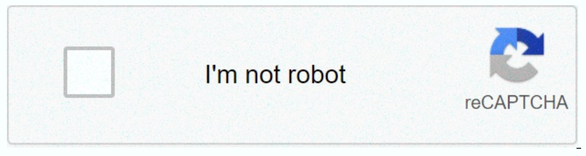

Continue

Dialysis tubing osmosis lab report

At the conclusion of the lab, the student must be able to: define the following terms: diffusion, osmosis, balance, tonicity, turgor pressure, plasmolysis describe what drives a simple diffuse (why molecules move?) to list factors that can affect the speed of a simple diffusion list, which molecules can usually freely disperse across plasma membrane cells describe what drives osmosis (why water molecules move?) explain why water moves out of the cell when the cell is inserted into a hypertonic solution explain why water moves in a cell when a cell is inserted into a hypotonic solution to describe what physically occurs in a cell when water leaves cells to describe what physically occurs to the cell when water enters the cell membrane lab of the Lumen Learning Understanding of diffusion and osmosis concepts is crucial to conceptualizing how substances move through cell membranes. Diffusion can occur across a semi-permeable membrane; diffusion also occurs when there is no barrier (or membrane). Several factors may affect the speed of diffusion, including temperature, molecular weight, concentration gradient, electric charge and distance. Water can also move with the same mechanism. This water diffusion is called osmosis. In this laboratory you will study diffusion and ososis processes. We will examine the movement through the membranes in the dialysis tubes, by definition, a semi-permeable membrane made of cellulose. We also examine these principles of living plant cells. part 1 of the Annex. Diffusion across a semi-permeable membrane: Dialysis procedure Cut a piece of dialysis tube, about 10 cm. Soak the dialysis tubes for about 5 minutes before use. Tie one end of the pipe with dental threads. Use a pipette and fill the bag with 1% starch solution, leaving enough space to tie the other end of the pipe. Tie the other end of the pipe closed with dental floss. Fill the 250 ml beagle with distilled water. Add Lugol's iodine to the distilled water in the beaker until the water is uniform light yellow. Place the dialysis tube bag in the beaker. The molecular formula of the Lugol solution is I2KI (atomic mass = 127). Starch consists of long glucose chains (each atomic mass of glucose = 180). Iodine turns dark blue in the presence of starch. Formulate a hypothesis for each of these. Remember to give a reasonable explanation of your predictions. Starch movement Iodine movement Color of solution in the bag after 30 minutes The colour of the solution in the beaker after 30 minutes Attach the dialysis bag to the beaker and allow to experiment for 30 minutes. Write down the colours of both the dialysis bag and the beakers. Dialysis tubing Data Dialysis tubing contents Beagle contents Preex experimental colour Pre-experimental content Pre-experimental content 1 % Starch solution Diluted iodine water Postsexual Color Lab Questions Is there evidence of starch diffusion If so, which direction does starch molecules diffuse? Is there evidence of iodine molecule diffusion? If so, in what direction was the iodine molecule diffuse. What can you say about the permeability of the dialysis membrane? (What particles could move and what particles could not?) What is the difference between a semi-permeable and selectively permeable membrane part 2. Plasmolysis-Observation of osmosis in the living system, Elodea If the plant cell is immersed in a solution that has a higher dissolved concentration than the cells, the water will leave / enter (circle one) the cell. Water loss from cells will cause cells to lose pressure caused by liquid plant cells vacuole, called turgora pressure. Macroscopically, you can see the effect of loss of turgor with wilted house plants or soft lettuce. Microscopically, increased water loss and turgora loss appear as the removal of protoplast from the cell wall (plasmolysis) and as a decrease in the size of the vacuole (Figure 1). Procedure Get the leaf from the end of Elodea Place it in a drop of water on the slide, cover it with a cover sheet and first inspect the material during the scan, then the low-power target and then at the high power target. Find a health region. Write down the location of the chloroplasts. Plot some cells. Do not move the slide to perform the next step. By touching one corner of the cover brush with a piece of Kimwipe to take off the water, add a drop of 40% salt solution