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Thursday Lab

September 1, 2023

LABORATORY 2 – MOLECULAR ACTIVITY AND MEMBRANE TRANSPORT

Purpose: These experiments demonstrate the transportation of various materials through various membranes, which includes the features of diffusion, osmosis, and differential permeability. Materials are carried into and out of cells via mechanisms of passive and active transport.

Procedure:

2-B measurement of diffusion through a liquid

- fill 3 PETRI DISHES with 40 ml of 25-degree Celsius WATER
- drop 1 CRYSTAL of POTASSIUM PERMANGANATE into each dish. record time
- measure in ml and record the largest diameter of the colored spot after 5 minutes
- repeat steps 1-3 for water at 5 degrees Celsius and 45 degrees Celsius
- construct a graph of ranges and means for each temperature

2-C measurement of diffusion through agar

- PETRI DISHES have been filled with AGAR with 2 holes in them. in one hole place 2 drops of METHYLENE BLUE. in the other hole place 2 drops POTASSIUM PERMANGANATE. record time and immediate diameter of each spot
- measure the diameter of each spot in ml once every minute for 15 minutes
- construct a graph of average diffusion diameter versus time for both chemicals

- determine the diffusion rate for each chemical. Which has the fastest diffusion rate? [potassium permanganate]
- look up the molecular formula and structure of methylene blue and potassium permanganate in Merck Index Molecular formula for methylene blue C16H18ClN3S molecular weight 319.85 Molecular formula for potassium permanganate KMnO4 Molecular weight 158.03

2-D demonstration of filtration

- fold 3 FILTER PAPERS into cones and insert them into 3 separate GLASS FUNNELS. wet the papers to make them stick to the glass
- prepare 3 100-ml solutions of CHARCOAL and WATER. make one thick, one, medium thickness, and one thin. record mass of charcoal used in each preparation
- pour 50 ml of each solution, one at a time, into a funnel
- immediately count the number of drops produced per minute
- count the number of drops per minute when the funnel is half-filled
- count the number of drops per minute when the funnel is nearly empty
- 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]
- repeat these procedures with the remaining 50 ml of solution

2-F measurement of osmosis

- attach DIAYLSIS BAGS 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

- 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
- allow 5 minutes for the systems to equilibrium then mark the fluid levels of each glass tube with a felt pen. record the time
- record the fluid level of the glass tubes in ml every 10 minutes for 50 minutes
- if the fluid level rises to the top of the glass tube sooner than 50 mins, record the time it took to get there, measure the length in ml 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
- determine the rate of osmosis for each system. Which system had the fastest osmotic rate, the 25% or the 50% sucrose solution? []

2-G measurement of differential permeability of sugar and starch

- fill a DIAYLSIS BAG w/ a 1% starch - 10% glucose solution
- tie the bag to a glass rod and suspend it in a beaker of DISTILLED WATER
- after 15 check waters for starch and sugar
- test the water in the beaker again at 30,45,60 mins
- record results

