Neuron Worksheet **NAME _____**

Use an Introductory Biology Text book to answer these questions. Team work is encouraged but each student must complete the assignment and bring the hard copy to lecture.

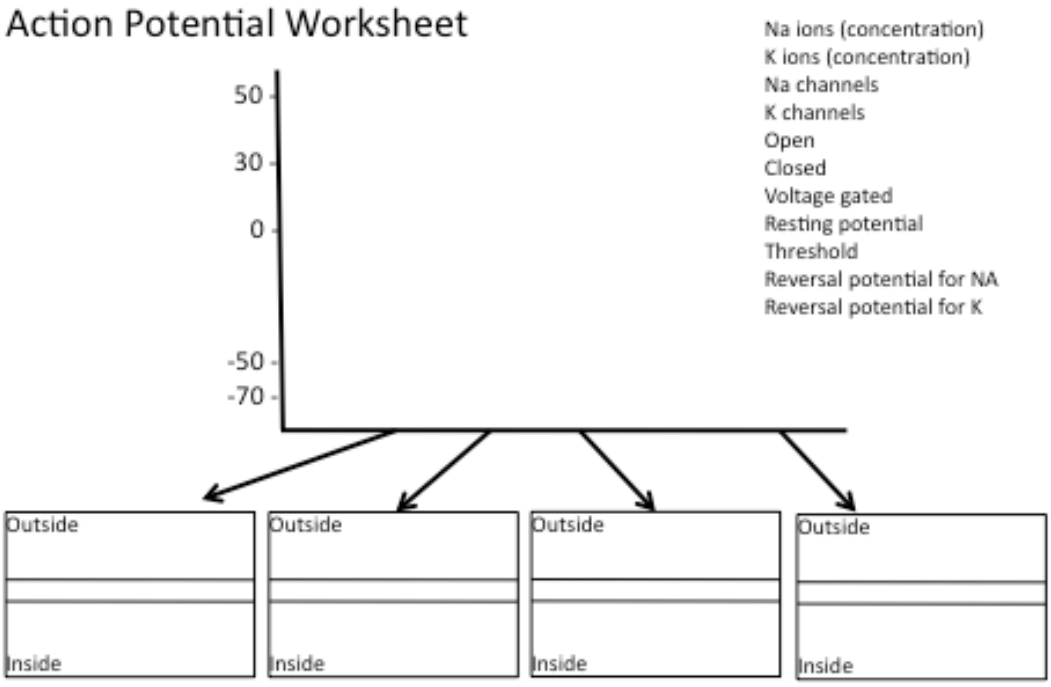
1) Which of the following statements describes the conditions in a living neuron?
A) Sodium concentration is higher **inside** the neuron & potassium concentration is higher **outside** the neuron.
B) Sodium concentration is higher **outside** the neuron & potassium concentration is higher **inside** the neuron.
C) Sodium concentration is higher **inside** the neuron & potassium concentration is higher **inside** the neuron.
D) Sodium concentration is higher **outside** the neuron & potassium concentration is higher **outside** the neuron.

2) Which of the following statements describes the conditions in a living neuron?
A) The inside of a neuron has a negative electrical potential relative to the outside of a neuron at all times.
B) The inside of a neuron has a positive electrical potential relative to the outside of a neuron at all times.
C) The electrical potential of a neuron at rest is negative but becomes positive when "excited".
D) The electrical potential of a neuron at rest is positive but becomes negative when "excited".
E) The inside of a neuron is always electrically neutral relative to the outside of a neuron.

3) Which ion is critical to trigger the release of neurotransmitters by allowing the vesicle to fuse with the pre-synaptic membrane?
A) potassium **B) sodium** **C) chloride** **D) calcium**

4) When neurotransmitter is released from the pre-synaptic terminal, the neurotransmitter receptors on the post-synaptic neuron will cause that neuron to
A) depolarize **B) hyperpolarize** **C) not change membrane potential**
D) it depends upon what type of receptors and neurtransmitters are involved.

5) Use the following figure to indicate different phases of an action potential indicating the state of different ion channels in each phase. Use the words in the right corner of the figure. (see fig. 45.10 in Sadava) We will go over this in class.



6) The reversal potential for an ion is:

A) always equal to 0 for a biological system.
B) independent of the surrounding temperature.
C) the membrane potential at which there is no net flow for that ion.
D) the membrane potential at which the voltage gated channels will open.

7) Natural selection resulted in the Na^+/K^+ pump (sodium/potassium pump) which sets up ion gradients across the neuron membrane such that K^+ concentration is higher inside the cell than outside the cell which Na^+ concentration is higher outside the cell than inside the cell. Evolutionarily, this make sense because:

A) NaCl (sodium chloride) is the salt we use on many food items.
B) NaCl (sodium chloride) is the predominant salt that occurs in the ocean.
C) K^+ (potassium) is the positively charged ion that has the greatest energy.
D) K^+ (potassium) is the ion that is contained in bananas and neurons look like bananas.

8) The resting potential of a neuron is very close to the reversal potential for which ion?

A) sodium (Na+)
B) potassium (K+)
C) Calcium (Ca++)

9) The peak of an action potential in a neuron is close to the reversal potential for which ion?

A) sodium (Na+)
B) potassium (K+)
C) Chloride (Cl-)

10) The action potential is possible because some of the ion channels are gated by:

A) light
B) the Map-Kinase pathway
C) voltage
D) DNA

The Nernst equation is used to calculate the reversal potential of a single ion across a cell membrane. If you understand logarithms you can estimate the reversal potential for an ion once you know the concentration of the ion inside and outside a cell. R and F are constants and T is the temperature in Kelvin. At 20°C (room temperature) the equation can be greatly simplified (on the right).

$$Rev_i = 2.303 \frac{R\,T}{z\,F} \log \frac{[out]}{[in]}$$

At 20 deg. C

$$Rev_i = \frac{58}{z} \log \frac{[out]}{[in]}$$