Cellular Transport Problem Set

1. Compare and contrast diffusion and osmosis.
   - Both involve movement from High to Low concentration.
   - Diffusion movement of molecules. Osmosis is diffusion of water.

2. 
   ![Beaker A](100\% \text{ Water})
   ![Beaker B](10\% \text{ Sugar} \quad 90\% \text{ Water})
   ![Beaker C](40\% \text{ Sugar} \quad 60\% \text{ Water})

   a. What is the solute concentration of Beaker A? \( 0\% \)
   b. What is the solvent concentration of Beaker C? \( 60\% \)
   c. What would the solvent concentration be for a solution that is isotonic to Beaker B?
      \( \text{Solvent} = 90\% \)

3. Below is a diagram of a cell submerged in a solution.
   a. What is the solution in this example – hypotonic, hypertonic or isotonic?
      \( \text{Isotonic} \)
   b. How do you know?
      \( \text{Higher concentration of solute outside the cell.} \)
   c. What process is going to take place in this example? (diffusion or osmosis)
      \( \text{Osmosis} \)
   d. Describe exactly what is going to happen to the cell in this example.
      \( \text{Important. The cell will lose water to the exterior solution. Cell will shrink. (Plasmolysis)} \)
      \( \text{This membrane is NOT permeable to sugar} \)

   ![Cell Diagram] 30\% \text{ Sugar} \quad 20\% \text{ Water} 70\% \text{ Sugar} \quad 30\% \text{ Water}
4. The cell in this beaker is bathed in a 5% NaCl solution. The membrane is permeable to water but not to NaCl.

   ![Diagram showing 0.9% NaCl (99.1% H₂O) and 5% NaCl (95.3% H₂O)]

   i. In which direction is the net movement of water here?
   - Out of cell into the solution.

   ii. How will this affect the cell?
   - Cell will shrink until equilibrium is reached.

5. Three funnels containing three different starch solutions were placed for 24 hours into a beaker that contained a starch solution of UNKNOWN concentration. The end of each funnel was covered by a selectively permeable membrane.

   a. What can you say about the concentration of the solution in the beaker based on the results shown in the diagram?

   ![Diagram showing 160% H₂O, 98% H₂O, and 96% H₂O solutions]

   - Tap Water
   - 2% Starch Solution
   - 4% Starch Solution

   - SELECTIVELY PERMEABLE MEMBRANE
   - UNKNOWN Solution

   START

   AFTER 24 HOURS

   - Hypertonic
   - Isotonic
   - Hypotonic

6. A U-tube is divided into 2 halves, A and B, by a membrane which is freely permeable to water and salt, but NOT to glucose. Side A is filled with a solution of 8% salt and 2% glucose, while side B is filled with 2% salt and 8% glucose.

   a. In terms of glucose concentration, which side is a hypotonic solution?
   - Side A

   b. What could you say about the water concentration on side A relative to side B?
   - 90% water on both sides (equal)

   c. Which molecule(s) will move across the membrane and in which net direction(s)?
   - Water: A → B
   - Salt: A → B

   d. Notice that the levels of liquid in both A and B are equal. Do you think they will appear this way when the system reaches equilibrium? Explain.
   - No, side A will be lower than B
   - Net movement of water will be to side B, raising level.