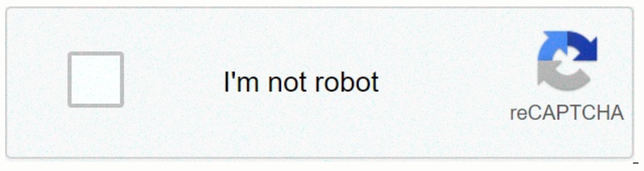

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Diffusion and osmosis lab answers ap bio

Comment: Water just slides through the membrane with other small polar molecules like ethanol and urea. Larger or loaded water-soluble substances will require a protein carrier. Fatty acyl residues do not repel water, but they do not attract water either. It is true that being polar, water is more attracted to other water molecules on the same side of the membrane than by the hydrocarbon chains that are in the caldera. When the water molecules are buzzing around, some of them just slip through. Protein pores and carriers are not involved and, in fact, water diffuses through an artificial lipid bilayer, which does not even have protein. It will not spread as quickly as if the lipid bilayer were not there, but it will spread quite easily. Now you mention water-soluble substances, which would refer to polar and charged molecules. Some water-soluble substances require protein channels or even transporters (called pumps if they require metabolic energy). Larger polar molecules have a harder time passing through and charged molecules have even more difficulty passing, even if they are small (i.e. ions). The reason why ions having trouble getting through has to do with the fact that they become hydrated (surrounded by water molecules whose charged ends opposite link to the charged ion). So you can't look at the ion by itself (which may seem small), but the whole hydration sphere that is likely to be large. Ions generally need membrane proteins to pass through, as do larger polar molecules. —Bob Goodman, Hunter College High School, New York City. 11/3/99 Equipment and supply modifications Tip: For dialysis tubes, I used the cheapest plastic sandwich bags. They work pretty well. - Jo Ann Burman, Andress High School, El Paso, Texas. 9/9/99 Tips: Two tips I would like to pass on. I'm a (pretty) new teacher and these last two discoveries have made things a little easier. First of all, I buy spray starch, as you would use for ironing. Gone are the days of heating the starch to dissolve it. Just keep spraying the starch in a bottle of water until you think there is enough. I never measure and it works very well! Second, for a Quickie Benedict test result, stick it in the microwave for about two to five seconds; again the results are great. Much better than test strips. I hope I shaved at least 10 minutes of your lab preparation time. Every minute counts! — Sara Sagmeister, Park Ridge, Illinois. 10/6/99 Advice: Try purple onion for the lab — it works — make sure they have pigmented cells. The differences with dH20 and salt solution are great. If you don't want to mix the salt solution and have a saltwater aquarium, just get a small beaker of water from the tank. It's going well. - Bobbie Hinson, Providence Day School, Charlotte, North Carolina. 14/10/99 Tip: I use a plant called A discolored Rhoeo instead of onion to do the last part of the lab. Its leaves are purple on the underside and purple purple the layer moves easily away from the rest of the sheet. It is very easy to grow (seems to thrive on skillful neglect!) in a pot on a window sill. It should be available in a garden centre. It is a very common plant, used for ground cover around North Texas, I wish I could tell you the common name; it reminds me of the wandering Jews, but with larger, less hairy leaves. - Marcia Sloan, Cleburne High School, Cleburne, Texas. 15/10/99 Question: I went to the pharmacy yesterday to buy glucose test strips, and there were a lot of possibilities. I didn't find any of the marks listed in the Teacher's Guide. Does the brand matter? Do you buy urine glucose test strips, or blood glucose test strips? They're very expensive, and I didn't want to buy the wrong kind. Answer 1: Ask your pharmacist to save out-of-date urine test strips for you. Often they will give you a price break if you tell them you are a teacher, and if the test strips have expired. Franklin M. Bell, St. Mary's Hall, San Antonio, Texas. 11/3/99 Answer 2: I always get my glucose test strips from Frey Scientific. They work very well for dialysis tests and do not show a false positive in the presence of iodine. I also use them to simulate urine tests and get much better results than pharmaceutical dipsticks. - Joni Driscoll, NW Cabarrus High, Concord, North Carolina. 10/10/99 Advice: Take a note for next year: use Benedict's solution instead of test strips to test the presence of sugars outside the bag. Just add some of the liquid to the beaker to a test tube that has an equal amount of Benedict. Mix and heat gently in a bath of water for 5 to 10 minutes. You should get a positive test: Benedict blue will become rusty (orange/red) if glucose is present. I did the lab last week and I got great results using Benedict's. — Carmen Austin, Wharton High School, Tampa, Florida. 