AP Water Potential Sample Questions Name: KEY

1. If a cell's Ψ_P = 3 bars and its Ψ_S = -4.5 bars, what is the resulting Ψ?

$\Psi = 3 + -4.5$ bars = **-1.5 bars**

2. The cell from question #1 is placed in a beaker of sugar water with Ψ_S = -4.0 bars. In which direction will the net flow of water be?

- Into the beaker from the cell. Movement from higher to lower concentration

3. The original cell from question # 1 is placed in a beaker of sugar water with Ψ_S = -0.15 MPa (megapascals). We know that 1 MPa = 10 bars. In which direction will the net flow of water be?

0.15 MPa x 10 bars = 1.5 bars

-1.5 bars = -1.5 bars → no direction because isotonic

4. The value for Ψ in root tissue was found to be -3.3 bars. If you take the root tissue and place it in a 0.1 M solution of sucrose at 20°C in an open beaker, what is the Ψ of the solution, and in which direction would the net flow of water be?

$\Psi_S = -iCRT$

$\Psi_S = -(1)(0.1)(0.0831)(293) = -2.43$ bars $\Psi_P = 0$ bars because open

$\Psi = -2.43 + 0 =$ **-2.43 bars = Ψ** Movement of water into cell

5. NaCl dissociates into 2 particles in water: Na^+ and Cl^-. If the solution in question 4 contained 0.1M NaCl instead of 0.1M sucrose, what is the Ψ of the solution, and in which direction would the net flow of water be?

$-(2)(0.1)(0.0831)(293) + 0 = \Psi =$ **-4.86 bars** Into the environment

→ set 2 sides equal

6. A plant cell with a Ψ_s of -7.5 bars keeps a constant volume when immersed in an open-beaker solution that has a Ψ_s of -4 bars. What is the cell's Ψ_P?

Ψ cell = Ψ solution

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

$-7.5 + \Psi_p = -4 + 0$

$+7.5 \quad +7.5$

3.5 bars

7. At 20°C, a cell containing 0.6M glucose is in equilibrium with its surrounding solution containing 0.5M glucose in an open container. What is the cell's Ψ_P?

cell solution

$(1)(0.0831)(0.6)(293) + \Psi_p = (-1)(0.0831)(0.5)(293) + 0$

-14.6 bars $+ \Psi_p = -12.17$

$+14.6 \quad +14.6$

2.44 bars

8. At 20°C, a cell with Ψ_P of 3 bars is in equilibrium with the surrounding 0.4M solution of sucrose in an open beaker. What is the molar concentration of sucrose in the cell?

$\Psi_{cell} = \Psi_{solution}$

$\Psi_s + \Psi_p$

$-(1)(C)(0.0831)(293) + 3 \text{ bars} = -(1)(0.4)(0.0831)(293) + 0$

$-24.348C + 3 \text{ bars} = -9.739$ bars

$-3 \quad -3$

$-24.348C = -12.739$ bars

$-24.348 \quad -24.348$

C = 0.52 M