The Nervous System: The Action Potential

1. a. The action potential changes the membrane potential from _-70_____ mV (resting) to __+30_____ mV and back again to the resting membrane potential (-70 mV).

   b. This results from a change in membrane permeability first to __Na+_____ then to _K+_____ due to the opening of what type of ion channels?

   ___voltage-gated_____

2. a. Where is the density of voltage-gated Na^+ channels the greatest?

   __axon hillock_____

   b. What areas of the neuron generate signals that open these voltage-gated channels? ___dendrites and cell body_____

   c. Opening of these channels causes the membrane to __depolarize_____ (voltage change).

3. a. If the membrane reaches the trigger point, known as __threshold_____, what electrical potential will be generated?

   __action potential_____

   b. During the depolarization phase, voltage-gated __Na+_____ channels open and __Na+_____ enters the cell.

4. What are the two processes that stop the potential from rising above +30 mV?

   a. inactivation of the voltage-gated Na+ channels

   b. opening of the voltage-gated K+ channels

5. a. The opening of voltage-gated K^+ channels cause the membrane to __repolarize_____.

b. Does K^+ move into or out of the cell? ____out of_____

c. If the membrane potential becomes more negative than –70 mV, this is called _hyperpolarization_____.

d. This potential is caused by what characteristic of K^+ permeability?

__K+ channels are slow to close_____

6. a. After an action potential, the neuron cannot generate another action potential because _Na+_____ channels are inactived. This period is called the __absolute refractory_____ period.

b. During the _relative refractory_____ period, the cell can generate another action potential but only if the membrane is __more_____ (more or less) depolarized.

7. a. Conduction velocity along the axon is increased by what two characteristics?

1. _the diameter of the axon_____
2. _how well the axon is insulated with myelin_

b. Conduction along a myelinated axon is called ___saltatory_____ conduction.

8. a. Name the disease whose symptoms include loss of vision and increasing muscle weakness: __multiple sclerosis_____

b. What does this disease destroy? _myelin sheath of CNS axons____

c. How does this stop an action potential? there is too much distance between the nodes of Ranvier