Make Up Lab: Diffusion and Osmosis

Scientists often develop and test explanations for natural phenomena. In this investigation you will have an opportunity to design and carry out an experiment to test two different explanations for why RBCs appear bigger after they are exposed to distilled water. These are the two explanations that you will test:

1. Molecules such as protein and polysaccharides are more concentrated inside the cell than outside the cell when the cell is in water. These molecules therefore begin to move out of the cell because of the process of diffusion but are blocked by the cell membrane. As a result, these molecules push on the cell membrane and make the cell appear bigger.

2. Water molecules move into the cell because the concentration of water is greater outside the cell than it is inside the cell. As a result, water fills the cell and makes it appear bigger.

Your Task
Design and carry out an experiment to determine which of the two explanations about the appearance of the RBCs after exposure to distilled water is the most valid or acceptable from a scientific perspective.

The guiding question of this investigation is: **Why do the red blood cells appear bigger after being exposed to distilled water?**

Materials
You may use any of the following materials during your investigation:

- balance or string to measure the mass or circumference of the egg
- raw chicken eggs
- vinegar
- distilled water
- corn syrup
- jar or cup (a pint size Mason jar works great)
- spoon

Getting Started
You will use models of cells rather than real cells during your experiment. You will use cell models for two reasons: (1) a model of a cell is much larger than a real cell, which makes the process of data collection much easier; and (2) cell models make it easier to control for a wide range of variables during your experiment. The cell models will therefore allow you to design a more informative test of the two alternative explanations outlined above.

You can construct a model cell by using a raw chicken egg. Once the shell has been dissolved by vinegar, the membrane of the egg behaves much like a cell membrane. To create a model of a cell, place the raw egg in vinegar for 24-36 hours until the shell is thoroughly dissolved. Remove the egg carefully from the vinegar with a spoon and place into a clean jar filled with corn syrup. Wait for 24 hours, then remove the egg. Place the egg back into a clean jar filled with vinegar and wait for 24 hours.
*Don't forget to take and record measurements before and after you put the egg into each solution.

You must determine what type of data you need to collect, how you will collect it, and how you will analyze it.
To determine *what type of data you need to collect*, think about the following questions:

- What was your dependent (responding) variable? (mass of the cell or size of the cell?)
- What type of measurements will you need to make during your investigation?

To determine *how you will collect your data*, think about the following questions:

- What will serve as a control (or comparison) condition?
- What types of treatment conditions will you need to set up and how will you do it?
- How many "cells" will you need to use in each condition?
- How often will you collect data and when will you do it?
- How will you make sure that your data are of high quality (i.e., how will you reduce error)?

To determine *how you will analyze your data*, think about the following questions:

- How will you determine if there is a difference between the treatment conditions and the control condition?
- What type of graph could you create to help make sense of your data?

Report

Once you have completed your research, you will need to prepare an investigation report that consists of four sections (be sure to have section headings):

1. Introduction: Give some background information on the topic. Explain what question were you trying to answer and include a hypothesis. (Background info, research question and hypothesis)
2. Procedure: What did you do during your investigation and why did you conduct your investigation in this way? (How you collected and analyzed data)
3. Data: Include a data table and/or graph to show your results. Be sure to include a title for your table or graph with labels for the variables.
4. Conclusion: What is your argument? (Claim - Evidence - Reasoning)

Your report should answer these questions in two pages or less. The report must be typed, and any diagrams, figures, or tables should be embedded into the document. Type your report on Google Docs (12 point font, double-spaced) and share it with your teacher. Your report will be graded based on the rubric in the class syllabus.