Delanie Duran
Tuesday Lab
08/30/2023

Laboratory 2- Molecular Activity and Membrane Transport

Purpose: The purpose of this laboratory is to investigate the basic properties of passive transport including diffusion, osmosis, and differential permeability. Filtration and the effects of tonicity on cells was also analyzed. All of the different methods being explored have their own system in the way they filter out the bad and good.

Procedure: For 2B, measurement of diffusion through liquid was observed by filling three Petri dishes with 40 mL of 25°C, 5°C, and 45°C water and dropping one crystal of potassium permanganate into each dish and record the largest diameter of the colored spot after 5 minutes. For 2C, measurement of diffusion through agar was observed by filling one of the holes in the agar dish with two drops of methylene blue and the other hole with two drops of potassium permanganate and recording the spots every minute for fifteen minutes. For 2D, this was to demonstrate filtration by using filter paper in a funnel to make a filtration system, while preparing three separate thicknesses of 100-milliliter solutions of charcoal and water. Pour the first 50 mL into the funnel and count how many drops for 15 seconds and times by 4 to obtain drops per minute and repeat this with the other 50 mL for all three trials. For 2F, measurement of osmosis was observed by attaching dialysis bags filled with a sucrose solution securely to two open thin glass tubes. One bag is filled with 25% sucrose and the other is filled with 50% sucrose and then insert both bags into separate beakers of distilled water and allow for five minutes for

systems to equilibrate then record the fluid levels of the glass tubes in millimeters every ten minutes for fifty minutes. For 2G, measurement of differential permeability of sugar and starch was observed by filling a dialysis bag with a 1% starch and 10% glucose solution and suspending it in a beaker of distilled water. After 15 minutes check the water for starch or sugar and then test again at 30, 45 and 60 minutes. For the starch test, 10 drops of Lugol's solution to 5 mL of water (red means no starch, navy blue means starch is present). For the sugar test, 3 mL of Benedict's solution to 5 mL of water and simmer the solution for 5 minutes (blue means no sugar, green=light sugar, yellow=moderate sugar, orange=more sugar and red= a lot of sugar is present). For 2H, the effects of tonicity on red blood cells was observed by adding a small drop of blood to three different wet mount slides, one containing DI water, the other 0.85% sodium chloride and the third one is 2% sodium chloride.

Results:

2B- Measurement of diffusion through a liquid

5°C (cold water)	**25°C (room temp water)**	**45°C (hot water)**
1. 30mm	**1.** 39mm	**1.** 42mm
2. 50mm	**2.** 50mm	**2.** 80mm

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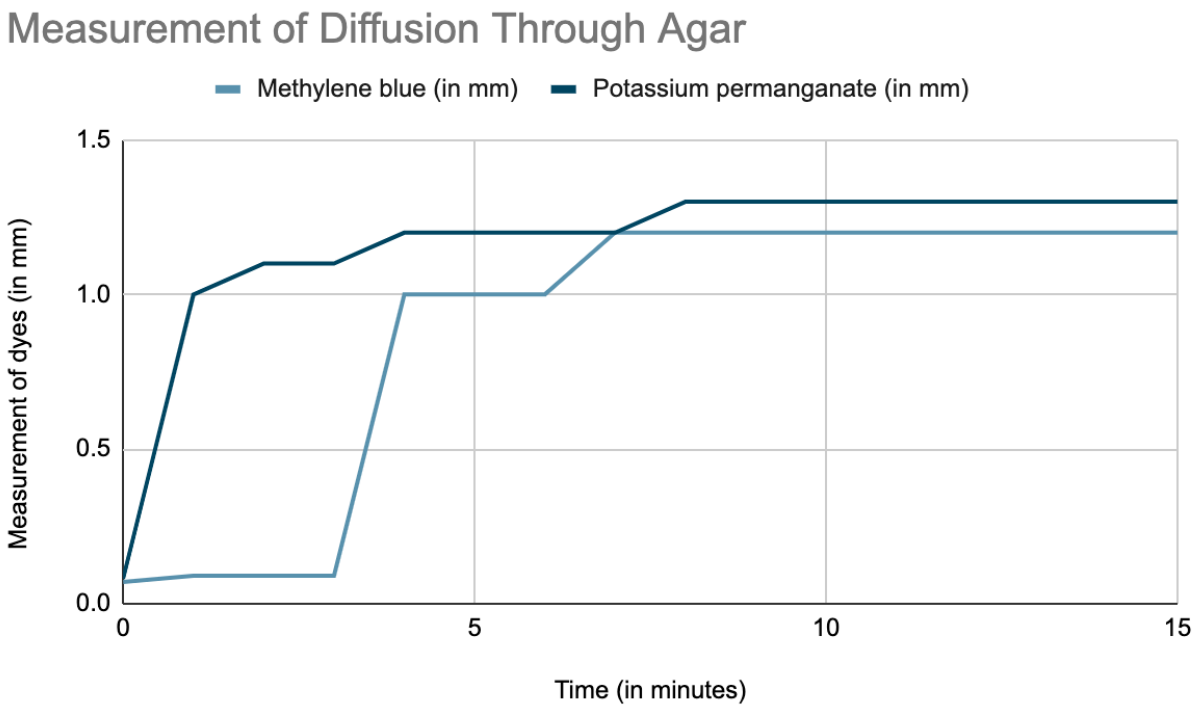
2C-Measurement of diffusion through agar