to the opposite corner of the cover glazing. Do it at the same time. Make sure that the saline solution moves under the saddle. Wait about 5 minutes, then check as before. To sketch these cells next to a cell sketch in step 2, consider the location of the chloroplasts. Label to 40% saline solution. Lab Questions What Happened to Salt Solution Cells? Assuming the cells are not killed, what would happen if the saline solution had to be replaced with water? Are plant cells usually hypernic, hypotonic, or istonic in their environment? Can plant cells explode? Explain. General conclusions Review your hypothesis for each experiment. Whether your original hypothesis was supported or rejected for each experiment. Explain why and why not. It should be based on the best information obtained from the experiment. Explain how you came to this conclusion. If this is not correct, give the correct answer again based on the best information obtained from the experiment. Sources of error Identify and explain two things that people may have done wrong that would have led them to receive different answers from the rest of the class. 9/15/98 - 9/17/98 Lab 3 - Membrane transport Cares 0002 Jake dehant membrane transport Lab A. Movement through the plasma membrane is selectively permeable, allowing only a few substances to pass through it. The internal environment differs from the external environment and selective helps to maintain these differences. Substances move through the membrane in 4 ways: directly through the lipid bi-layer (O2, CO2, steroids) through membrane channels (ion, Cl, K, Na, H2O?) with carrier molecular weight (i.e. glucose, a.a.) in bladders (i.e. phagocytosis) 1. Diffusion diffusion tends to result in dissolved particles moving from a higher concentration zone in the solution to a lower concentration zone. Due to the random molecular movement of molecules (Brown movements) diffusion is a passive process, which means that it is not energy expenditure in the cell. (cf. active transport) All solutions are either liquid or gas and consist of a solvent with reconstituted solution. The balance is if the solution does not fear diluted net. Factors influencing the diffusion rate 1. 2. Temperature - as temp. increases the particles to move faster and the diffusion rate increases the size of the 3rd molecule – smaller molecules diffuse more easily than do larger 4th viscosity – if the solution is thick, such as syrup, diffusion will occur more slowly. 5. Molecular weight - heavier is usually diffuse more slowly, but the shape of the molecules can also affect diffusion. 2. Osmosis def: It is a diffusion of water (solvent) across selectively permeable membranes Water moves easily to and from cells because of its small size. Water tends to move from an area where there is more water (more water = less dissolved water) to the area where there is less water (less water = more dissolved pressure) osmotic pressure - is the force required to prevent water movement with osmosis across a selectively permeable membrane (basically, if there is a solution that is highly concentrated with dissolved, the water will tend to move in it more strongly than a weaker solution. This tendency for water to move in the solution is known as osmotic pressure) 3. Hypotonic, istonic and hypertonic solutions Cells tend to shrink or swell when inserted into the solution. If the cell is placed in a hypotonic solution, the inside of the cell will be more dissolved than the solution to the water rush and cause it to swell and/or lyse. If the cell is inserted into an istonic solution, inside the cell there will be the same concentration of ions as the solution, so the water is not the net movement to or from the cell. (think about injections) If a cell is placed in a hyperonic solution there is more water inside the cell than the outer solution, so that the water leaves the cell, and it becomes crenated Note: In conducting a rat blood cell experiment today, try predicting what will happen to the cell in each purify. 3. Filtering There is a time when a compartment containing small holes is inserted into a moving stream of liquid. Particles small enough to pass through holes move across the partition with liquid, but something larger is prevented from crossing. Filtering is greater than half of which things are filtered. PROCEDURE SHEET MEMBRANE TRANSPORT LAB SOME TIPS FOR THE FOLLOWING EXPERIMENTS: 1. First set the experiment 2 and get it - it takes the longest and is the most difficult. 