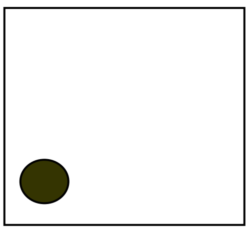
Name:___________________________________

Lab 2 – Cell Processes – Diffusion and Enzyme Action
SCI141 – Fall 2004

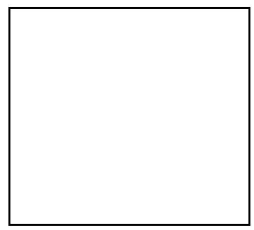
Procedure 1 – Diffusion and Osmosis

Introduction

You already know what **diffusion** is. Picture to yourself what would happen if someone opened a bottle of strong perfume on the other side of the room. Similarly, picture the results of dropping food coloring into a glass of water. As you have probably imagined, both the food coloring and the perfume would spread out over time.

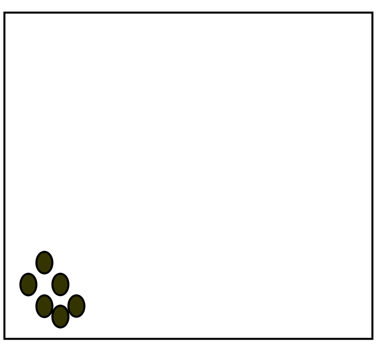


Box A

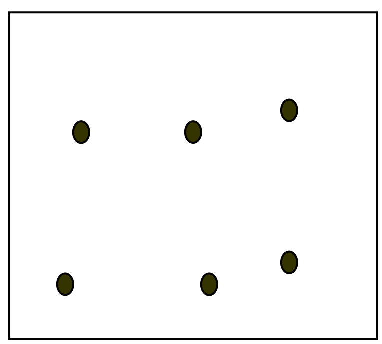


Box B

Diffusion is a property of molecules, whether the molecules are solids, liquids, or gasses. Above there are two boxes, A and B. In each box there is a black dot that represents a bottle of perfume. Take a minute and draw where you might be able to smell the perfume after 5 minutes.



Box A



Box B

Picture that in reality the perfume is just a collection of molecules, again demonstrated in Box A. Over time, (Box B) those molecules try to spread out in space so that they are evenly distributed. The actual movement of the molecules is called **diffusion**.

The next question we have to answer is “in what direction will molecules move?”

Again, look at Box A and Box B above. In Box A, when we open the bottle of perfume, the molecules are clustered, or we could say that they are in a **high concentration**. Everywhere else in Box A has a very **low concentration** of perfume. If there is a difference in concentrations in an area, as in Box A, a **concentration gradient** exists.

In diffusion, molecules will move across concentration gradients from high concentrations to low concentrations. This movement will continue until there is no more concentration gradient. If there is no more movement we call that **equilibrium**.

Diffusion is the process that is responsible for the movement of many molecules into organisms, for example, diffusion causes oxygen to move into the blood and carbon dioxide to come out of our blood. In the case of carbon dioxide, however, there would be no physical way to have more ***actual*** carbon dioxide in your blood than in the air around you. So why does the carbon dioxide want to leave our blood?

Most Biological organisms rely on **relative concentrations**. Even though there may be billions of carbon dioxide molecules in the air we breathe, carbon dioxide only accounts for 0.03% of the gases in the air. In contrast, carbon dioxide makes up 7.0% of the gases in your lungs. So even though there are less carbon dioxide molecules in the blood, they are actually in higher ***relative concentration***.

About Membranes
All cells are surrounded and protected by a membrane. These membranes have many functions which you will discuss in class; however, one of their most important functions is helping to regulate the materials that can enter the cell.

In order for a molecule to enter your cells, it must diffuse in. Most Biological membranes are picky. They only allow the movement of certain molecules. The one molecule that diffuses easily into and out of most cells is water. Water will move into and out of cells based on the rules of diffusion. We call this movement of water "**osmosis**."

In this lab you will use a real Biological membrane in order to measure the effects of osmosis in a real system.

Procedure:

Before you start →
You will have the following materials at your lab bench:
4 beakers
4 membranes
string
scissors
1 filter

"Varying Concentrations"

1. You will need to prepare 4 simulated cells. Eventually, Cell A will contain water, Cell B will contain 25% Molasses, Cell C will contain 50% molasses, and Cell D will contain 100% molasses.

2. Label your beakers Cell A through Cell D with a wax pencil.

3. The membranes will about 6 – 8 cm long. Tie off one end of the membrane with a piece of string. Find the opening at the opposite end of the membrane. Insert the filter into the opening.

4. Fill up each Cell with its contents (See 1 above or the chart below). For example, if you are creating Cell A, fill the membrane about half way with water. Leave some space and tie off the open end of the cell.

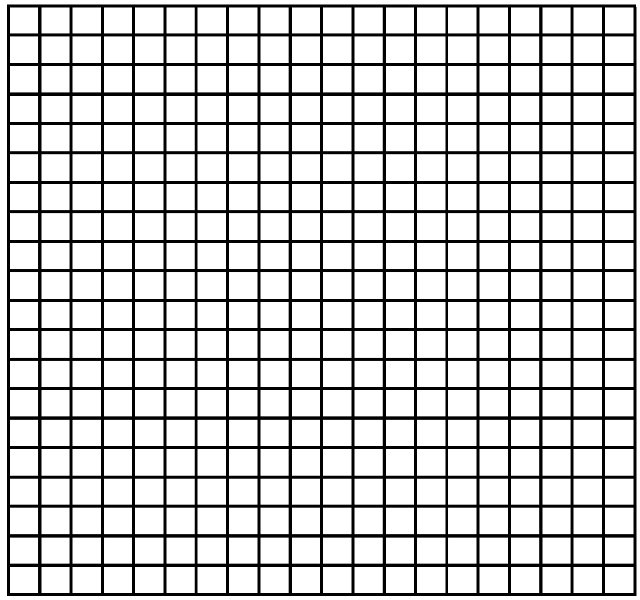
5. Before you put each cell into its beaker, weigh it on one of the balances in the room. Record all of you data in the chart below.

6. Place each cell into its beaker. Fill each beaker about ¾ full of water.

7. Let the cells sit in the beakers for a total of 20 minutes. Check the weight of each cell every five minutes. Make sure you record all of your data in the chart below.

Data Table → Effects of Concentration on Difussion					
Cell Composition	***Initial Wt (g)***	***5 min***	***10 min***	***15 min***	***20 min***
Water					
25% Molasses					
50% Molasses					
100% Molasses					

8. On the next page, construct a graph that represents the table above.



Graph 1 – The effect of concentration on diffusion

Questions:

1. What was the purpose of Cell A?

2. If our cells were perfectly tied off and very clean after we filled them, should we expect to see molasses in the beakers?

3. From your graph, what conclusion did you make about the effects of concentration on diffusion?

4. Did you reach equilibrium in any of the cells? How can you tell?

9. Based on the principles of diffusion, try to describe why you mouth gets dry when you eat a lot of crackers.