Laboratory 2- Molecular Activity and Membrane Transport

Purpose:

- to understand the mechanism of Brownian motion
- understand the difference between passive and active transport
- Define: diffusion, osmosis, active transport, dialysis, and filtration
- Also, knowing the result of dropping red blood cells in hypertonic, isotonic, and hypotonic solutions.
- Understand the significance of all these experiments in terms of passive transport processes and molecular activity.

Procedure:

- 2-B Measurment of diffusion through a liquid

-three perti dishes drop one crystal in each dish - record the drop potassium permanganate in millimeters and the largest diameter after 5 minutes.
- rest 1-3 steps

- 2-C measurements of diffusion through agar
- Fill Petri dish with agar. Place a drop in one hole of methylene blue and the other two with potassium Permanganate. Record time and immediate diameter of each spot.
- Measure the spot in millimeters once every fifteen minutes.
- 2-D: Demonstration of filtration

-Fold three filter papers into cones and insert them into three separate glass funnels.
- Prepare three 100-milliliter solutions of charcoal and water. Make one thick, one medium thickness, and one thin. Record the mass of the charcoal. Pour 50 ml (about 1.69 oz) of each solution, one at a time, into a funnel. 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. Repeat these procedures with the remaining 50 ml. of solution.

- 2-F: Measurement of osmosis

-Attach 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. Make sure the ends of the tubes are immersed in the solution. Insert both bags into separate beakers of distilled water making sure the dialysis bags are fully submersed 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 five minutes for the systems to equilibrate. 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 millimeters every 10 minutes for 50 minutes.

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

-Fill a dialysis bag with a 1% starch – 10% glucose solution. Reliable results depend on

your ability to tightly seal the dialysis bag. - Tie the bag to a glass rod and suspend it in a beaker of distilled water. After 15 minutes has passed check the water again for starch and sugar in the following way:

Test for starch:

a. Add 10 drops of Lugol's solution to 5 ml (about 0.17 oz) of water obtained from the beaker.

Reddish color = No starch

Navy blue color = Starch present

Test for sugar:

a. Add 3 ml (about 0.1 oz) of Benedict's solution to 5 ml (about 0.17 oz) of water obtained from the beaker.

Simmer the solution at a low boil for 5 minutes.

Blue color = No sugar

Color change = Sugar present (green = little sugar; yellow = moderate sugar;

orange = more sugar; red = lots of sugar)

- Test the water in the beaker again at 30, 45 and 60 minutes.

- 2-H: The effects of tonicity on red blood cells – Demonstration

- 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)

- 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. A small drop of blood will be added to each tube and the contents thoroughly mixed.
- Examine each slide under the high-dry lens of a compound microscope.

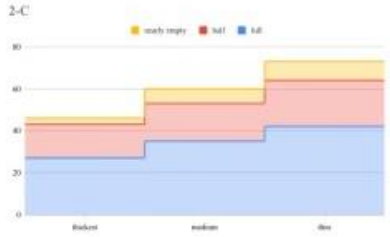
Results-2-b

40 ml cold	3.5mm
40ml hot	4.5mm
temp	3.6mm

2-c

2-D

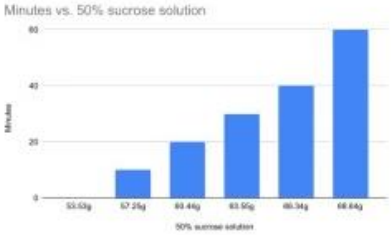
	Full	half	Nearly empty
Thickest	27	16	3
Medium	35	18	7
Thin	42	22	9

