NERVOUS SYSTEMS

NEURON
SIMPLE REFLEX
**Resting Potential**

![Diagram of resting potential with ions K⁺, Na⁺, and Cl⁻]

**Action Potential**

![Diagram of action potential showing electrical impulses and ion movements]

Animal Form & Function Activity #7 page 3
TRANSMISSION ACROSS A SYNAPSE
QUESTIONS:

1. Match the structure with the correct letter from the diagram below.
   ______ Dendrites
   ______ Schwann cell nucleus
   ______ Axon
   ______ Node of Ranvier
   ______ Cell body
   ______ Myelin sheath
   ______ Nucleus
   ______ Axon terminals
   ______ Neurilemma
   ______ End bulbs

2. Identify each of the following as true of the sensory neuron (SN) or the motor neuron (MN)

   ______ anterior root                      ______ posterior root
   ______ has a ganglion                    ______ lacks a ganglion
   ______ carriers impulses from receptor to spinal cord
   ______ carriers impulses from spinal cord to effector
   ______ has a relatively long dendrite & short axon
   ______ has relatively short dendrites & a long axon
   ______ enters spinal cord
   ______ exits spinal cord
3. Match the following parts with the correct letter from the diagram.

______ Dorsal Root
______ Dorsal Root Ganglion
______ Effector
______ Interneuron
______ Receptor
______ Ventral Root

4. Match the following parts with the correct letter from the diagram.

______ Motor neuron axon
______ Sensory neuron axon
______ Sensory neuron cell body
______ Sensory neuron dendrite

5. Match the description with the correct event.

______ More Na+ outside cell
    More K+ inside cell
    A. Depolarization

______ Na+ ion gates open and Na+ rush into cell
    B. Hyperpolarization

______ K+ gates open & Na+ gates close; K+ rush out of cell
    C. Refractory Period

______ More K+ moved out of cell than necessary to reestablish charge across membrane
    D. Repolarization

______ Na+ pumped out of cell & K+ pumped into cell
    E. Resting potential
6. How is the resting potential different from repolarization?

____________________________________________________________________

____________________________________________________________________

7. Answer the following questions regarding the transmission of a nerve impulse.

a. What maintains the excess of Na+ outside the cell and an excess of K+ inside the cell during the resting potential stage?

____________________________________________________________________

b. The resting potential of a neuron (-70mV) indicates that the inside of the cell is more negative than the outside. What two factors cause this negative charge?

____________________________________________________________________

c. What causes Na+ channels (gates) to open?

____________________________________________________________________

d. What causes Na+ to rush into the neuron during depolarization?

____________________________________________________________________

e. What causes K+ to rush out of the neuron during repolarization?

____________________________________________________________________

f. What causes the neuron to be hyperpolarized?

____________________________________________________________________

g. What reestablishes the original distribution of K+ and Na+ during the refractory period?

____________________________________________________________________
8. Listed below is the distribution / movement of Na+ and K+ during the transmission of a nerve impulse. Put the following in the correct order.

   ___1__ More Na+ outside the neuron; more K+ inside the neuron

   ______ Na+ gates open

   ______ Na+ gates close & K+ gates open

   ______ Na+ rushes into the neuron

   ______ K+ rushes out of the neuron

   ______ More K+ is outside the neuron; more Na+ is inside the neuron

   ______ Na+ is pumped out of the cell & K+ is pumped into the cell

9. Match the structure with the correct letter from the diagram below.

   ______ Neurotransmitter

   ______ Postsynaptic membrane

   ______ Presynaptic membrane

   ______ Receptor site (protein)

   ______ Synaptic cleft

   ______ Synaptic end bulb

   ______ Synaptic vesicle

10. Nervous system organization tends to correlate with body symmetry. Explain this statement providing examples from the animal kingdom.

    _______________________________________________________________

    _______________________________________________________________

    _______________________________________________________________

    _______________________________________________________________
11. Define cephalization.

_________________________________________________________________

_________________________________________________________________

12. Why was cephalization important in the evolution of the animal kingdom?

_________________________________________________________________

_________________________________________________________________

13. Complete the following chart comparing the two major divisions of the vertebrate nervous system.

<table>
<thead>
<tr>
<th>Division</th>
<th>Central Nervous System</th>
<th>Peripheral Nervous System</th>
</tr>
</thead>
<tbody>
<tr>
<td>Components/Parts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Function</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

14. What are the two divisions of the peripheral nervous system? Provide a general function for each.

<table>
<thead>
<tr>
<th>Division</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
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<td></td>
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</tbody>
</table>
15. What are the two divisions of the autonomic nervous system?

_____________________________________________________________

16. Use Figure 48.16 page 979 to identify the autonomic nervous system division (Parasympathetic or Sympathetic) describe in each of the following.

_____ Long preganglionic fibers
_____ Short preganglionic fibers
_____ Long postganglionic fibers
_____ Short postganglionic fibers
_____ Ganglia near the CNS
_____ Ganglia near the effector
_____ Originate from the thoracic and lumbar regions of the spine
_____ Originate from the brain and sacrum
_____ Constricts the pupil
_____ Dilates the pupil
_____ Increases activity of the digestive system
_____ Decreases the activity of the digestive system
_____ Stimulates defecation and urination
_____ Constricts respiratory passageways
_____ Dilates respiratory passageways
_____ Reduces heart rate and the force of cardiac contractions
_____ Increases heart rate and the force of cardiac contractions
_____ Centers on relaxation, food processing, and energy absorption
_____ Prepares the body for emergencies; triggers the fight or flight response
17. Color the following parts on the diagram:

**Central Nervous System**
- Cerebral hemisphere (A)
- Epithalamus (B)
- Thalamus (C)
- Hypothalamus (D)
- Midbrain (E)
- Pons (F)
- Medulla (G)
- Cerebellum (H)
- Spinal cord (I)

**Simple Spinal Reflex**
- Receptor (L)
- Sensory neuron (M)
- Posterior root (M₁)
- Posterior root ganglion (M₂)
- Motor neuron (N)
- Anterior root (N₁)
- Effector (O)
18. Match the structure with the correct function.

<table>
<thead>
<tr>
<th>A. Brainstem</th>
<th>D. Epithalamus</th>
</tr>
</thead>
<tbody>
<tr>
<td>B. Cerebellum</td>
<td>E. Hypothalamus</td>
</tr>
<tr>
<td>C. Cerebral hemispheres</td>
<td>F. Thalamus</td>
</tr>
</tbody>
</table>

- Contains centers that control breathing, heart and blood vessel activity, swallowing, vomiting, digesting
- Helps coordinate large-scale body movements such as walking
- Contains centers for receipt and integration of several types of sensory information
- Most of descending axons cross from one side to CNS to the other; results in right side of brain controlling left side of body
- Medulla, pons, midbrain
- Coordination of movement
- Receives information about position of joints, length of muscles, information from auditory and visual systems, and information from motor pathways; uses information to provide automatic coordination of movements and balance
- Contains the pineal body and choroid plexus
- Major integration center; major input center for sensory information going to cerebrum; main output center for motor information leaving cerebrum
- Produces hormones; contains centers that regulate body temperature, hunger, thirst, fight-or-flight response, sexual responses, pleasure
- Center for higher thought processes; thinking, speech, vision, hearing