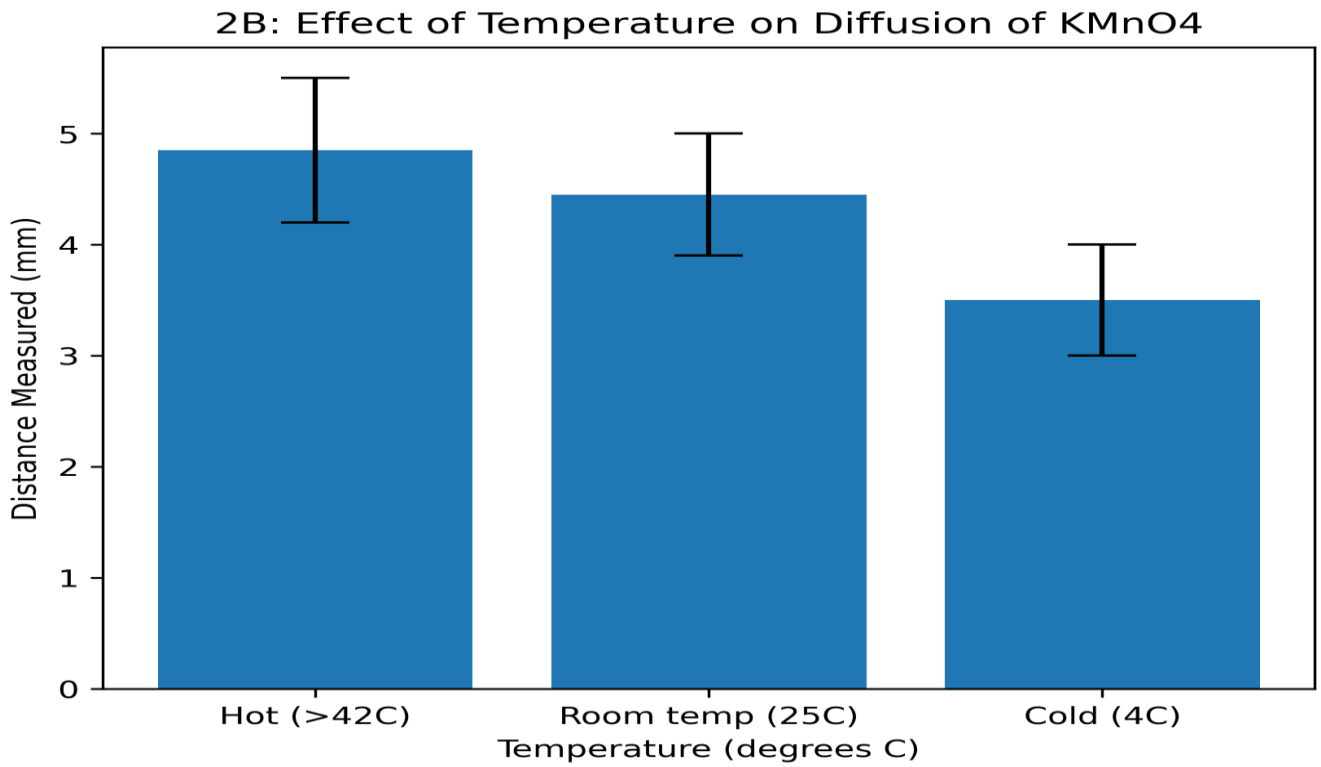
2-H the effects of tonicity on red blood cell- demonstration

- one ml of each of the following solutions will be in 3 test tubes a. distilled water (hypotonic) b. physiological saline- .85% NaCl (isotonic) c. salt water- 2.0% NaCl (hypertonic)
- a small drop of BLOOD will be added to each tube and the contents thoroughly mixed
- a wet mount slide will be made of each solution

