

Title: Laboratory 2 Molecular Activity and Membrane Transport

Purpose: Materials are moved in and out of cells by mechanisms of passive and active transport. With these experiments it shows how certain materials like properties of diffusion, differential permeability, and osmosis are able to pass through the membrane or be restricted.

Material and Methods

- 2-B measurement of diffusion through a liquid
 1. fill three Petri dishes with 40 ml. of 25C water
 2. Drop one crystal of potassium permanganate into each dish. Record time
 3. Measure, in millimeters, and record the largest diameter of the colored spot after 5 minutes
 4. Repeat steps 1-3 for water at 5C and at 45C
 5. Construct a graph of ranges and means for each temperature

- 2-C measurement of diffusion through agar
 1. Petri dishes have been filled with agar with two holes. Into one hole, place two drops of methylene blue. Into the other hole, place two drops of potassium permanganate. Record the time and immediate diameter of each spot.
 2. Measure the diameter of each spot in millimeters once every minute for fifteen min
 3. Construct a graph of average diffusion diameter versus time for both chemicals
 4. determine the diffusion rate for each chemical. Which has the fastest diffusion rate? [potassium permanganate]
 5. look up the molecular formula and structure of methylene blue and potassium permanganate in Merck Index Molecular formula for methylene blue C₁₆H₁₈CIN₃S molecular weight 319.85
Molecular formula for potassium permanganate KMnO₄ Molecular weight 158.03

- 2-D demonstration of filtration
 1. Fold three filter papers into cones and insert them into three separate glass funnels. Wet the papers to make them stick to the glass.
 2. Prepare three 100-milliliter solutions of charcoal and water. Make one thick, one medium thickness, and one thin. Record the mass of the charcoal used in
 3. Pour 50 ml of each solution, one at a time, into a funnel.
 4. Immediately count the number of drops produced per minute.
 5. Count the number of drops per minute when the funnel is half-filled.
 6. Count the number of drops per minute when the funnel is near
 7. did the charcoal pass into the filtrate? [no] which solution had the fastest rate of filtration? [light]
what is the driving force behind filtration? [amount of charcoal] What other factors influence the rate of filtration? [how the filter paper is folded] do your results illustrate these influencing factors? [yes]

8. repeat these procedures with the remaining 50 ml of solution

- 2- F measurement

1. Attach a dialysis bag filled as much as possible with SUCROSE SOLUTIONS securely to the bottom of 2 open, thin glass tubes. one bag should be filled with a 25% SUCROSE solution and the other filled with 50% SUCROSE solution
2. Insert both bags into separate beakers of distilled water making sure the dialysis bags are fully submerged but not touching the bottom of the beakers, and suspend each by gently applying a ring stand clamp to the glass tubes. Check for solution leaking out of the bags
3. Allow five minutes for the systems to equilibrate. Then, mark the fluid levels of each glass tube with a felt pen. Record the time.
4. Record the fluid level of the glass tubes in millimeters every 10 minutes for 50 minutes.
5. If the fluid level rises to the top of the glass tube sooner than 50 minutes, record the time it took to get there, measure the length in millimeters from the equilibration line to the top of the glass tube. Divide that length by the number of minutes to get your rate in mm/min

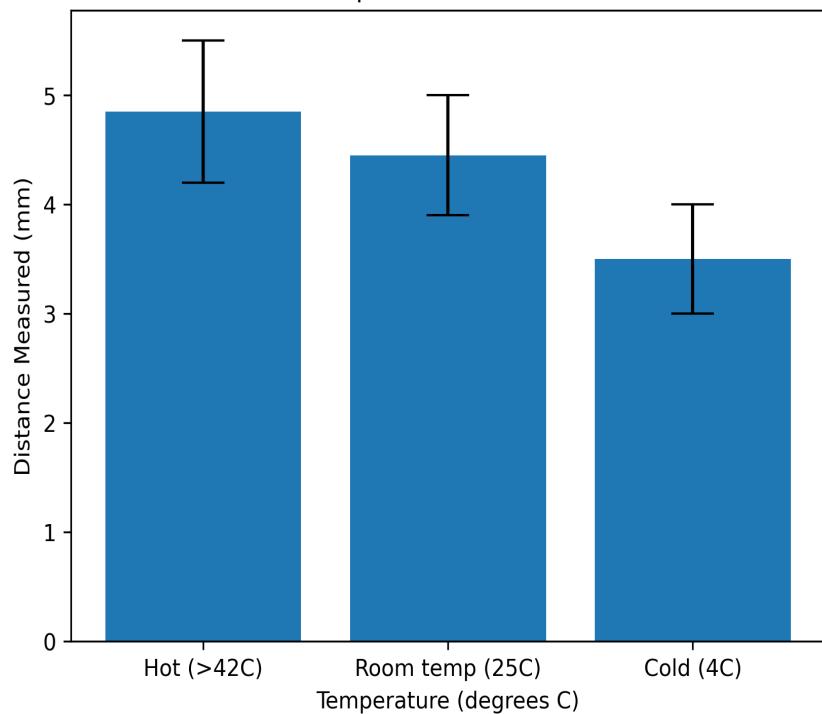
- 2-G measurement of differential permeability of sugar and starch

