Biology 12

Diffusion Lab

Introduction

Diffusion is the process of molecules moving from an area of high concentration to an area of low concentration. If the molecules in question are water, the process is further specified as *osmosis*. If the molecules are the solute, the process is known as *dialysis*. This lab has been designed to analyze these processes and see, first hand, how they may be applied in an experimental basis. There will be ~~three~~ 2 different parts, each quite different from the other.

Part I. Investigation of a Selectively Permeable Membrane

Purpose: Qualitative analysis of the permeability of different substances through a selectively permeable membrane. From this analysis, a conclusion can be drawn regarding the relative sizes of the different molecules in question.

Materials:

1 pc. Dialysis Tubing	15% Glucose/1% Starch Solution
250 mL Beaker	Distilled Water
String	Lugol's Solution (IKI)
2 100 mL Beakers	2 Glucose Test Strips

Procedure:

1. Obtain one pre-cut piece of dialysis tubing. You will find it soaking in the water bath beside the other solutions. Dialysis tubing will act as our selectively permeable membrane. It has microscopic pores that only let certain molecules through it based on their size. Tie off one end of the tubing using a piece of string and form a bag. To open the other end of the bag, rub the end between your fingers until the edges separate. * use *
2. Place about 15 mL of the 15% glucose/1% starch solution in the bag (proper technique would have you take one of your small beakers to the bottle of solution, pour in about 20 mL into the beaker, and take that back to your table). Tie off the other end of the bag, leaving sufficient space for expansion of the contents in the bag. Record the colour of the contents as "Initial Solution Colour – Bag."
3. Before proceeding, make sure there is no solution leaking from the bag or that there is any solution on the outside of the bag. In order to prevent poor results, neither of these conditions can occur. a few drops (3-4)
4. Fill a 250 mL beaker 2/3 full of distilled water. Add approximately ~~4 mL~~ of Lugol's solution (conc) (the exact amount is not important). Record the colour as "Initial Solution Colour –Beaker."
5. Fully immerse the bag in the beaker of distilled water/Lugol's. Allow it to stand for 30 minutes.
6. At this point you can start Part II while you wait.
7. After 30 minutes, record the colour of the bag as "Final Solution Colour -- Bag" and the colour of the beaker as "Final Solution Colour -- Beaker." Remove the bag from the beaker and test the beaker contents for glucose using a test strip. Use the second test strip to test for glucose inside the bag. A positive test for starch occurs when Lugol's contacts starch and changes to a very deep blue/purple colour. A positive test for glucose will be indicated on the test strip package.
   * compare to colour on package *

make sure it is tight!

make sure it is tight!

rinse before step 4.

max 2 strips per pair !!

Part III. Observation of Onion cells in Distilled and Salt Water

Purpose/Prediction: _____

Materials: Onion Cells
Concentrated Salt Solution
Microscope and Slide Materials

Procedure:

1. Obtain your microscope, plug it in, turn it on, and adjust the objective lens to low power.
2. Obtain one slide, one cover slip, one scalpel, one sharp dissecting probe, one dropper, and a small beaker of water.
3. Clean all surfaces that you will need light to pass through (lenses, slide and coverslip) using lens paper **only**.
4. Obtain the sample of onion cells. On the under side of each layer of an onion is a thin "skin." This skin is made from a layer of cells which is only one cell thick! It is this skin that we will use. Take a small piece of one onion layer, perhaps 1 cm x 1 cm. With the tip of the ~~scalpel~~, tweezer tease off the thin skin on the concave surface, being careful not to fold it. Place this sample on the clean slide. From this, cut a piece that is **no larger** than 1 mm x 1 mm. Again, try to keep this tiny sample from folding over. When you are pleased that the piece is small enough and is flat, remove the rest of the onion skin from the slide.
5. Put one drop of water on the sample, and place the coverslip on top using the 45-degree technique (this is called preparing a wet mount).
6. ✳ Blot any excess water with a paper towel that may be around the edge of the coverslip. (IMP STEP)
7. Observe the onion cells on low power. Adjust the light (using the diaphragm below the stage) to optimize the image.

** These onion cells are very typical plant cells...they have a firm, cellulose-based outer cell wall that is very porous and an inner semi-permeable cell membrane. It is very hard to discern the two because they are right up beside each other.

8. Change the magnification to high power. Remember the microscopes are *parfocal*, which means they should already be very close to in focus when you switch from one magnification to the next. Because they are like this, you should only have to make adjustments with the fine focus.
9. ✳ Draw two or three of the cells that you can see clearly.
10. Get a small volume of concentrated salt solution (about 5 mL).
11. As you are watching the onion sample through the microscope, put 3-5 drops of salt water just on the edge of the coverslip. Draw the salt water under the coverslip by placing paper towel on the **other** side of the coverslip (see the diagram). The paper towel creates a "capillary" action that draws the salt water into the onion cell environment. Observe the result of changing the concentration of the onion cell extracellular fluid.
12. ✳ Draw two or three of the cells that you can see clearly.

Diffusion Lab Name: _____ Date: _____

Part I – Selectively Permeable Membrane

BEFORE YOU START: Read the each lab – predict what will happen.

DURING THE LAB: **Initial Observations:**

Initial Solution, Inside the Bag	Initial Beaker Water, Outside the Bag

Time dialysis bag put into distilled water: _____

After 30 minutes - Observations:

Amount of time dialysis bag stayed in distilled water: _____

Final Solution, Inside the Bag	Final Beaker Water, Outside the Bag
Glucose strip test:	Glucose strip test:

AFTER THE LAB: Explain your observations using the terms osmosis, diffusion, isotonic, hypertonic and hypotonic solutions:

Diffusion Lab Name: _____ Date: _____

Part III– Onion Cells in Distilled and Salt Water

BEFORE YOU START: Read the each lab – predict what will happen.

DURING THE LAB: **Observations:**

Draw Cells in Distilled Water	Draw Cells in Salt Water

AFTER THE LAB: Explain your observations using the terms osmosis, diffusion, isotonic, hypertonic and hypotonic solutions: