

Teacher Demonstration Instructions

After students view online animations of cell membrane dynamic, conduct the following three teacher demonstrations of diffusion and osmosis. Students witness the effect of movement through a semi-permeable membrane using Lugol's solution, a strong iodine solution.

1. Diffusion Demo

Materials

- 3 beakers of water, one at 10 °C, one at 37 °C, one at 90 °C
- food coloring, any dark color, 2 drops for each beaker

Procedure

Drop 2 drops of food coloring in each of the three beakers of water. Do not stir or agitate. Observe and compare the movement and timing of the dye molecules through the water.

Analysis

Discuss how the three beakers were different and why.

2. Osmosis Demo

Materials

- 8 green grapes
- 4 beakers or containers, with covers
- 4 different solutions:
 - hypertonic: 20 g fructose (honey) per 100 g water
 - hypotonic: distilled water
 - isotonic: 8 g fructose (honey) per 100 g water
 - hypertonic salt solution: 20 g sodium chloride per 100 g water

Procedure

Dry and mass each grape; record the masses. Mark each solution container with contents. Drop 2 grapes in each solution. Let the solutions sit at room temperature in covered beakers for 24 hours. Gently dry each grape, mass each and record the masses.

Analysis

Looking at the results, ask the following questions:

1. Was the mass different for each solution?
2. How was the mass different?
3. What inferences can be made about the sugar content of grapes?
4. What happened in the hypertonic salt solution? How was that different than the hypertonic sugar solution?

3. Osmosis through a Semi-Permeable Membrane Demo

Materials

- dialysis tubing, 12 cm length
- beaker of distilled water
- soluble starch
- Lugol's solution

Procedure

The following steps demonstrate the movement of particles through a semi-permeable membrane:

1. Make the dialysis tubing pliable by wetting it with water.
2. Tie off one end of the tubing.
3. Make a 10% starch solution by placing 1 g of starch in 9 g of water.
4. Fill the dialysis tubing with the starch solution. Make sure you tie off the second end and wipe off all liquid around the outside of the tubing.
5. To the beaker of distilled water, add the Lugol's solution. The Lugol's solution contains iodine that reacts with a starch solution to give a blue-black color.
6. Place the tubing into the beaker and check after 20-30 minutes.

Analysis

1. Did the solution color inside the tubing change? What happened? Why?
2. Did the solution color in the beaker change? How? Why?
3. Using results from these demonstrations, which substances moved across the membrane? Which substance(s) did not move across the membrane? Why?