**Diffusion Phet Simulation** Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Class \_\_\_\_

For this activity you will need to the phet simulation titled “membrane channels”- <https://phet.colorado.edu/en/simulation/legacy/membrane-channels>

For this simulation we will use the area above the membrane to represent inside the cell and the area at the bottom to represent outside of the cell.

Let the blue diamond’s represent water molecules while the green dots will represent a solute, like salt. These are both things that cells need to transport across their membranes.

Green dots:\_\_\_\_\_\_\_\_\_\_\_\_\_

Blue diamonds:\_\_\_\_\_\_\_\_\_\_\_\_\_

**Part One:**

**Add 20 green dots to the inside of the cell and 10 green dots to the outside of the cell.**

1. Where is the concentration of sodium higher?

2. Where is the concentration lower?

**Add in three green leakage channels (evenly spaced)**

3. Make a prediction, how will the green dots move once you start the simulation?

**Run the simulation for 15 seconds and then press pause.**

3. Count the number of green dots inside the cell and outside of the cell

Inside: Outside:

4. Run the sim for 15 more seconds and count again:

Inside: Outside:

5. What was the net movement of dots? (Think about the initial concentrations)

6. Based off of your observations, define diffusion:

**Part Two**

**Clear all of the particle from the simulation by pressing reset and add the following molecules:**

**Inside Cell: Outside Cell:**

**Water Molecules: 5 Water molecules: 20**

**Sodium Molecules: 20 Sodium molecules: 5**

7. You have created a solution containing water and salt. What is the solute and what is the solvent?

8. Comparing the amount of water and salt molecules, which side of the membrane has the most concentrated salt solution?

9. Which side has the most dilute salt concentration?

10. Which side has the highest water concentration?

11. Which side has the lowest water concentration?

**Add two blue gated channels and two green gated channels.**

**Open up the gates and run the simulation. Count the number of water molecules and salt molecules at the following times:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Inside of Cell (top of simulation) | | Outside of cell (bottom of simulation) | |
|  | Solute (green dots) | Water molecules (blue diamonds) | Solute (green dots) | Water molecules (blue diamonds) |
| 0 seconds | 20 | 5 | 5 | 20 |
| 15 Seconds |  |  |  |  |
| 30 Seconds |  |  |  |  |
| 45 Seconds |  |  |  |  |
| 60 Seconds |  |  |  |  |

12. What was the net movement of the green dots? High to low concentration or low to high?

13. Osmosis is a special word that describes the diffusion of water molecules across a membrane. Based off your observations, what was the net movement of water in regards to concentrations of solutions?

14. If you continue to run the simulation you should observe dynamic equilibrium. Based off of the number and movement of the green dots on each side of the membrane come up with a definition for dynamic equilibrium.