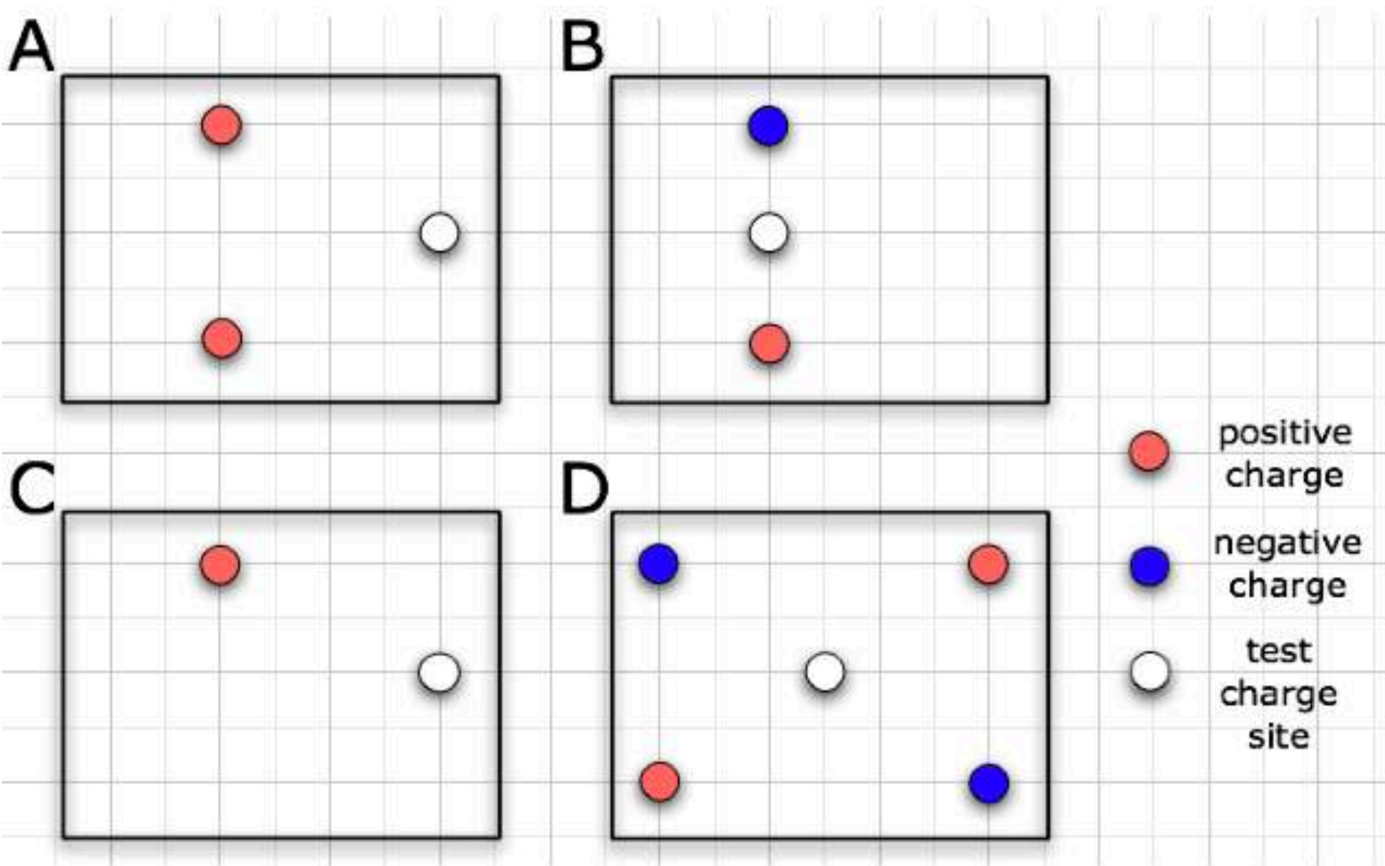
Below are shown four situations in which charges have been placed. Each positive and negative charge has the same magnitude. If in each situation, we put a small positive test charge at the indicated positions, rank the magnitude of the force that the test charge would feel.

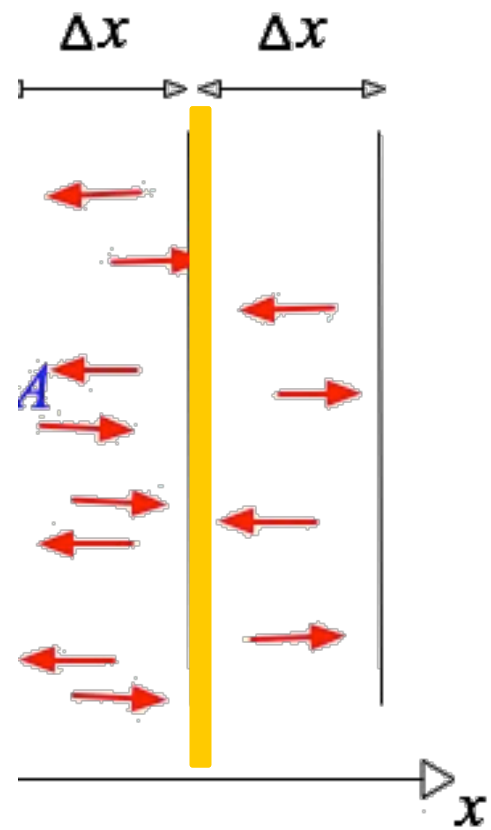


Sodium ions are at different densities on the inside and outside of a cell. Assume each ion moves randomly as a result of collisions with other atoms and molecules.