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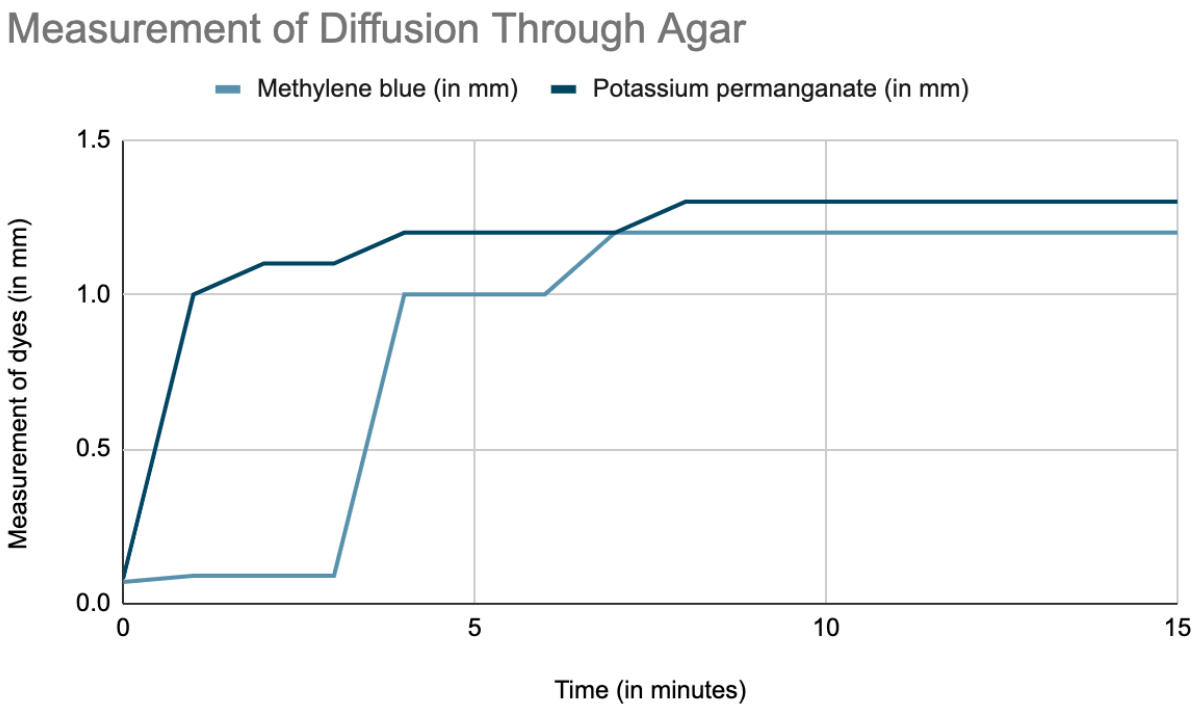
2D- Demonstration of filtration



