BIO 25 PAL Worksheet
Week 5 (#1): Excitable Tissues

Remember

1. Define the following using a picture:

Potential energy
Kinetic energy

2. Ions (because they are charged particles) can have multiple forces/gradients acting on them: Concentration force Electrical(Charge) force

*Question: How could these forces represent **potential** energy? How about **kinetic** energy?*

Understand

3. Ions (specifically Na^+ and K^+) are distributed unevenly across the cell membrane (that is, inside vs. outside).

K^+ is high _____; Na^+ is high _____

Draw this. Also include the charge (-70 inside) for a resting cell. The cell you've drawn (with -70 mV inside; outside @ 0 mV) is considered to be a polarized cell. *What does this mean?*

Question: How did these ions come to be distributed this way?

Question: What are the gradients acting on each ion?

Question: Given the gradients that exist on the Na^+ ions, why don't they just go into the cell?

Apply

Using your drawing from #3, indicate the different types of gradients acting on both Na^+ and K^+ (direction, relative size - if known).

There are lots of different types of protein channels in the membrane. For Na^+ and K^+, there are both **leak** channels and **gated** channels. *How do they differ?*

Question: Can Na^+ move through K^+ channels? Vice versa?

Question: What would happen to the charge inside the cell if a bunch of Na^+ channels suddenly opened?

Question: What would happen to the charge inside the cell if a bunch of K^+ channels suddenly opened?

Question: what will happen to the numerical value of the membrane potential if A) sodium is allowed to enter? B) potassium is allowed to exit. For each case, will the cell depolarize or hyperpolarize? ***Draw a graph that shows each.***

Advanced question:

A cell has particles distributed as follows:

Intracellular fluid:

O^+ 40 mM	P^- 40 mM	Q^+ 75 mM	R^- 75 MM

Extracellular fluid:

O^+ 40 mM	P^- 40 mM	Q^+ 25 mM	R^- 25 MM

A. Assume that Q^+ has a number of leak channels so that it is able to move freely across the membrane. What will its movement do to the membrane potential?
B. Given your answer to "A", if a channel were to then open for O^+, would it move? Explain.
C. Will P^- move? Why or why not?