Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Date\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

# Passive Transport

**Purpose**

The purpose of this exercise is to demonstrate the processes of diffusion, selective permeability, and osmosis.[[1]](#endnote-1)

**Procedure:**

 **Materials**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part 1** | **Part 2** | **Part 3** | **Part 4** |
| Celery | Plastic bags (2) | Plastic cup | Potato cores (cut like French fries) |
| Styrofoam cups (2) | Styrofoam cups (2) | Mountain Dew | Styrofoam cups(5) |
| Food coloring | Yarn | Raisin | Sugar |
| Hot water | Starch Solution(1 cup of water, ½ Tsp Corn starch) | Graduated Cylinder (50ml) | Scale |
| Ice water | Iodine solution(1 cup of water, 20 drops of Iodine) |  | Graduated Cylinder (50 ml) |
| Graduated Cylinder (50 ml) | Graduated Cylinder (50 ml) |  |  |

**Sequence of Steps**

**![C:\Users\Angela\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.IE5\DRP2N1IJ\MCj04242300000[1].wmf]()Part 1: Diffusion**

1. ![C:\Users\Angela\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.IE5\DRP2N1IJ\MCj04242300000[1].wmf]()Put 50 mL of hot water in a cup and place 2 drops of food coloring into it. Record how long it takes to diffuse so that a homogenous mixture is reached.
2. Put 50 mL of ice water in a cup and place 2 drops of food coloring into it. Record how long it takes to diffuse so that a homogenous mixture is reached.
3. ![C:\Users\Angela\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.IE5\DRP2N1IJ\MCj04242300000[1].wmf]()Obtain 2 pieces of celery and place one piece of celery into each cup of food coloring. Set aside so that they are not disturbed.
4. ![C:\Users\Angela\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.IE5\DRP2N1IJ\MCj04242300000[1].wmf]()After 20 minutes determine how far the food coloring has traveled up the piece of celery. To do this, cut off the top of the celery in small increments until you run into the food coloring. Measure distance traveled. Record data.
5. Answer analysis questions 1-3.

**Part 2: Selective Permeability**

1. Obtain 2 plastic bags. Label bags as 1 & 2.
2. Bag 1: add 10 mL of iodine to 10 mL of water. Carefully seal and tie the bag shut.
3. Bag 2: add 20 mL of starch solution. Carefully seal and tie the bag shut.
4. Place bag 1 into cup A containing 20 mL of starch solution.
5. Place bag 2 into cup B containing 10 mL of iodine and 10 mL of water.
6. ![C:\Users\Angela\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.IE5\DRP2N1IJ\MCj04242300000[1].wmf]()Set the cups aside and allow them to sit overnight undisturbed.
7. The next day, record your observations.
8. ![C:\Users\Angela\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.IE5\DRP2N1IJ\MCj04242300000[1].wmf]()![C:\Users\Angela\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.IE5\DRP2N1IJ\MCj04242300000[1].wmf]()Carefully remove bag 1 from the cup, pour the contents into a graduated cylinder and record the volume. Discard bag and contents. Clean and dry graduated cylinder.
9. Measure and record the volume of the remaining liquid in cup A.
10. ![C:\Users\Angela\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.IE5\DRP2N1IJ\MCj04242300000[1].wmf]()![C:\Users\Angela\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.IE5\DRP2N1IJ\MCj04242300000[1].wmf]()Carefully remove bag 2 from the cup, pour the contents into a graduated cylinder and record volume. Discasrd bag and contents. Clean and dry graduated cylinder.
11. Measure and record the volume of the remaining liquid in beaker B.
12. ![C:\Users\Angela\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.IE5\DRP2N1IJ\MCj04242300000[1].wmf]()Answer analysis questions 4-10.

**Part 3: Osmosis**

1. Place 50 mL of Mountain Dew into a cup. Add two raisins.
2. ![C:\Users\Angela\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.IE5\DRP2N1IJ\MCj04242300000[1].wmf]()Set aside undisturbed for 20 minutes.
3. Record your observations.
4. ![C:\Users\Angela\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.IE5\DRP2N1IJ\MCj04242300000[1].wmf]()Answer analysis questions 11 & 12.

**Part 4: Osmosis**

1. Obtain 5 potato cores (cut like French fries) and 5 plastic cups.
2. ![C:\Users\Angela\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.IE5\DRP2N1IJ\MCj04242300000[1].wmf]()Label the cups 1-5.
3. Weigh and record weights of potato core. Make sure to note what cup you place that potato into.
4. Into cup 1, add 50 mL of water and one of the weighed potatoes. Set aside until tomorrow.
5. Into cup 2, add 50 mL of water and 5 grams of sugar. Mix solution until all the sugar has dissolved. Add to cup 2 one of the weighed potatoes. Set aside until tomorrow.
6. Into cup 3, add 50 mL of water and 10g of sugar. Mix solution until all the sugar has dissolved. Add to cup 3 one of the weighed potatoes. Set aside until tomorrow.
7. Into cup 4, add 50 mL of water and 15g of sugar. Mix solution until all the sugar has dissolved. Add to cup 4 one of the weighed potatoes. Set aside until tomorrow.
8. ![C:\Users\Angela\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.IE5\DRP2N1IJ\MCj04242300000[1].wmf]()Into cup 5, add 50 mL of water and 20g of sugar. Mix solution until all the sugar has dissolved. Add to cup 5 the last weighed potato. Set aside until tomorrow.
9. ![C:\Users\Angela\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.IE5\DRP2N1IJ\MCj04242300000[1].wmf]()The next day, remove potato from cup 1, blot dry, weigh and record weight. Make a wet mount and view cells under the microscope on low and high power. Draw the cell under high power.
10. Repeat step 9 for cups 2-5
11. ![C:\Users\Angela\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.IE5\DRP2N1IJ\MCj04242300000[1].wmf]()Answer analysis questions 13-17.

**![C:\Users\Angela\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.IE5\DRP2N1IJ\MCj04242300000[1].wmf]()**

**Observations & Analysis Questions**

1. What is diffusion?

2. In which cup did diffusion occur more rapidly? Explain why.

3. Did diffusion occur more quickly in one celery verses the other? Explain.

4. Define selective permeability.

5. Which way did the iodine molecule move through the bag? Explain how you know this.

6. Did starch molecules pass through the membranes? Explain how you know this.

7. In which direction did water move in cup A and in cup B? Explain how you know this.

8. What can you infer from this experiment about movement of large molecules (starch) through a thin polyethylene membrane?

9. Can you call the membrane in this experiment selectively permeable? Explain your answer.

10. Of the molecules tested, which diffused through a polyethylene membrane?

11. Define osmosis.

12. Explain what happened to the raisin.

Illustrations: Draw the potato cell from each up as you observe it under high power.

Cup 1 Cup 2

 Cup 3 Cup 4

 Cup 5

13. Explain the changes in the masses of the potatoes.

14. Explain the changes in the potato cells.

15. Determine which solutions were hypertonic, hypotonic, and isotonic.

16. Why is it important that an IV is isotonic to blood?

1. Goehring, JessaLee (2008). Passive Transport, Lab. *Lodi High School Agriculture Department*. [↑](#endnote-ref-1)