10/5/99 Changes to the pre-laboratory preparation procedure Question: Is there an alternative to the emerald ash borer method for obtaining potato samples? Answer 1: Instead of using a cork driller to make potato cylinders, try using a French fry cutter to make many uniform pieces of raw potato at once. One of my students thought about it! — Marcia Fischer, Desert Mountain High School, Scottsdale, Arizona. 24/10/00 Answer 2: ... If you don't have a French deep fryer, you can simply slice them yourself. I gave up on the emerald ash borer years ago, and just take a good kitchen knife and potatoes in sticks roughly uniform to the approximate size required. It works, and I consider it to be one of the most reliable laboratories. It also reinforces my conclusion (which I always tell the kids) that learning to cook is an excellent training for the lab — a lot of more skills transfers! Leslie Haines, Walter Williams High School, Burlington, North Carolina. 28/10/00 Answer 3: I found it very difficult to make this laboratory as it is written. I use thin slices of potato instead of cores, and try to end up with about about g. potato. Once I started doing it that way, it works like a charm. I think it's for two reasons: (1) You have a much larger mass of potatoes and therefore you have a much lower percentage of errors in the mass; (2) you don't have as many small pieces of potatoes that fall and reduce the mass. - Ed McDaniels, Grandville High School, Grandville, Michigan. 19/10/00 Advice: I used a French mandolin to slice potato sticks for the 1C laboratory and I got excellent results (R squared - 0.996). For one of my teams, I used the waffle cut technique and produced waffle shavings, which I then hit with a small dish to produce uniformly sized waffle discs. The result was that the discs in the hypotonic solutions expanded and the discs in the hypertonic solutions contracted in an exaggerated way only to be confirmed by the data. It seems that the increase in the surface was responsible. - Harry Padden, Washington Twp High School, Sewell, New Jersey. 11/17/00 Trouble Shooting and Cleanup Tip: While running the osmosis/broadcast lab today, my students made an interesting discovery. The iodine solution reacted with glucose test strips (Carolina Biological Osmosis Laboratory Replacement Kit) and turned a color indicating a positive glucose reaction. The students wanted to know how they could determine if the glucose released out of the dialysis bag since the iodine in the beaker solution already tested positive. Similarly, at the end of the experiment, when iodine had spread into the dialysis sac, they wanted to know how they could detect that the glucose was gone (as indicated by a attenuated color reaction with the glucose test strips). We ended up running an iodine-free dialysis bag so that we could detect glucose on its own, but if you follow the lab as it says, you might need to look at this problem. Jeff Smith, Indiana Academy, Muncie, Indiana. 10/5/99 Laboratory driving with sensors and computers/calculators Question: Does anyone have a simpler or modified osmosis laboratory procedure? One that can be done in a single day? Answer 1: Use a large cork borer and a large (long) potato. Using a twisting motion, insert the black from the cork to the potato lengthwise. Since you have to do this to several potatoes, the idea is to use the emerald ash borer of the same size on each potato. You don't have to go all the way (or even close to the wrong way) the potato. If you remove the emerald ash borer, the cylindrical lump potato will remain attached to the potato. However, if you place a scalpel at the back of the emerald ash borer and twist the emerald ash borer and scalpel together, the potato cylinder will twist and eventually break. Take out the emerald ash borer and, just like popping a bottle of champagne, the potato cylinder will come out. You now have a hole in the potato, and if you repeat that with several potatoes, you will have UNIFORM sized holes in the potatoes. Rinse each with tap water to get excess starch grains, which have been released from this rough procedure, out of the holes. Lla Lla are now ready. Fill each with a different concentration of sucrose: 0, 0.2, 0.4, 0.6, 0.8 and 1.0. Using #2 cork with an inverted pipette, gently twist the cork into the potato. Don't force it too hard or the potato will tear (and therefore be useless). You should get a tight air connection. I usually put them in a 600 mL beaker and tape the cork down safely. Attach a Vernier gas pressure sensor (CBL or computer) to the pipette and measure the pressure change over a period of 20 to 30 