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Lab 2: Molecular activity and membrane transport
08/30/23

Purpose: The purpose for this experiment was to investigate the basic properties of passive transport, active transport, diffusion, and osmosis. We also learned how cell membranes can act like a filter barrier when it comes to separating cells. We got to learn the effects of tonicity on cells.

Procedures:

2-B) Measurement of diffusion through a liquid

1. Filled 3 PETRI DISHES with 40 ml of 25-degree Celsius water.
2. Dropped 1 crystal of potassium permanganate into each dish. Recorded time.
3. Measured in ml and recorded the largest diameter of the colored spot after 5 minutes.
4. Repeated steps 1-3 for water at 5 degrees Celsius and 45 degrees Celsius
5. Constructed a graph of ranges and means for each temperature.

2-C) Measurement of diffusion through agar

1. Petri dishes have been filled with agar. Two holes have been made in the agar. Into one hole, we placed two drops of methylene blue. Into the other hole, we placed two drops of potassium permanganate. Recorded the time and immediate diameter of each spot.
2. Measured the diameter of each spot in millimeters once every minute for fifteen minutes. Calculated the averages from the data collected by all groups doing this exercise.
3. Constructed a graph of average diffusion diameter versus time for both chemicals.
4. Determined the diffusion rate of each chemical. Which has the fastest diffusion rate, methylene blue or potassium permanganate? Recorded these results (Potassium permanganate).
5. Looked up the molecular formula and structure of methylene blue and potassium permanganate in a Merck Index. Made note of this information.

2-D) Demonstration of filtration

1. Folded 3 filter papers into cones and inserted them into 3 separate glass funnels. Wet the papers to make them stick to the glass.
2. Prepared 3 100-ml solutions of charcoal and water. Made one thick, one, medium thickness, and one thin. record mass of charcoal used in each preparation.
3. Poured 50 ml of each solution, one at a time, into a funnel.
4. Immediately counted the number of drops produced per minute.
5. Counted the number of drops per minute when the funnel was half-filled.
6. Counted the number of drops per minute when the funnel was nearly empty.
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 is the filter paper folded) Do your results illustrate these influencing factors? (yes)

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

2-F) Measurement of osmosis

1. Attached dialysis bags filled as much as possible with sucrose solutions securely to the bottom of two open, thin glass tubes. One bag should be filled with a 25% sucrose solution and the other should be filled with a 50% sucrose solution.
2. Inserted both bags into separate beakers of distilled water making sure the dialysis bags were fully submersed but not touching the bottom of the beakers and suspended each by gently applying a ring stand clamp to the glass tubes. Check for solution leaking out of the bags.
3. Allowed five minutes for the systems to equilibrate. Then, marked the fluid levels of each glass tube with a felt pen. Recorded the time.
4. Recorded the fluid level of the glass tubes in millimeters every 10 minutes for 50 minutes.
5. If the fluid level rose to the top of the glass tube sooner than 50 minutes, recorded the time it took to get there, measured the length in millimeters from the equilibration line to the top of glass tube. Divided that length by the number of minutes to get your rate in mm/min.
6. Determined the rate of osmosis for each system. Which system had the fastest osmotic rate, the 25% or 50% sucrose solution?

2-G) Measurement of differential permeability of sugar

1. Filled a dialysis bag with a 1% starch - 10% glucose solution.
2. Tied the bag to a glass rod and suspended it in a beaker of distilled water.
3. After 15 minutes checked water for starch and sugar
4. Tested the water in the beaker again at 30, 45 and ,60 minutes.
5. Recorded results.

2-H) The effects of tonicity on red blood cells

1. One ml of each of the following solutions were in 3 test tubes a. distilled water (hypotonic) b. physiological saline- .85% NaCl (isotonic) c. salt water- 2.0% NaCl (hypertonic).
2. A small drop of BLOOD was added to each tube and the contents thoroughly mixed.
3. A wet mount slide will be made of each solution.
4. Examined each slide under the high-dry lens of a compound microscope.
5. Observed:

   A. hemolysis of cells in the hypotonic solution

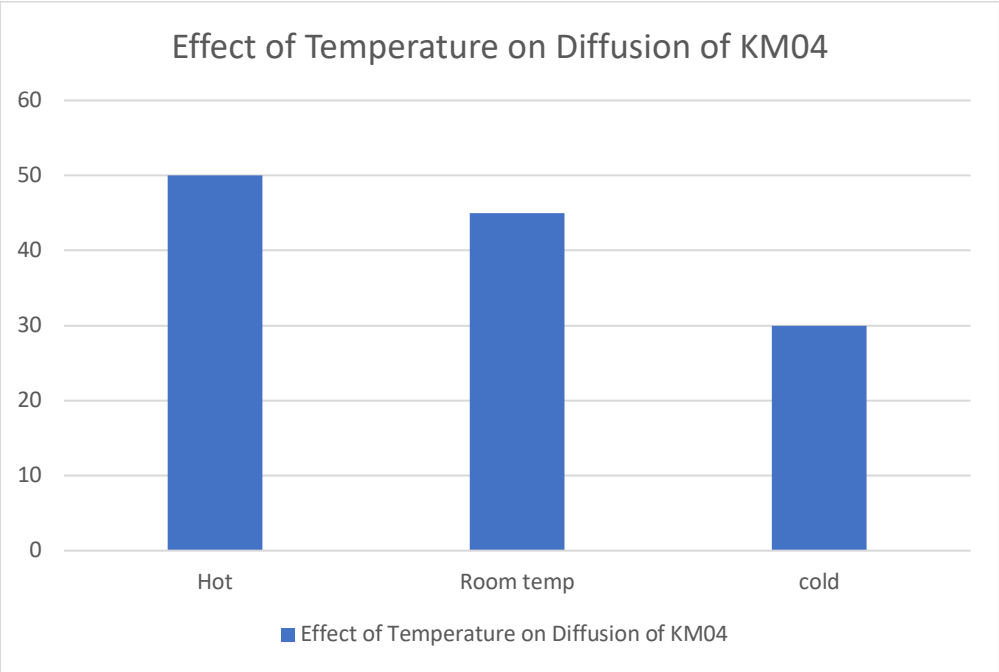
   B. maintenance of cell size in the isotonic solution