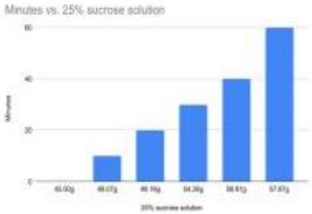


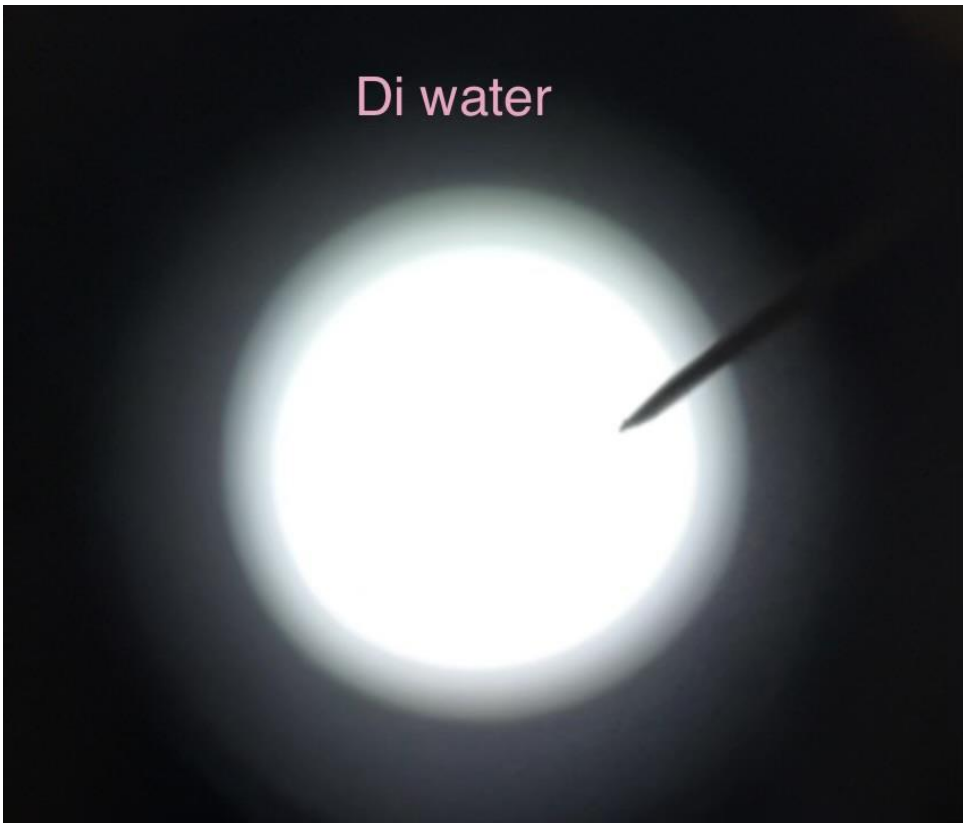
2-F

Min	50 % sucrose solution
0	53.53g
10	57.25g
20	60.44g
30	63.55g
40	66.34g
60	68.64g

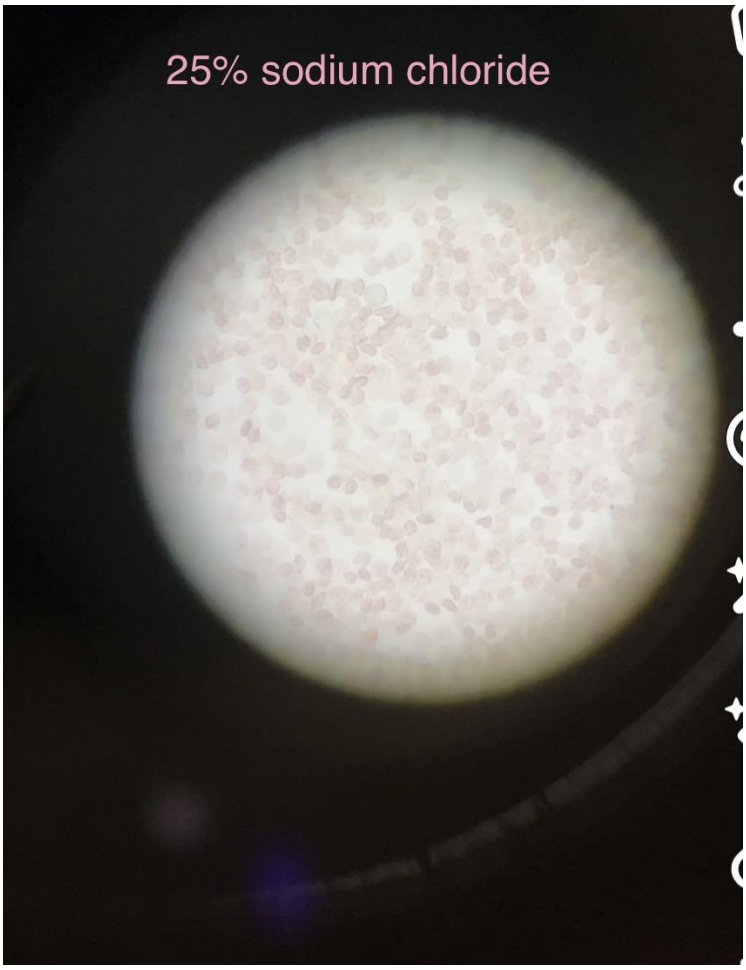
Min	25% sucrose solution
0	45.00g
10	48.07g
20	49.16g
30	54.26g
40	56.81g
60	57.87g






Di water


2% sodium chloride



Discussion: Diffusion can happen in all phases of matter, solid liquid and gas (and especially in plasma). It means molecules or atoms can move from one location to another.In plasma, it's a given. Everything is highly energetic and even the electrons and nuclei are free to do their own thing.In gas, the individual molecules are only weakly attracted to each other and can easily move around in their container.In a liquid, though the molecules are held more strongly together than in gas, the individual molecules can still move around through the solution. That's how your coffee, tea or coolaid gets to be all the same concentration. Diffusion of the solute molecules through the whole of the liquid.

'Conclusion: In 2-b when I added the potassium permanganate in soars water it diffused a lot faster then room temp or cold water. The dye molecules move in agar gel due to diffusion. There is higher concentration where the dye is placed and they will move out to areas with lower concentration. It also depends on the energy of the molecules of the dye and their molecular weight. Since the dye molecules have the energy, they have some movement due to which they move out. If placed in a hypotonic solution, a red blood cell will bloat up and may explode, while in a hypertonic solution, it will shrivel, making the cytoplasm dense and its contents concentrated and may die.