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| http://cdn.graphicsfactory.com/clip-art/image_files/tn_image/1/1315741-tn_chicken10.jpgAnatomy & Physiology 12  **Egg: Osmosis Lab** | Name:  Block:  Date: |

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| **Introduction** |

A chicken’s egg can be compared to a giant cell. A developing embryo has all the food it needs to grow into a little chicken, but it cannot survive without being able to get oxygen in and carbon dioxide out. The shell acts as a protective coat but still allows gas exchange to take place. When the shell is removed, other substances can also enter or leave the egg. A chicken egg’s protective outer shell has high calcium content. If a raw egg (shell still intact) is placed in a glass of vinegar, a chemical reaction takes place. The calcium carbonate dissolves and the products are carbon dioxide gas, water and calcium acetate. The balanced chemical equation for the reaction is:

CaCO3(s) + 2 CH3COOH(l) 🡪 Ca(CH3COO)­2(s)­ + H2O(l) + CO2(g)

The acetic acid in the vinegar will dissolve the eggshell and leave a semipermeable membrane. This membrane will feel rubbery to touch.  **In this lab, you will observe the process of osmosis and diffusion across the membrane of an egg.**

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| **Purpose** |

To observe and understand the process of osmosis and diffusion across a selectively permeable membrane.

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| **Materials** |

* 1 egg
* Beaker
* Vinegar
* Scale
* Ruler
* String
* Food coloring
* Corn syrup

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| **Pre-Lab** |

1. What is the function of the cell membrane? What does selectively permeable mean?
2. What is diffusion?
3. What is osmosis?
4. What do the following terms mean: hypertonic, hypotonic and isotonic solutions.
5. Summarize in your own words, what you will be doing over the three days.
6. What observations should you be recording? Be sure to include both quantitative and qualitative observations
7. Why is it important to take measurements of the egg before we place it in the various solutions?
8. Formulate a hypothesis: Predict what you think will happen to the egg when it is placed in vinegar, syrup and water with food coloring.
   1. If the egg is placed in **vinegar** then the egg will (increase / decrease / remain the same) in size because the **vinegar** is a(n) (hypotonic / hypertonic / isotonic) solution.
   2. If the egg is placed in **syrup** then the egg will (increase / decrease / remain the same) in size because the **syrup** is a(n) (hypotonic / hypertonic / isotonic) solution.
   3. If the egg is placed in **water with food coloring** then the egg will (increase / decrease / remain the same) in size because the **water with food coloring** is a(n) (hypotonic / hypertonic / isotonic) solution.

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| **Procedure** |

***Day 1***

1. Weigh your egg and record the mass in the data table.
2. Measure the circumference (waist) of your egg using a piece of string and a ruler.
3. Record this measurement (quantitative observations) in the data table.
4. Make qualitative observations regarding the egg. Record this in the data table.
5. *Gently* place your egg in a 250 mL beaker.
6. Pour enough **vinegar** into the beaker to submerge the egg.
7. Cover the beaker with saran wrap.
8. Ensure beaker is labeled with your names. Place the beaker on the side bench (location indicated by Ms. Sandhu).
9. Answer the day 1 questions.

My group is assigned Day 2 procedure group \_\_\_\_\_\_\_\_\_

***Day 2: Group A***

1. Carefully remove your egg from the beaker and rinse it. Be very careful.
2. Dump the **vinegar** down the sink and rinse your beaker.
3. Weigh your egg and record the mass in the data table.
4. Measure the circumference of your egg using a piece of string and a ruler.
5. Record this measurement in the data table.
6. Make qualitative observations regarding the egg. Record this in the data table.
7. Place your egg back in the cleaned beaker.
8. Cover the egg with **water**.
9. Add a few drops of **food coloring.**
10. Cover the beaker with saran wrap.
11. Leave the beaker until next class.
12. Answer the day 2 questions.

***Day 2: Group B***

1. Carefully remove your egg from the beaker and rinse it. Be very careful.
2. Dump the **vinegar** down the sink and rinse your beaker.
3. Weigh your egg and record the mass in the data table.
4. Measure the circumference of your egg using a piece of string and a ruler.
5. Record this measurement in the data table.
6. Make qualitative observations regarding the egg. Record this in the data table.
7. Place your egg back in the cleaned beaker.
8. Cover the egg with **corn** **syrup**.
9. Cover the beaker with saran wrap.
10. Leave the beaker until next class.
11. Answer the day 2 questions

***Day 3***

1. Carefully remove your egg from the beaker and rinse it. Be very careful. Your egg will be EXTREMELY FRAGILE now.
2. Dump the **solution (water or corn syrup)** down the sink and rinse your beaker.
3. Weigh your egg and record the mass in the data table.
4. Measure the circumference of your egg using a piece of string and a ruler.
5. Record this measurement in the data table.
6. Make qualitative observations regarding the egg. Record this in the data table.
7. Dispose of your egg.
8. Clean and dry your beaker.
9. Answer the day 3 questions.
10. Complete the post lab questions

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| **Observations** |

Data Table 1:

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|  | **Day 1: Original Egg** | **Day 2: Egg without shell** | **Day 3: Egg after water immersion** | **% Change in mass compared to Day 2** | **Day 3: Egg after sugar/ colored water solution** | **% Change in mass compared to day 2** |
| **Mass**  **(g)** |  |  |  |  |  |  |
| **Circumference (cm)** |  |  |  |  |  |  |

Data Table 2:

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| **Day 1: Qualitative observation** |  |
| **Day 2: Qualitative observation** |  |
| **Day 3: Qualitative observation** |  |

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| **Questions** |

*Day 1:*

1. How can you tell a chemical reaction is taking place?

*Day 2:*

1. Vinegar is made of acetic acid and water. When the egg is placed in vinegar, which way did the water molecules move? How do you know?
2. Why did the contents of the egg not move into the vinegar after the calcium carbonate dissolved?

*Day 3: Group A*

1. Why did the egg increase in size?
2. Was color present inside the egg? What does this tell you about the size of particles of food coloring?

*Day 3: Group B*

1. What happened to the size of the egg? Why?

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| **Follow-up questions** |

1. Why did you first soak the egg in vinegar? Did you see any indication that a chemical reaction was taking place as it soaked in the vinegar? Explain the reaction that happened.
2. In which substance(s) [acid, water, corn syrup] is/are the egg in a hypotonic solution?
3. In which substance(s) [acid, water, corn syrup] is/are the egg in a hypertonic solution?
4. Roads are sometimes salted to melt ice. Many of the roadside plants die of dehydration. Explain why?
5. Why do grocery store owners spray fresh fruits and vegetables with water?
6. If a shipwrecked crew drinks seawater, they will probably die. Why?
7. If a bowl of fresh strawberries is sprinkled with sugar, a few minutes later the berries will be covered with juice. Why?

