PEEBEDU

Water Potential Calculator

Name: _____ **Period:** _____ **Date:** _____

Open **peebedu.com** and navigate to **Water Potential Calculator**. Click the **Start Learning!** button to begin. Read the introduction popup, which describes water potential (Ψ), solute potential (Ψ_S), tonicity (hypertonic, hypotonic, isotonic), and ionization constants for different solutes.

Free Response Questions

Question 1 — Conceptual Analysis

Simulation Task: *In the Water Potential Calculator, select* **Plant Cell** *from the Cell Type dropdown and* **Sucrose** *as the solute. Set the temperature to* **25 degrees C***. Click* **Add Solute** *three times, then click* **Stir Solution***. Record the Solution Solute Potential (Ψs) and Concentration (C) from the Live Data panel. Then click* **Insert Cell** *and observe the direction of water movement and the cell's response.*

(A) (1 pt) **Describe** the relationship between the water potential of the external solution and the water potential inside a cell, and how this relationship determines the direction of net water movement.

(B) (1 pt) **Explain** why increasing the concentration of a solute in the external solution causes a plant cell that was previously swelling to begin losing water.

(C) (1 pt) **Predict** what would happen to the turgor pressure of a plant cell if the soil water surrounding its roots became highly concentrated with solute due to drought.

(D) (1 pt) **Justify** your prediction.

Question 2 — Analyze Model / Visual Representation

> **Simulation Task:** *In the Water Potential Calculator, select* **Red Blood Cell** *from the Cell Type dropdown and* **NaCl** *as the solute. Note the Cell Internal Ψs value. Click* **Add Solute** *once, then click* **Stir Solution***. Record the Solution Ψs. Now click* **Insert Cell** *and observe the cell's response. Next, click* **Empty Beaker***, then switch to* **Bacterial Cell** *and repeat the same procedure (NaCl, one addition, stir, insert cell). Compare the two cells' responses.*

(A) (1 pt) **Describe** why different cell types placed in the same external solution can experience different directions of net water movement.

(B) (1 pt) **Explain** why a red blood cell and a bacterial cell respond differently when placed in the same NaCl solution, given that the two cell types have different internal solute potentials.

(C) (1 pt) **Represent** the water movement for a red blood cell and a bacterial cell placed in the same NaCl solution by drawing two labeled diagrams, including arrows showing the direction of water movement and labeling the relative water potential (higher and lower) for the solution and each cell's interior.

Draw your diagram here.

(D) (1 pt) **Explain** how drought conditions that lower soil water potential could ultimately affect the rate of enzyme-catalyzed reactions inside a plant's root cells.

2.7.B.2

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