minutes. The slope (change in pressure from the change over time) is a measure of the osmosis rate. By graphing the concentration relative to the slope, you can determine the concentration at which the slope is 0 (i.e. when the watered potential of potato cells is equivalent to the watered potential of the sucrose solution). I haven't tried this without probes, but you can also plug it in with very narrow bore graduated pipettes. The procedure has some hitches that I always try to work on. I can't say it works cleanly all the time, but it doesn't take 24 hours. I have some ideas to clean it up. - Bob Goodman, Hunter College High School, New York. 23/10/00 Alternative Lab Ideas Egg Osmosis Lab Question: I've heard of teachers using eggs to demonstrate osmotic principles. Does anyone have any lab activities or demos dealing with this? Answer 1: I have a wonderful reference to this lab in the Journal of College Science Teaching, November 1985. I think it is a publication of the NSTA? It is called Osmosis and the Wonderful Membrane and deals with the use of decalified eggs to demonstrate osmosis. I have my children shift the eggs in vinegar for 48 hours, and then I give them four unknown solutions (distilled, sucrose .5M, sucrose 1M, and 2M sucrose). They massage their eggs, put solutions on and massage them again every 10 or 15 minutes for 1.5 hours. The lab works very well! It will also work within a 45-minute period if the children return for lunch or later to massage them after class. Then they plot the percentage change in the mass relative to time. They must also calculate the molar of the egg; it usually goes out on .8M. The article I referenced above recommends using glucose solutions, but I found that sucrose works as well and is much cheaper. The article also says that NaCl solutions give strange results, perhaps because of salt ions modifying the membrane somehow. Just make sure you have extra eggs on hand as there is always only one student who ends up with the egg on his hand. I placed dozens of eggs in a gallon of vinegar overnight, and replaced the vinegar the next day. The eggs were ready to go on the third day. - Franklin Bell, St Mary's Hall, San Antonio, Texas. 20/10/99 Answer 2: Another side trip with eggs — once you have finished salt or sugar treatments — is to place them in different types of dye at night: methylene blue dye Rit dye Each has a different diffusion rate (diffuse at different depths in the egg) — boil and slice in half to see the Not recommended to eat, however! - Pam Tidswell, Rancocas Valley Regional High School, Mt. Holly, New Jersey. 19/10/99 Answer 3: For 30 years, I have used the egg lab as a great demonstration or as an individual activity. It leads home the action of our own cells with a familiar animal cell that students can see. Really simplistic directions follow. You add chemistry, pressure, etc. Soak/submerge the egg of a raw hen in white vinegar (the cheapest store variety works best) for 24 to 48 hours to remove the calcium carbonate shell. The shell will be evidence of corrosion immediately with many small bubbles forming around the surface, which leaves time for a good discussion of the basic chemistry and actions of acids and metal compounds. The membrane can be covered with soluble calcium salts at the end of this time, wash gently to remove, which will allow you to see the translucent membrane. At this point, you can realize the need to prepare some relief eggs! Pat dry and mass. You can take other measures such as circumference, volume per water displacement, etc. Place the egg in a known volume of distilled water (150 mL) in a clean 250 mL beaker. Again collect all the data you feel appropriate or ask students to design their own lab (an opportunity for constructivism and 3P). Wait 24 hours—all night. Gently remove the egg; pat dry and gain in mass is water. Compare the volume lost in the beaker. Osmosis by selectively permeable membrane. You can have students break the egg in a petri dish; assess the consistency of white. An alternative laboratory or companion is to take a second egg. Remove the shell and the mass. Place in 100 percent white Karo syrup (liquid fructose). Leave to rest overnight. Remove the egg, wash quickly, dry and massage. Compare the new volume in the beaker and the lost mass. If students are careful, you should notice some overlap due to differences in density. The results here are quite spectacular and can be reversed by placing the egg in distilled water. You and your students can make this lab as involved or simple as you like. It is also a good place to review the structure of the amniotic egg. - Donna M. Gilbertson, Beloit Memorial High School, Beloit Wisconsin. 10/18/99 10/18/99

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