2. Split the work among your lab group members – at least 2 people would be working on an experiment of 2.3. Experiment 3 can be set and done last - it only takes about 15 minutes. 4. Be sure to read all the instructions before starting any of the experiments! Experiment 1: Osmotic changes in red blood cell water movement across a semi-permeable membrane is given a special name for osmosis. Water movement through the cell membrane is extremely important for all cells in the body, as it can affect cell volume, cell shape and ultimately cell survival. In this experiment you will change the speed and direction of water movement with osmosis using various extracellular solutions. You will notice how these osmotic changes affect the volume and shape of cells. These solutions can be described using terms describing the dissolved concentration of the solution relative to the dissolved concentration in the erythrocytes: Hypertonic: it has a higher dissolved concentration than the cell. The water will dissipation from the cell and into the solution, causing the cell to shrink (crenation). Hypotonic: It has a lower dissolved concentration than in the cell. The water will dissipate from the solution and into the cell, causing the cells to swell and possibly burst (lysis) Isonic: It has the same dissolved concentration as the cell. There will be no net movement of water, and the cell will neither shrink nor swell. Remember that these terms are relative - the solution with a 10% dissolved concentration will be hypertonic to one with a 5% dissolved concentration. However, 10% solution is hypotonic on the solution with 15% dissolved concentration. MATERIALS: assembled microscope 1-2 microscope slides and lid layers 3 solutions: 0,9 % NaCl, distilled water, 10 % NaCl solution dilute rat blood 1. Put a drop of diluted rat blood on a slide, add one drop of isethonic salt, and drop the cap to slip on the slider. Observe RBC using the high dry target (43-45X). Create a drawing or type a cell size and description of the shape in the space that you see on the next page. 2. Place the drop of 10% NaCl on one side of the lid slip and spread it through (place the Kimwipe piece on the slipping edge of the second cover to draw the solution under the cover. Wait a few minutes, then observe the size and shape of the cells. Note any differences on the next page. 3. Place a drop of distilled water on one side of the lid to slip and wick it through. After a few minutes, note the size and shape of the cells. 4. Alternative method: Follow step 1; Then, get a fresh slide and 2 more cover slips. Put a drop of rat blood at one end of the slide, and add a drop of 10% NaCl to the blood, and put on the lid to slip. P the other end of the slide, place another drop of rat blood, add a drop of distilled water, and cover the slip. Compare the cell size and shape at each end of the slide under the microscope using a high dry target (43-45X). 5. For each of the solutions you apply to the red blood cell, describe: 1) What happened to the cell shape and size; 2) Whether the solution you applied was isotonic, hypertonic, or hypotonic to the cells; 3) The net direction of water movement (on the cells, from the cells, there is no net movement). 10 % NaCl solution: distilled water: 0,9 % NaCl: Experiment No 2: Osmosis rate In Experiment No 1 you looked at the effect of water movement on cell size and shape. In this experiment, you will examine the effect of the concentration gradient on the rate of water movement through the semi-transparent membrane (dialysis tubes). You will compare the osmosis rate of 3 different combinations of solutions: Bag Setup BAG INSIDE BAG BEAKER 1 tap water 20% sucrose 2 1% sucrose tap water 3 10% sucrose tap water MATERIALS: dialysis bags for soaking water 3 beakers, 1 funnel rubber band solutions: 10% sucrose, 20% sucrose, 1% sucrose paper towels; Watch NOTE: Follow the procedure for each dialysis bag until another bag is finished - this experiment requires a sequence of time measurements - do not try to prepare all the dialysis bags at the same time! 1. Remove one dialysis bag from the beakers and tied one end (the instructor will show you how to tied the bags to prevent leaks). Fill the bag with 20 ml of tap water using a funnel. Squeeze air out of the bag, taking care not to massage the fingertips (oil on the tip of the skin may damage the dialysis membrane). Tie the opposite end of the bag. 2. Carefully remove the bag on paper towels, especially knotted ends. Weigh the bag on the scales 3. Put the bag in a labelled 400 ml beaker and fill the beaker with 20% sucrose to cover the bag only - NOTE THE TIME. 4. Fill the second dialysis bag with 1% sucrose, fasten it, remove it, put it in a separate, labelled 400 ml beaker with enough tap water to cover the bag, and take NOTE AGAIN. 