# Neuron Simulation

Go to https://bit.ly/3pI1rVu

This is a simulation of the axon of a neuron. Let's figure out how nerve signals travel down the length of the axon.

1. Slide towards the + to zoom in a little on the neuron.
   What protein structures are imbedded in the membrane?
   **Sodium gated channel, potassium gated channel, sodium leak channel, potassium leak channel**

2. What main protein is missing? **Sodium-potassium pump**

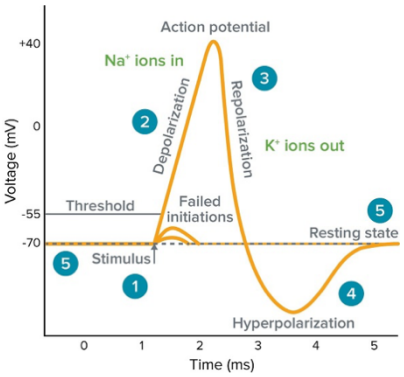
3. a. What substance is there more of outside the neuron? **$Na^+$** What about inside? ? **$K^+$**
   *(Click "Show - Concentrations" if you are unsure).*
   b. Why does this occur?
   **Sodium-potassium pump actively moves 3 $Na^+$ out and 2 K+ into the cell.**

4. a. Click "Show - Charge" What charge is shown inside the cell? **negative**
   b. What is the charge of the outside of the cell? **positive**
   c. If K+ and Na+ are both positive, how might a negative charge come about?
   **It is a comparative change, since there are more total positive ions outside it is called positive, there are less inside so in comparison it is more negative. Potassium are continually leaking outside faster than sodium inside adding to difference as well.**

5. Select "slow motion". Click "**Stimulate neuron**".
   a. Which way did Na+ move? **Into the cell** Through what did it move to get there? **Sodium gated channel**
   b. Which way did K+ move? **Out of the cell** Through what did it move to get there? **K+ gated channel**
   c. What was the wave that moved down the neuron? **action potential**
   d. Why did the K+ and Na+ move? **moved due to concentration gradients (diffusion)**
   e. Describe what happens to the charge on the inside and outside after the wave passes.
   Inside: **became positive then back to negative**
   Outside: **became - then back to +**

6. Can you stimulate the neuron again right after firing it? **No** Explain? **It is in absolute refractory period – Na+ & K+ channels have not closed yet so cannot be reopened/stimulated.**

7. Click the button "**Potential chart**" Stimulate the neuron and draw the resulting graph below.




a) What does this graph show? AP

b) Label "threshold", "stimulus", "resting potential" "depolarization" "repolarization" and "hyperpolarization" on your graph. Make the title "Action Potential"

8. Is there a way to make the signal any stronger? Is there a way to make it stronger in an actual neuron? **No**
b. Is there a way to make it stronger in an actual neuron? **No**Explain?
**nerves work on all or none basis, they fire maximally or not at all.**