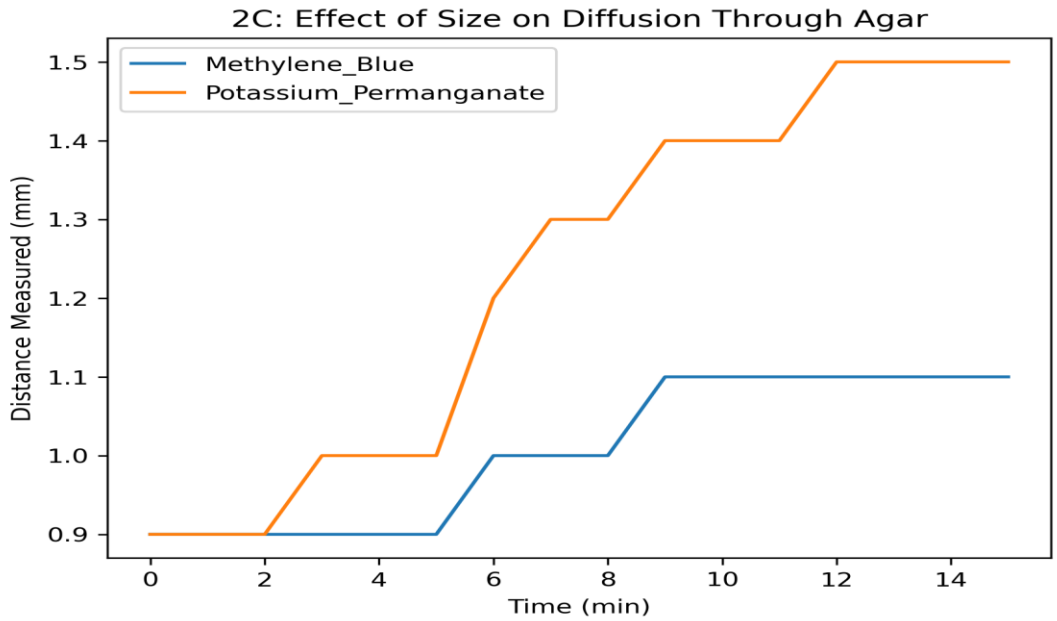
- examine each slide under the high-dry lens of a COMPOUND MICROSCOPE
- observe a. hemolysis of cells in the hypotonic solution b. maintenance of cell size in the isotonic solution c. crenation of cells in the hypertonic solution
- make a drawing of each observation and provide an explanation for each

Results

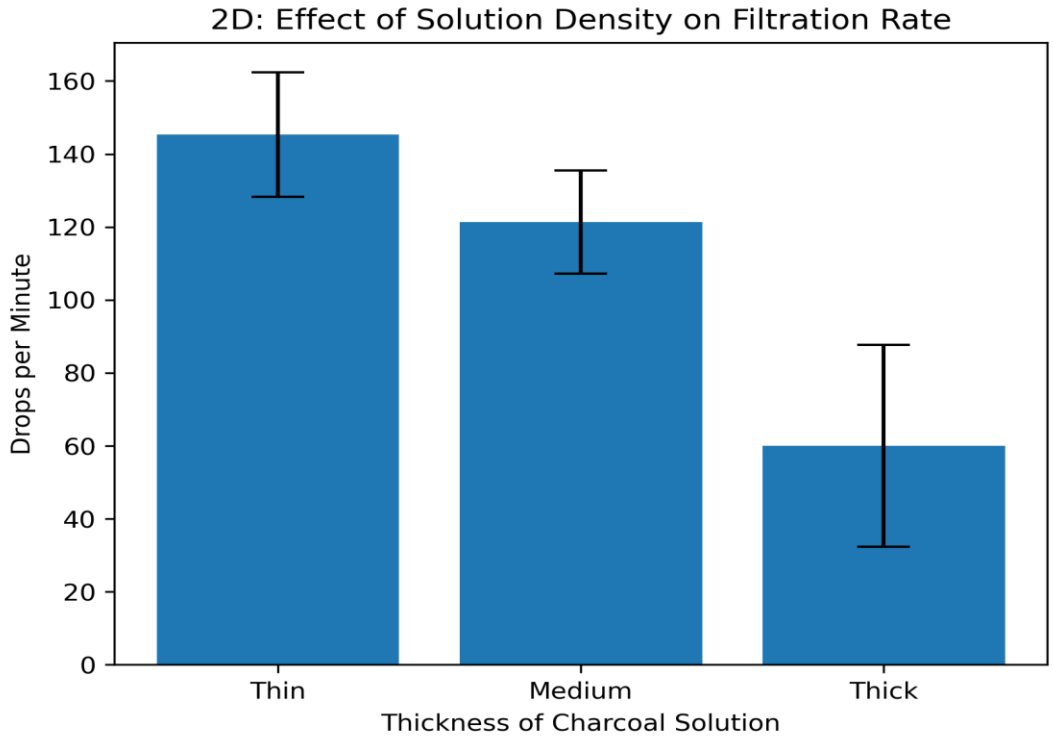
2B



2C


2C: Effect of Size on Diffusion Through Agar
Methylene_Blue
Potassium_Permanganate
Distance Measured (mm)
1.5
1.4
1.3
1.2
1.1
1.0
0.9
0
2
4
6
8
10
12
14
Time (min)

