**Water Potential Worksheet**

Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Solute potential + Pressure potential = Water potential**

**Ψs + Ψp = Ψ**

***Water potential is the potential of water to leave an area. It is waters ability to ‘get up and go’. High water potential represents a high potential to leave. Low water potential represents a low potential to leave. Therefore, water moves from an area with a high water potential to an area with low water potential.***

Now let’s add some numbers to this:

* Pure water has a water potential of ZERO.
* Solutes added to pure water decrease water potential—negative numbers.
* Pressure increases water potential.

1. Given the following scenarios **draw an arrow** representing the movement of water across these semi-permeable membranes.

a. b. c.

ψ = 1.2 ψ = 3.2 ψ = 0 ψ = 2.3 ψ = -2.3 ψ = 0

2. The solute potential of pure water is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

3. The solute potential of the plant cell is (greater/less than)pure water. Therefore the greater water potential is (in the cell/in the solution). *Circle your choice*.

4. If solute potential in the plant cell above is –6.25 bars and pressure potential is 0, what is water potential of the plant cell? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

What does this indicate in terms of water movement?

5. If solute potential in the plant cell above is –6.25 bars and pressure potential is 6.25 bars, what is water potential of the plant cell? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ What does this indicate in terms of water movement?

6. A plant cell has a solute potential of –4.0 and a pressure potential of 1.0. It is then placed in a solution with a water potential of –5.0. What will happen to this plant cell?

7. A plant cell has a solute potential of –2.0 and a pressure potential of 0.0. It is placed in a solution with a water potential of –1.0. What will happen to this plant cell?

**And now for calculating ΨS… ΨS = -i C R T**

*For Sucrose -* Sucrose’s ionization constant (i) = 1.

The pressure constant (R) = 0.0831 liter bars/mole ºK.

The experiment was run at 23 ºC. (Convert to Kelvin by adding Celsius to 273).

8. For the following molarities of sucrose, calculate the water potential of each.

***SHOW WORK BELOW***

* 1. 1.1 Mol/Liter = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  2. 0.3 Mol/liter = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  3. 0.0 Mol/Liter = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  4. 7 Mol/Liter = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

9. Santa Claus is trying to repeat these experiments at the North Pole. The temperature is -3 ºC, calculate the new ψ for each problem.

***SHOW WORK BELOW***

* 1. Ψ = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  2. Ψ = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  3. Ψ = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  4. Ψ = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

10. Describe the relationship of temperature to water potential.

11. Describe the relationship of tonicity to water potential.