2F- Measurement of osmosis

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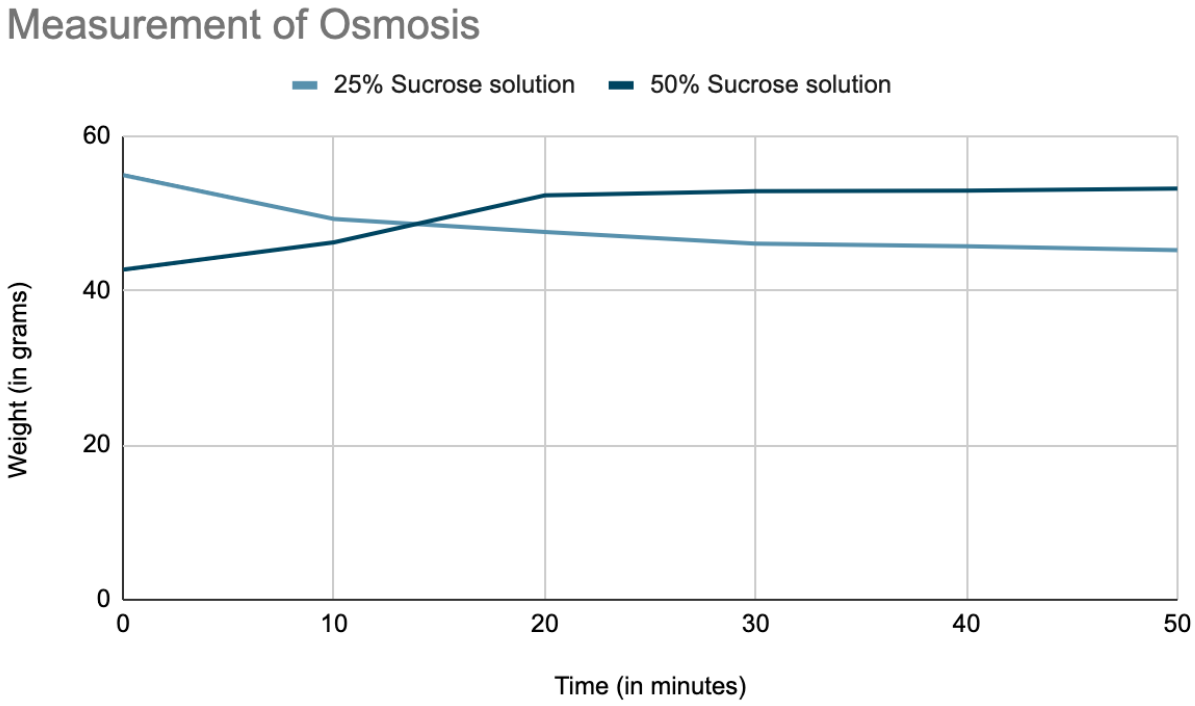

2G- Measurement of differential permeability of sugar and starch

15 minutes	**30 minutes**	**45 minutes**	**60 minutes**
No starch	**No starch**	**No starch**	**No starch**
Little sugar	**Moderate sugar**	**More to a lot of sugar**	**A lot of sugar present**

Discussion: For 2B, most of the measurements were pretty similar besides in hot water (45°C) the diffusion was more measurable going from 42mm to 80mm is a big jump. For 2C, the methylene blue and potassium permanganate roughly stayed around the same distance since the

agar was harder to diffuse through unlike the petri dishes filled with different temperatures of water. For 2D, there were some random or systematic errors that could've been caused due to not exact measurements of the charcoal solution since the thick charcoal solution seemed to filter faster than the medium charcoal solution. The medium solution only had around 24-48 drops per minute while the thick solution had 64-72 drops per minute. The way the water was poured definitely played a role because there could have been parts in the thicker solution where the charcoal powder wasn't evenly mixed, making more water pass through the funnel quicker. For 2F, this was to show the fluid level rises of the two different solutions, one having a more hypotonic (25%) solution and one having a more hypertonic (50%) solution. For 2G, it was shown that even after 60 minutes there was no starch present, but more sugar became present after every four trials of 15 minutes. For 2H, not shown in the graph, but for the hypotonic solution which was the blood sample mixed with distilled water, it showed the blood cell expand and eventually explode which is why humans do not drink distilled water. For the isotonic solution, there was 0.85% of sodium chloride which appeared to be many full pink circles that didn't appear to be exploding nor shrinking. For the hypertonic solution, there was 2.0% of sodium chloride which appeared to be many brownish conjoined cells that seem to be shriveled up.

Conclusion: This lab was to learn about the different mechanisms of how materials are moved in and out of cells using different processes. The basic properties of passive transport including diffusion, osmosis, differential permeability, the concept of filtration and effects of tonicity on cells were explored and discussed. Cell membranes act as selectively permeable structures, allowing some materials through and restricting other materials that are either too large or

doesn’t pass the criteria to pass. Cell membranes have a filter barrier to allow separation from the organelles and important materials in the cell from the external environment.