A small patch of membrane (area A) is shown in yellow. There are more ions are on the left than on the right.

What do you expect is true about the ions **on the left side of the membrane**?

A. More go to the right
B. More go to the left
C. Equal amount goes left and right
D. There is not enough information to tell

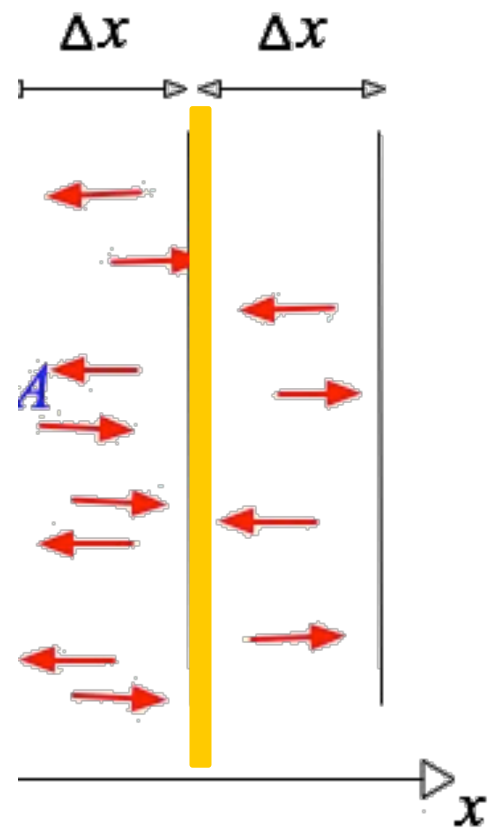



Sodium ions are at different densities on the inside and outside of a cell. Assume each ion moves randomly as a result of collisions with other atoms and molecules.

A small patch of membrane (area A) is shown in yellow. There are more ions are on the left than on the right.

What do you expect is true about the ions **on the right side of the membrane**?

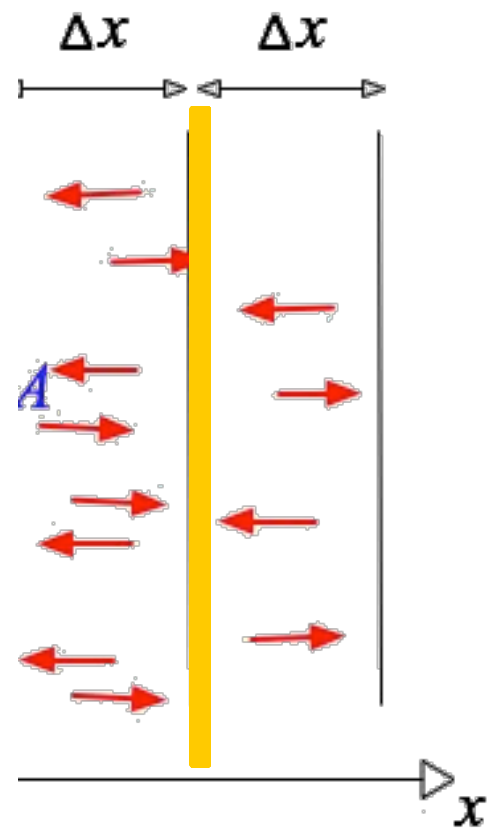
A. More go to the right
B. More go to the left
C. Equal amount goes left and right.
D. There is not enough information to tell



Sodium ions are at different densities on the inside and outside of a cell. Assume each ion moves randomly as a result of collisions with other atoms and molecules.

A small patch of membrane (area A) is shown in yellow. There are more ions are on the left than on the right.

If the membrane allows ions to pass through what do you expect will be true?




A. There will be a net flow of ions to the right

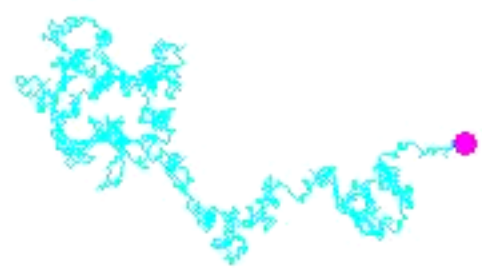
B. There will be a net flow of ions to the left

C. There will be no net flow. Equal amounts will go left and right.

D. There is not enough information to tell

Our simulation representing a chemical signaling molecule released from an organelle in a cell, performed a “random walk”. What is responsible for the changes in direction of the motion of the signaling molecule?

A. Collisions with other signaling molecules.
B. Collisions with one of the liquid molecules in the liquid the molecule is in.
C. An imbalance in the many strikes the molecule feels from the molecules of the liquid the molecule is in.
D. Something else.



# If the average rate at which a 1D particle moves is given by $\langle (\Delta x)^2 \rangle = 2Dt$ what will be the rate at which it moves in 2D? 3D?

A. $\langle (\Delta r)^2 \rangle = 2Dt$

B. $\langle (\Delta r)^2 \rangle = 4Dt$

C. $\langle (\Delta r)^2 \rangle = 6Dt$

D. Something else