2D


2D: Effect of Solution Density on Filtration Rate
Drops per Minute
160
140
120
100
80
60
40
20
0
Thin
Medium
Thick
Thickness of Charcoal Solution

2F

25% Sucrose (Red)	1) 23.47 g
2) 23.55 g	3) 25.33 g
4) 25.74 g	5) 26.85 g

50% Sucrose, because higher concentration

2G

Test for starch:

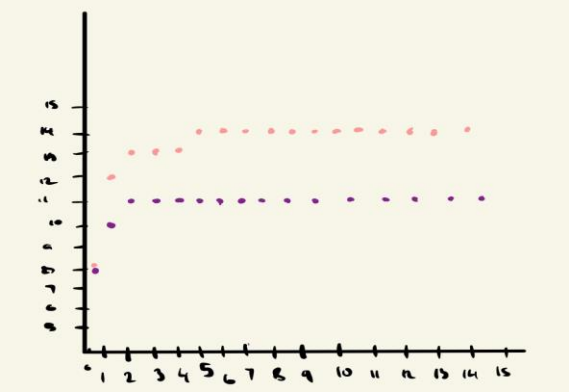
The change of color depended on the dialysis bag, and it resulted in a reddish color. Which indicated no signs of starch.

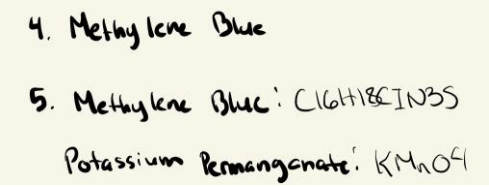
Test for sugar:

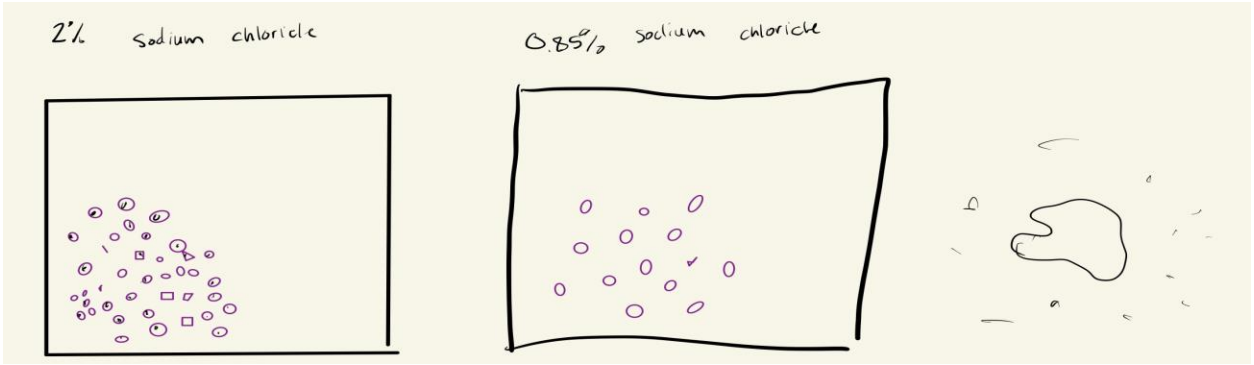
The change of color depended on the dialysis bag, and it resulted in a blue color. Which indicated no signs of sugar.

After sitting in distilled water for 60 mins, we determined that sugar was moderately present as it turned into a yellow color. As regards the permeability of the dialysis bag. We can conclude that sugar was present and mixed in with the distilled water.

2H






2% sodium chloride
0.85% sodium chloride