Osmosis — Student Worksheet

Name:	
Date:	
Group Members:	

Safety Considerations

- Wear gloves, lab coat, and safety glass at all times; tie back long hair and secure loose clothing.
- Treat raw eggs as potentially contaminated (do not eat, touch your face, or share materials).
- Avoid contact with vinegar; rinse immediately with water if it gets on skin or in eyes.
- Clean up spills promptly and keep work areas dry and organized.
- Dispose of eggs and solutions as instructed and wash hands before leaving the lab.

Purpose

This lab uses a decalcified egg as a model cell to investigate how osmosis and solution tonicity affect cell volume and homeostasis, helping you connect these principles to fluid balance in the human body.

Key Concepts

- Selectively permeable barrier (i.e. cell membrane) = egg membrane
- Intracellular fluid = inside egg there is fluid compartment with dissolved solutes
- Osmosis = water movement driven by water concentration gradient created by solutes
- Tonicity = how a solution affects cell volume (hypotonic, isotonic, hypertonic)

Pre-Lab Questions (Individual)
Answer in full sentences in your binder or in the space provided below.

1) **Define osmosis** in your own words and explain why it is important for maintaining normal cell function in living organisms.

2) **Define selectively permeable** in your own words. Describe how selective permeability helps the body maintain **homeostasis**.

3) We will place a deshelled egg into two different solutions: pure water, and a high sugar solution (e.g. Karo syrup). For each solution, predict the direction of water movement and the change in egg mass and dimensions.
   a) Pure water:

   b) Sugar solution:

4) Predict what ratio of water to sugar solution would create an **isotonic** environment for the egg, no net water movement into or out of the egg

Procedure (Group)

1. (If completing at home) Decalcify eggs by fully submerging them in white vinegar for 24–72 hours, until the shells are completely dissolved.
2. Carefully remove the eggs from the vinegar using a spoon. Rinse gently with water and pat dry with a paper towel.
3. **Baseline measurements**: Measure and record for each egg:

	Egg 1	Egg 2	Egg 3
Mass (g)			

Width (cm)			
Height (cm)			
Firmness			
Appearance			

4. Place each egg in a separate, labeled container.
5. Add **distilled water** to completely cover Egg 1.
6. Add **sugar solution** to completely cover Egg 2.
7. Prepare your predicted **isotonic solution** (water:sugar ratio) and use it to completely cover Egg 3.
8. Allow the eggs to soak in their solutions. Every **15 minutes for at least 1 hour**, remove each egg, gently rinse and dry it, measure its mass and size, and record any observations about the firmness and appearance of the eggs.
9. (Optional) Continue measurements for up to 48 hours to observe longer-term trends.
10. For each egg, calculate:
    a. Change in mass (g) = Final mass – Initial mass
    b. Percent change (%) = (Change ÷ Initial mass) × 100
11. Create a graph showing percent change in mass (y-axis) versus time (x-axis) for each solution. Include appropriate units, axis labels, and a legend.

Conclusion Questions (Individual)

1. Describe overall trends in your variables. Were they consistent with your hypotheses

2. What sources of error might affect your mass or size measurements in this experiment? How could they influence your results?

3. For each egg complete the following table to make a data-backed claim on whether the solutions were hypotonic, isotonic, or hypertonic, and the reasoning for how the weight or size of the eggs changed.

	Water:	Sugar Solution:	Test Solution:
Claim			
Evidence (numbers and trends from graph)			
Reasoning (explain how the water moved)			

4. Based on your experiment (and class data if available) what ratio of water to sugar solution would be isotonic for the egg cell, back up your claim with your data (and class data if available).

5. A human red blood cell is placed in three different solutions: pure water, normal saline (0.9% NaCl), and a very salty solution. For each solution, predict what will happen to the cell and explain why using osmosis and tonicity (hypotonic, hypertonic, and isotonic).

Pure water	
Normal saline	
Salty solution	

6. Edema & dehydration: Pick ONE scenario and explain using osmosis/tonicity what happens to body fluid compartments/cells?.
    a. A person drinks very salty soup without much water
    b. A person with severe diarrhea loses lots of water quickly

Submission Information
Upload to the assignment page by the due date. Submit ONE PDF containing:

☐ Completed worksheet
☐ Data tables
☐ Graph(s)
☐ Photos of experimental setup (if at home)

Creation and Copyright Information
Last updated: Jan 31, 2026
Last updated by: Heather Talbott

Resources used in the creation of this material:

- Allen, C., & Harper, V. (2020). *Laboratory manual for anatomy and physiology* (7th ed.). Wiley.
- Grammarly. (2026). Grammarly (Version 14.1268.0) [Software]. *https://www.grammarly.com/*
- OpenAI. (2026). ChatGPT (GPT-5) [Large language model]. *https://chat.openai.com/*