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INVESTIGATING DIFFUSION AND OSMOSIS THROUGH NONLIVING MEMBRANE

Introduction: In this lab we discussed two forms of passive transport across a membrane: Diffusion and Osmosis. Diffusion is the movement of molecules from a region of high concentration to a region of low concentration. This occurs because of a concentration gradient, which simply indicates there is a difference in concentration. The gradient causes molecules to move across the until homeostasis is achieved. Osmosis is the movement of water across a semi-permeable membrane.

Purpose: How does Diffusion and Osmosis occur? In this lab experiment we will test both of these processes with the help of dialysis sacs. While dialysis sacs are not living membranes, they are a valuable tools which shows the movement of molecules through a selectively permeable membrane. To check whether Osmosis and Diffusion occurred we will use dying agents to physically see the results.

Materials:

- Dialysis sacs (four)
- Funnel (small)
- Graduated cylinder (25ml)
- Pencil (wax)
- Twine or Dialysis tubing clamps
- Beakers (four/250ml)
- 40% Glucose solution
- 10% Sodium Chloride solution
- 40% Sucrose solution
- Benedict’s test
- Silver Nitrate
- Laboratory scale
- Test tubes (eight)
- Test tube holder
- Hotplate

Procedure:

1. Number the beakers 1-4, and half fill three of them with distilled water (leave beaker 2 empty).
2. In beaker two add 125ml of 40% glucose solution.
3. Using the funnel to prepare each sac, half fill each with 20ml of the specified liquid (see chart).
4. Remove all the air you can from each sac and tie or clamp each closed.
5. Rinse each bag off and quickly and carefully dry each bag off with a paper towel.
6. Weigh and record the weight of each bag.
7. Proceed to place each bag in their corresponding beaker. Add more solution to beaker if the bag is not completely covered.
8. Wait 1 hour
9. After an hour, boil water on the hotplate.
10. Dry off each sac, weigh and record.
11. Add 5 drops of Benedict’s solution in each of the two test tubes.

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12. Put 4ml of beaker fluid, from beaker 1, into one test tube and 4ml of the sac fluid, from sac 1, into the other.
13. Label each test tube
14. Place test tubes into boiling water for 2 minutes.
15. Cool slowly, and record results.
16. Repeat process with sacs and beakers two, and four.
17. For sac three, repeat step 10.
18. Put 5ml of beaker 3 into a clean test tube and add a drop of silver nitrate.
19. Record results.

Results:

Beaker	**Contents of sac**	**Initial weight**	**Final Weight**	**Weight change**	**Test beaker fluid**	**Test sac fluid**
Beaker 1 Half filled with distilled water	Sac 1 20ml of 40% glucose solution	7.1 g	8.0 g	+ 0.9 g	Positive	Positive
Beaker 2 Half filled with glucose	Sac 2 20ml of 40% glucose solution	6.9 g	6.9 g	No Change	Positive	Positive
Beaker 3 Half filled with distilled water	Sac 3 20 ml of 10% NaCl solution	7.2 g	7.8 g	+ 0.6 g	Positive	Positive
Beaker 4 Half filled with distilled water	Sac 4 20ml of 40% sucrose solution containing red dye	7.1 g	8.0 g	+ 0.9 g	Negative	Positive

Conclusion: The results indicated that diffusion and osmosis occurred in all beakers and sacs except beaker and sac number 2. The weight gain of each sac (except 2) indicates that distilled water has diffused into the sac. In the case of sac 2, there is no change in the weight because the environment inside the sac is the same as outside the sac.
Furthermore, the positive results for the beaker and sac fluids after adding the dying agents physically show that, not only is the dialysis sac selectively permeable, but also diffusion has occurred. Benedict's solution, which is light blue in color, turns yellow to brown in color when exposed to sugars. Silver nitrate, which is brown in color, will produce a milky white precipitate when exposed to salts. The reason for the negative result of beaker 4, is because sucrose is too large a molecule to permeate through the sac.