Name:
Date:

Objective: Simulating traffic across cell membranes.

Important terminology:

<table>
<thead>
<tr>
<th>membrane</th>
<th>hypertonic</th>
<th>isotonic</th>
<th>channels</th>
</tr>
</thead>
<tbody>
<tr>
<td>diffusion</td>
<td>hypotonic</td>
<td>facilitated diffusion</td>
<td>concentration</td>
</tr>
</tbody>
</table>

Go to the website below and run the simulation. You may just be able to run it . . . you may have to download it first.

http://phet.colorado.edu/en/simulation/membrane-channels

Directions:

1. Click the “Show Concentrations” box on the right.
2. Use the bottom controller to shoot in 30 green circles on the bottom screen. Use the same bottom controller to shoot in 6 blue squares into the bottom screen. If you make a mistake you can click “clear particles” on the right and start over.
3. Use the top controller to shoot in 30 blue squares on the top screen. Use the same top controller to shoot in 6 green circles into the top screen. If you make a mistake you can click “clear particles” on the right and start over.
4. Set the speed to medium-ish.
5. Watch the particles bounce around for a few moments.
Questions:

A. The circles and squares represent particles. These particles are in motion and therefore have (kinetic, potential) energy. Circle one.

B. In which screen is there a greater concentration of green particles? (top or bottom) Circle one.

C. In which screen is there a greater concentration of blue particles? (top or bottom) Circle one.

D. Did you have to compare the two screens in order to answer the last two questions? (Yes or No) Circle one.

E. In the top screen, the green circles are (hypertonic or hypotonic) to the blue squares. Circle one.

F. In the top screen, the blue squares are (hypertonic or hypotonic) to the green circles. Circle one.

G. In the bottom screen, the green circles are (hypertonic or hypotonic) to the blue squares. Circle one.

H. In the bottom screen, the blue squares are (hypertonic or hypotonic) to the green circles. Circle one.

More Directions:

6. Drag two green leakage channels and two blue leakage channels to the membrane. Watch the particles bounce around and move through the channels.

More Questions:

I. Which particles go through the blue channels? ______________

J. Which particles go through the green channels? ______________

K. Initially, to which screen do more green particles move (top or bottom). Circle one.

L. Initially, to which screen do more blue particles move (top or bottom). Circle one.

M. Are the particles moving from (high concentration to low or low concentration to high). Circle one.

N. Eventually, will the concentrations of all particles even out on both screens? (Yes or No) Circle one. If so, what would you call this? (Isotonic, hypertonic, or hypotonic)
O. When concentrations of particles even out do particles stop moving back and forth across the membrane? (Yes or No)

O. When particles move though protein channels in a cell membrane, this is called (active transport, osmosis or facilitated diffusion). Circle one.

P. When water molecules diffuse directly across a cell membrane this is called (facilitated diffusion, active transport, or osmosis). Circle one.

Q. When transporting molecules requires no energy on the part of a cell this is referred to as (active transport or passive transport). Circle one.

S. When transporting molecules requires energy on the part of a cell this is referred to as (active transport or passive transport). Circle one.

More Directions:

7. Clear the screens by clicking “Reset All”.

8. Redo steps 2-5.

9. Add two gated blue channels and two gated green channels to the membrane, but do not open them.

10. Watch the particles move for a few moments.

11. Open the blue channels by clicking “open channels”, but not the green ones.

More Questions:

T. In a short paragraph describe what is happening:

● to the concentrations of the blue particles on the top screen
● to the concentrations of the blue particles on the bottom screen
● to the concentrations of the green particles on the top screen
● to the concentrations of the green particles on the bottom screen
● to the whole system

*Once you know what happens feel free to manipulate the screens how you would like :).