SC.912.N.1.1 – Nature of Science – Example 1 Answer

An osmosis investigation was conducted using chicken eggs to represent cells with semi-permeable membranes. The mass of each egg was measured to determine how much water diffused into or out of the eggs. The eggs were first soaked in vinegar to dissolve the shell. Each egg was then placed in one of three different solutions for 24 hours. The table below shows the results of the investigation.

**Osmosis in Cells**

| Solution | Average Mass of Eggs Before Soaking (grams) | Average Mass of Eggs After Soaking (grams) | Difference in Average Mass (grams) | Percent Change in Average Mass |
|---|---|---|---|---|
| **Vinegar (95% water)** | **71.2** | **98.6** | **27.4** | **+38.5** |
| **Corn Syrup (5% water)** | **98.6** | **64.5** | **34.1** | **-34.6** |
| **Distilled Water (100% water)** | **64.5** | **105.3** | **40.8** | **+63.3** |

Based on this experiment, which of the following should be inferred about cells with semi-permeable membranes?

**A. Substances other than water may also cross the cell membrane.**

**B. Substances other than water may block pores in the cell membrane.**

**C. Water enters the cell when placed in environments of high water concentration.**

**D. Water leaves the cell when placed in environments with a low concentration of solutes**

**Answer**

C. Water enters the cell when placed in environments of high water concentration

In both the vinegar (95% water) and distilled water (100% water) solutions, the egg gained mass after soaking. This means that water moved into the egg over time. The reason for this movement is that the solutions are both **hypotonic** to the concentration of the egg. **Water always moves from a more hypotonic solution to a more hypertonic solution** (which has more solutes and less water).

This item also assesses your ability to read and interpret graphs, charts and data tables. Even if you had no knowledge of hypo and hypertonic solutions, you could use the data in the table to conclude that in the solutions with the most water, the eggs gained the most mass.