C. crenation of cells in the hypertonic solution

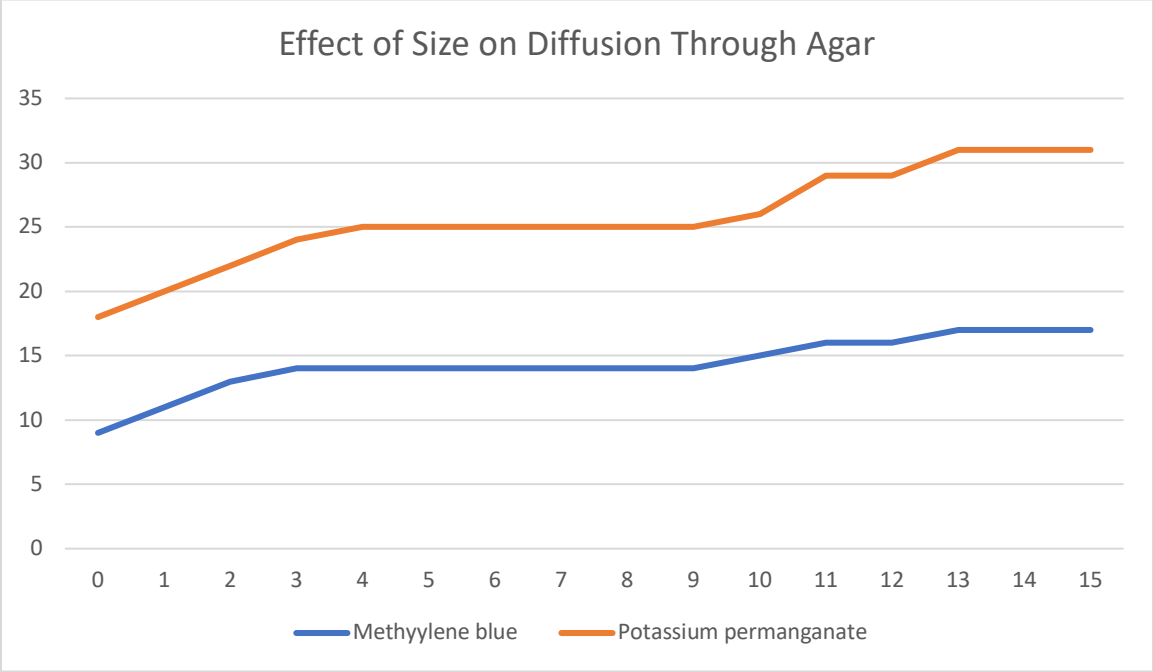
6. Made a drawing of each observation and provided an explanation for each.

Results:

2B-



2C-



2D-

	Thin	Med	Thick
1. 15 seconds	28 drops	25 drops	3 drops
2. 60 seconds	112 drops	100 drops	12 drops
3. Half filled	79 drops/ min	101 drops/ min	69 drops/ min
4. Nearly empty	55 drops/ min	37 drops/ min	34 drops/ min

2F-

Minutes	50% sucrose (red)	25% sucrose (blue)
0 min	1.40 g (empty bag)	1.40 (empty bag)
10 min	54.59 g	48.95 g
20 min	57.31 g	51.26 g
30 min	59.57	52.55 g
40 min	61.76	53. 75 g
50 min	62.81	54.52 g

2G-

15 min	30 min	45 min	60 min
Starch = N/A	Starch = N/A	Starch = N/A	Starch = N/A
Sugar =N/A	Sugar = N/A	Sugar = Green/blue	Sugar = Green
		-Slight sugar in water	-Little sugar in water

Discussion: Lab 2 was somewhat hard since I haven't really worked with doing experiments for a while. Me and partner had a little trouble starting at first, but once we got the hang of it we were able to complete the experiments. We took turns recording the evidence and taking the weight to make sure we had equally involved parts.

Conclusion: In conclusion, this being our second lab we didn't finish right on time, but we did ask a lot of questions to our peers and teacher. This lab involved a lot of observing so throughout our lab we worked on getting everything typed online. We were resourceful with our time while waiting. Overall it was an interesting experiment.