

# AP Biology Lab 1c: Calculation of Water Potential from Experimental Data

$i =$	The number of particles the molecule will make in water; for NaCl this would be 2; for sucrose or glucose, this number is 1
$C =$	Molar concentration (from your experimental data)
$R =$	Pressure constant = 0.0831 liter bar/mole K
$T =$	Temperature in degrees Kelvin = 273 + °C of solution

1. The solute potential of this sucrose solution can be calculated using the following formula:

$$\text{Solute potential } (\Psi_s) = -iCRT$$

The units of measure will cancel as in the following example:

- A 1.0 M sugar solution at 22 °C under standard atmospheric conditions  
 $\Psi_s = -i (C) (R) (T)$

$$\Psi_s = -(1) \left( 1.0 \frac{\text{mole}}{\text{liter}} \right) \left( 0.0831 \frac{\text{liter bar}}{\text{mole K}} \right) (295 \text{ K})$$

$$\Psi_s = -24.51 \text{ bars}$$

- In an open system with only atmospheric pressure, the same amount of force is acting on both the beaker and the cells in it. That allows us to assume that the pressure potential ( $\Psi_p$ ) of any open system is Zero. Knowing the solute potential of the solution ( $\Psi_s$ ) and knowing the pressure potential of the solution is zero ( $\Psi_p = 0$ ) allows you to calculate the water potential of the solution. The water potential will be equal to the solute potential of the solution.

$$\Psi = \Psi_p + \Psi_s$$

$$\Psi = 0 + \Psi_s$$

$$\Psi = \Psi_s$$

The water potential of the solution at equilibrium will be equal to the water potential of the potato cells. What is the water potential of the potato cells? Show your calculations here.

- Water potential values are useful because they allow us to predict the direction of the flow of water. Suppose that a student calculates the water potential of a solution inside a bag is -6.25 bar and the water potential of a solution surround the bag is -3.25 bar. In which direction will the water flow?.....Water will flow into the bag. This occurs because there are more solute molecules inside the bag (therefore a value further away from zero) than outside the solution.

# Ap Biology Lab Answers

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