 WP = PP – SP • SP = -iCRT

 SP = -(1)(.33 from x-intercept)(.0831 STP of open container)(295K) -8.01bars

 WP = -8.01 + PP (0) in a DI sol’n