5. Fill the third dialysis bag with 10% sucrose, fasten it, sedate it, put it in a separate labeled 400 ml beaker with enough tap water to cover the bag, and note the time again. 6. Weigh each bag every 15 minutes for one hour - carefully remove the bag before each weighing. Also, make sure that the bags remain immersed in liquid - if necessary, weight them with a pen or pencil. 7. You can use the table below to keep track of your weighing times and the weight of dialysis bags. 8. Graph weight change for each bag as a function of time for each experiment (due to the next class period that is part of your Lab Report). EXPERIMENTAL RESULTS Weight at T= 0 Weight at T = 15 min Weight at T = 30 min Weight at T = 45 min Weight at T = 60 min Bag 1 Bag 2 Bag 3 CALCULATIONS 1. rate osmosis = weight at 15 min - weight at 0 min / 15 min You calculate the initial rates of osmosis bags 1, 2 and 3 as part of your lab report, in the next lab session. 2. Based on the formula for the initial osmosis rate, type the formula for the final osmosis rate below: You will calculate the final osmosis values for 1,2 and 3 bags as part of your laboratory report due to the next laboratory session. THOUGHTS QUESTIONS Why do some of the dialysis bags gain weight while other bags lost weight? What caused the difference in the rate of weight change between 3 bags? Do you think there will be a difference in the initial and final rates of osmosis in any of the bags? Why and why not? What molecule moves through the dialysis membrane to cause changes in the weight observed in dialysis bags? Experiment 3: Dialysis The ability of molecules to disperse through a semi-permeable membrane depends on its size and shape. The dialysis process uses the molecule's ability to disperse through a semi-permeable membrane to remove large and small molecules. In this experiment you compare the ability of glucose and starch molecules to cross dialysis tubes into a semi-permeable membrane. The dialysis tubes we use allow the passage of molecules of less than 14,000 daltons. While you are doing this experiment keep in mind that glucose is a monomer (one sugar molecule) and starch is a polymer consisting of several sugar molecules that are linked together. MATERIALS: 1 piece of dialysis tube, soaking in a water beaker in tubes 4 tube holder colored tape and labeling pen iodine solution and Benedict solution starch (10%) and glucose (5%) solution rubber band 1. Tie one end of the dialysis tube with rubber bands, as you did in Experiment 2. Using the funnel, fill the bag with ~20 ml of starch/glucose solution. Make sure that all the air is out of the bag, and sob at the other end with a twine. 3. Immerse the bag in the tap water beaker and make sure the bag remains below the surface of the water. 4. Let the bag sit in a water beaker for 15 minutes. 5. Label 4 tubes: IN - STARCH OUT - STARCH IN - GLUCOSE OUT - glucose 6. At the end of 15 minutes, cut one end off the dialysis bag and pour a few ml (no matter how accurately) into the IN tubes. Pour a few ml of beakers water out into the tubes. 7. Add 10 drops of iodine solution to the pipes named: IN - starch & OUT - starch Dark blue color indicates the presence of starch. Type the results in the following table. 8. Add 10 drops of Benedict solution to the pipes named: IN - glucose and OUT - glucose Put in the tubes containing Benedict's solution in a boiling water bath (on the side bench) for 1-2 minutes. The blue color will change to green, orange or yellow in the presence of glucose. Type the results in the following table. DOMU QUESTIONS Based on what you know about the relative size of glucose and starch molecules, be able to predict which molecule(s) will dissipt from the bag and which molecule(s) will remain in the bag. EXPERIMENTAL RESULTS Test Tube Presence of starch * Presence of glucose * IN - starch ---------- OUT - starch ---------- IN - glucose ---------- OUT - glucose ---------- * indicates that there are no molecules with - and molecules with + +