1. Fill a dialysis bag with a 1% starch –10% glucose solution.
2. Tie the bag to a glass rod and suspend it in a beaker of distilled water.
3. After 15 minutes has passed check the water again for starch and sugar
4. Test the water in the beaker again at 30, 45 and 60 minutes
5. Record the results.

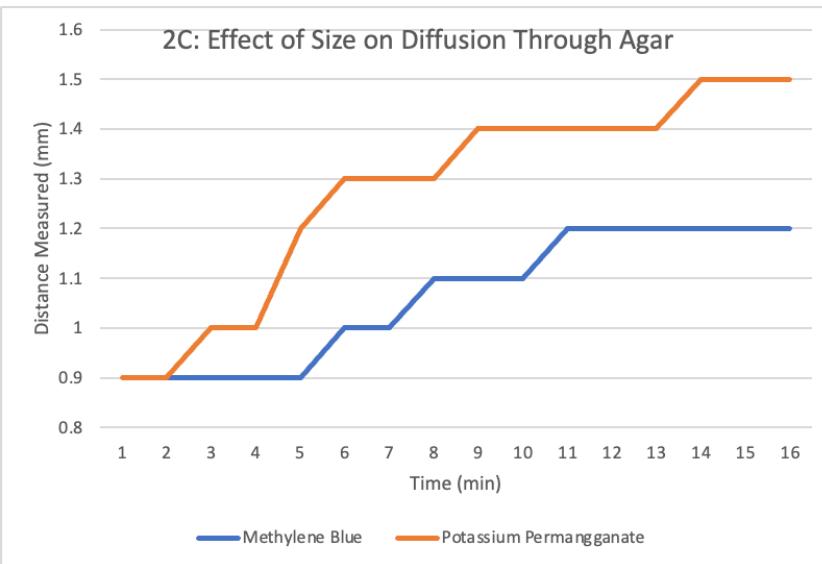
- 2-H the effects of tonicity on red blood cell- demonstration

1. One milliliter of each of the following solutions will be in three separate test tubes. a. Distilled water (hypotonic)b. Physiological saline –0.85% NaCl (isotonic)c. Salt water –2.0% NaCl (hypertonic)
2. A small drop of blood will be added to each tube and the contents thoroughly mixed.
3. A wet mount slide will be made of each solution.
4. Examine each slide under the high-dry lens of a compound microscope.
5. Observe the following:a. Hemolysis of cells in the hypotonic solution. (Note the transparent solution.)b. Maintenance of cell size in the isotonic solution.c. Crenation of cells in the hypertonic solution.
6. Make a drawing of each observation and provide an explanation for each.

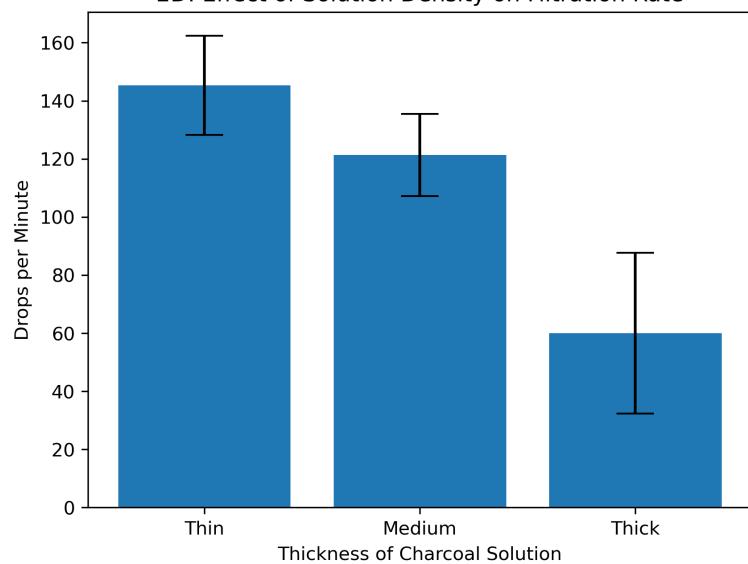
2B: Effect of Temperature on Diffusion of KMnO₄



