

Please show all equations, all substitutions, all units, and all work to receive any credit

- Much of what we know about how nerve cells work comes from studying neurons in squids. Squids have intracellular / extracellular **potassium** concentrations of 400 mM and 20 mM respectively. Squids have intracellular / extracellular **sodium** concentrations of 50 mM and 440 mM respectively. Squids have intracellular / extracellular **chloride** concentrations of 60 mM and 560 mM respectively. You are developing a science fiction novel that describes how squid nerves might work on planet Squeron where squid neuron membranes are actually **most permeable to sodium ions**. Answer the following questions:

 - Estimate what the membrane resting potential would be on planet Squeron; fully explain your reasoning. Draw a picture that clearly shows the polarity of the resting potential
 - Calculate the equilibrium Nernst potential for chloride ions. Draw a labeled diagram of the chloride ion channel that is at equilibrium and clearly explain why it is at equilibrium.
 - For ligands that open up chloride ion channels, predict and explain what neural effects (excitatory or inhibitory) these ligands would have in squids on planet Squeron. Draw a diagram showing membrane potential changes and fully explain why.
- Outline a very detailed sequence of steps clearly explaining the entire mechanism of action of GPCRs.