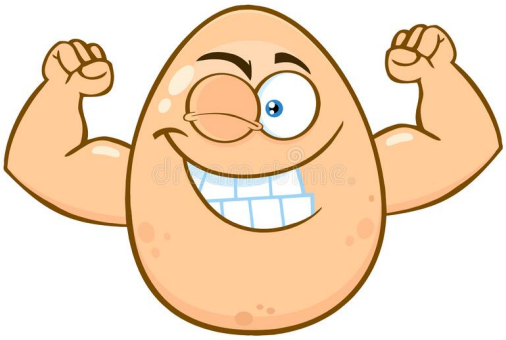
# Egg Osmosis: Modeling Selective Permeability

**INTRODUCTION:**

All living cells have an outer layer known as the cell membrane. The cell membrane is an organelle that strictly controls what molecules can enter and leave the cell. Some molecules like sugar are too big to cross on their own, and some molecules like oxygen are tiny enough to squeeze through. This characteristic of the cell membrane is known as selective permeability.



When the cell membrane is placed in uneven concentrations of molecules (or solute), it attempts to balance those molecules out to reach an equilibrium. This automatic evening out of molecules from high to low concentrations is known as diffusion. For example, if the cell membrane has too many water molecules outside of its cell, then water will move inside the cell in hopes of reaching an equilibrium. This specific type of diffusion is known as osmosis, or the movement of water.

In this 4-day lab, an egg will serve as a model of a cell and its cell membrane. The egg will be placed in various liquid solutions, forcing molecules to diffuse inside and outside of the egg, depending on the type of solution. Below is a table of the possible solutions your egg can be placed:

| Type of Solution | Solute Concentrations | Movement of Water |
|---|---|---|
| Hypotonic Solution | Less solute on the outside of the cell, more solute on the inside of the cell. | Water moves into the cell. |
| Isotonic Solution | Solute on the outside of the cell is equal to solute on the inside of the cell. | Water moves in and out of the cell equally. |
| Hypertonic Solution | More solute on the outside of the cell, less solute on the inside of the cell. | Water moves out of the cell. |

**PURPOSE:** To visualize the diffusion and osmosis of molecules across cell membranes.

**PROCEDURE:**

*Day #1:*

1. Obtain the mass of the egg using the scale. Record on data table.
2. Make *at least* three physical observations about the egg (color, texture, shape, etc.).
3. Place the egg inside an empty beaker.
4. Pour vinegar in the beaker to cover the egg.
5. Label your group's beaker with your class period, initials, and group #.
6. Place the beaker in its designated area, and let it sit overnight.

*Day #2:*

1. *Carefully* remove the egg from the beaker and obtain its mass. Record on data table.
2. Make *at least* three physical observations about the egg.
3. Answer the conclusion questions for Day #2.
4. Dump the vinegar from the beaker out into the sink.
5. Place the egg back inside the empty beaker.
6. Pour distilled water in the beaker to cover the egg.
7. Place the beaker in its designated area, and let it sit overnight.

MATERIALS RECEIPT
PRICES ARE APPROXIMATE

| | |
|---|---|
| Eggs | $2.50 |
| Vinegar | $2.00 |
| Saturated Sugar Solution | $3.00 |
| Distilled Water | $1.00 |
| Scale | $6.00 |
| Beaker (or Cup) | N/A |
| TOTAL | $14.50 |

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*Day #3:*

1. *Carefully* remove the egg from the beaker and obtain its mass. Record on data table.
2. Make *at least* three physical observations about the egg.
3. Answer the conclusion questions for Day #3.
4. Dump the distilled water from the beaker out into the sink.
5. Place the egg back inside the empty beaker.
6. Pour corn syrup (*a saturated sugar solution is a much cheaper substitute*) in the beaker to cover the egg.
7. Place the beaker in its designated area, and let it sit overnight.

*Day #4:*

1. *Carefully* remove the egg from the beaker and obtain its mass. Record on data table.
2. Make *at least* three physical observations about the egg.
3. Answer the conclusion questions for Day #4.
4. Dump everything out of the beaker and rinse out in the sink. Throw the egg away.

**DATA:**

| | Day #1<br>Normal Egg | Day #2<br>Vinegar Egg | Day #3<br>Water Egg | Day #4<br>Syrup Egg |
|---|---|---|---|---|
| Mass (g) | | | | |
| Observation #1 | | | | |
| Observation #2 | | | | |
| Observation #3 | | | | |

**CONCLUSION:**

*Day #1:* Predict what will happen to the egg once it sits overnight in vinegar. Why do you think this?

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*Day #2:* Was the prediction for day #1 correct? **Justify** your answer using the data collected as evidence.

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*Day #3:*

1. Sketch what the egg looks like. Indicate the direction that water has moved.
2. Is distilled water a hypo, iso, or hypertonic solution? Use the data and observations collected as evidence to **justify** your answer.

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*Day #4:*

3. Sketch what the egg looks like. Indicate the direction that water has moved.
4. Is distilled water a hypo, iso, or hypertonic solution? Use the data and observations collected as evidence to **justify** your answer.

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