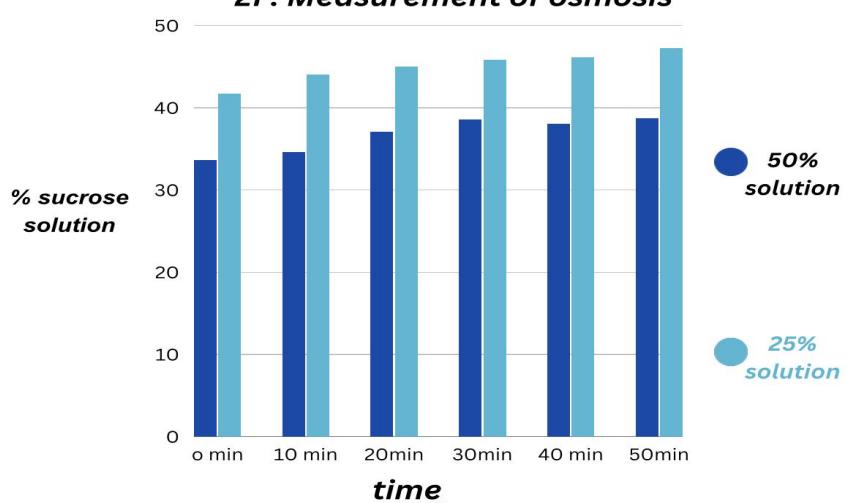
2C: Effect of Size on Diffusion Through Agar



2D: Effect of Solution Density on Filtration Rate



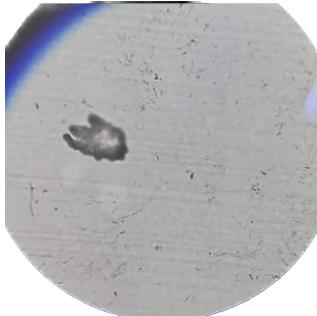
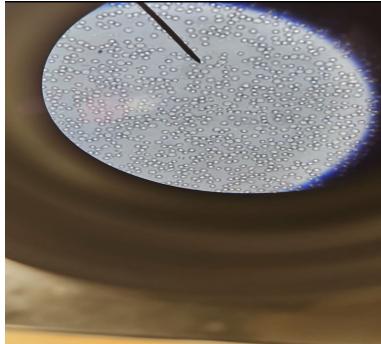
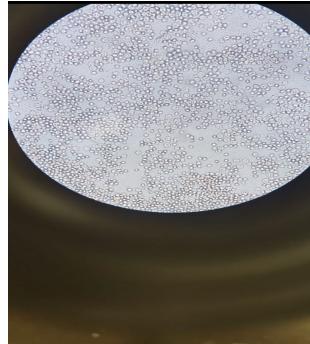
2F: Measurement of osmosis



2 G:: Measurement of differential permeability of sugar and starch

Time	Starch present	Sugar present
15 min	no	no
30 min	no	yes
45 min	no	yes
60 min	no	yes

2H: The Effects of Tonicity on Red Blood Cells

		
a. Distilled water (hypotonic)	b. Physiological saline -0.85% NaCl (isotonic)	C. Salt water -2.0% NaCl (hypertonic)

Discussion: Throughout these experiments I was able to understand the basic properties of passive transport, tonicity on cells, along with the concept of filtration. Some limitations during these experiments was that I wasn't not able to be hands-on for some of these experiments and instead gathered data from others.

Conclusion:

Diffusion is temperature and size dependent.

Filtration is dependent upon solution density.

Osmosis is concentration dependent.

sugar is more permeable than starch.

RBC in hypertonic solution shrunk , RBC in isotonic solution slightly swell , and RBC in hypotonic solution swell.