

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 (Ψ_s) 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 direction of net water movement between a cell and a solution when the solution has a lower water potential than the cell's interior.

(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 volume of a plant root cell if the water potential of the surrounding soil solution became more negative than the water potential inside the cell.

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

Question 2 — Analyze Model / Visual Representation

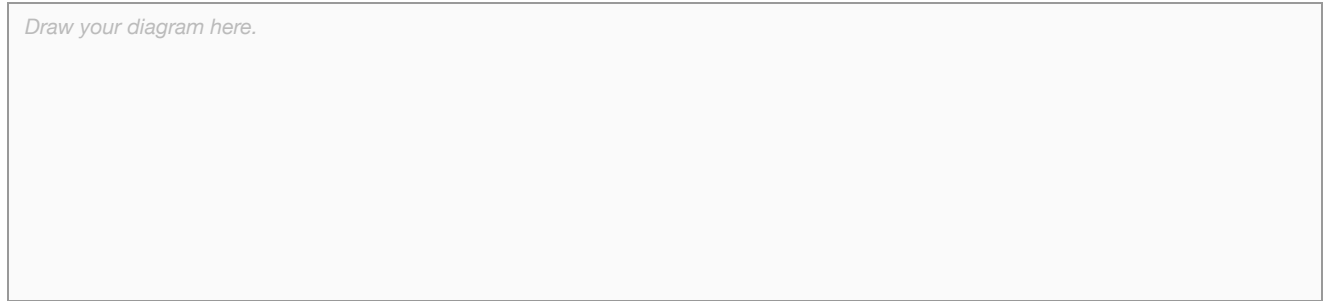
Simulation Task: In the Water Potential Calculator, select **Red Blood Cell** from the Cell Type dropdown and **NaCl** as the solute. Note the Cell Internal Ψ_s value. Click **Add Solute** once, then click **Stir Solution**. Record the Solution Ψ_s . Now click **Insert Cell** and observe the cell's response. 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** the difference between the Cell Internal Ψ_s value shown for the red blood cell and the value shown for the bacterial cell.

(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 the cell wall of the bacterial cell protects it from osmotic lysis when the cell is placed in a solution with a higher water potential than its interior.

2.7.B.2