**Nervous System Practice & Review**

1. Label the parts of the neuron below.



1. Label the parts of a reflex arc below.



1. When an action potential reaches the axon terminal of a neuron and the vesicles fuse with the membrane, what type of chemical messenger is released into the synaptic cleft?
2. Describe what is happening at each step of this neural transmission by completing the summary below.

**STEP 1**: The \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (nerve impulse) travels down the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and reaches the axon terminal.

**STEP 2:** The action potential causes a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of the of the presynaptic membrane at the axon terminal. This ***directly*** causes voltage-gated \_\_\_\_\_\_\_ channels to \_\_\_\_\_\_\_\_\_\_\_\_\_.

**STEP 3:** Synaptic vesicles fuse with the presynaptic membrane and release \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ into the synaptic cleft via exocytosis.

**STEP 4**: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ ion channels on the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ membrane open as the neurotransmitter (ligand) binds to those receptors.

1. Why are action potentials usually conducted in only one direction?
2. Do all action potentials move along the axon at the same speed? Why or why not? Give an example to support your answer.

**Understanding the Action Potential**



**On the graph above, highlight or color and label the following:**

* Resting Potential (yellow)
* Depolarization (orange)
* Repolarization (pink)
* Hyperpolarization(Refractory Period) (green)

**On the graph above, annotate/label:**

1. Where Na+ ion-gated (voltage-gated) channels open and Na+ enters
2. Where K+ ion-gated (voltage-gated) channels open and K+ exits
3. Where Na+ ion-gated (voltage-gated) channels close
4. Where K+ ion-gated (voltage-gated) channels close
5. Threshold for an Action Potential

1) In the communication between a motor neuron and a skeletal muscle,

A) the motor neuron is considered the presynaptic cell and the skeletal muscle is the postsynaptic cell.

B) the motor neuron is considered the postsynaptic cell and the skeletal muscle is the presynaptic cell.

C) action potentials are possible on the skeletal muscle but not the motor neuron.

D) the motor neuron fires action potentials but the skeletal muscle is not electrochemically excitable.

2) The operation of the sodium-potassium "pump" moves

A) sodium and potassium ions into the cell.

B) sodium and potassium ions out of the cell.

C) sodium ions into the cell and potassium ions out of the cell.

D) sodium ions out of the cell and potassium ions into the cell.

E) sodium and potassium ions into the mitochondria.

3) The "threshold" potential of a membrane

A) is the point of separation from a living to a dead neuron.

B) is the minimum hyperpolarization needed to prevent the occurrence of action potentials.

C) is the minimum depolarization needed to operate the voltage-gated sodium and potassium channels.

D) is the peak amount of depolarization seen in an action potential.

4) Action potentials move along axons

A) more slowly in axons of large than in small diameter.

B) by the direct action of acetylcholine on the axonal membrane.

C) by activating the sodium-potassium "pump" at each point along the axonal membrane.

D) more rapidly in myelinated than in non-myelinated axons.

E) by reversing the concentration gradients for sodium and potassium ions.

5) Saltatory conduction is a term applied to

A) conduction of impulses across electrical synapses.

B) an action potential that skips the axon hillock in moving from the dendritic region to the axon terminal.

C) rapid movement of an action potential reverberating back and forth along a neuron.

D) jumping from one neuron to an adjacent neuron.

E) jumping from one node of Ranvier to the next in a myelinated neuron.

6) Neurotransmitters are released from axon terminals via

A) osmosis. B) active transport.

C) diffusion. D) exocytosis.

7) The following steps refer to various stages in transmission at a chemical synapse.

1. Neurotransmitter binds with receptors associated with the postsynaptic membrane.

2. Calcium ions rush into neuron's cytoplasm.

3. An action potential depolarizes the membrane of the axon terminal.

4. The ligand-gated ion channels open.

5. The synaptic vesicles release neurotransmitter into the synaptic cleft.

Which sequence of events is correct?

A) 1 → 2 → 3 → 4 → 5

B) 2 → 3 → 5 → 4 → 1

C) 3 → 2 → 5 → 1 → 4

D) 4 → 3 → 1 → 2 → 5

E) 3 → 1 → 2 → 4 → 5

**For the following questions, refer to the graph of an action potential.**



8) The membrane's permeability to sodium ions is at its maximum at label

A) A.

B) B.

C) C.

D) D.

E) E.

9) The minimum graded depolarization needed to operate the voltage-gated sodium and potassium channels is indicated by the label

A) A.

B) B.

C) C.

D) D.

E) E.





