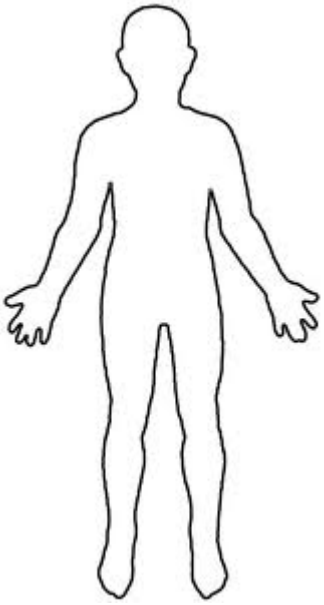
WebQuest: The Structure of the Nervous System

The nervous system consists of three parts: the Brain, the Central Nervous System, and the Peripheral Nervous System. The Brain is the command center, the Central Nervous System is the brain and the spinal cord, and the Peripheral Nervous System consists of the nerves going from the spinal cord out to your body. Draw and label each of these parts on the diagram below:



The Brain

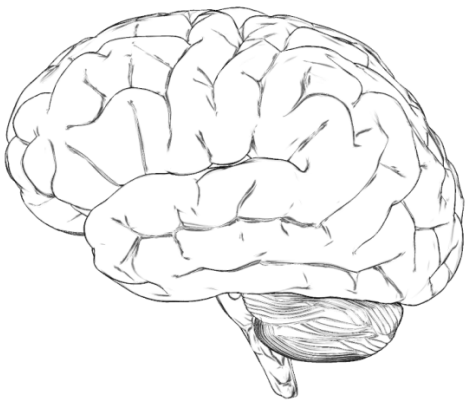
Go to the following web site and follow the instructions below:

http://serendip.brynmawr.edu/bb/kinser/Structure1.html

Part One: The Cerebrum

The cerebrum or cortex is the largest part of the human brain, associated with higher brain function such as thought and action. The cerebral cortex is divided into four sections called "lobes": the frontal lobe, parietal lobe, occipital lobe, and temporal lobe.

1. On the diagram below, label the four lobes of the cerebrum.



2. List the function of each of the lobes of the cerebrum.
   Frontal Lobe:

   Parietal Lobe:

   Occipital Lobe:

   Temporal Lobe:

3. Label the cerebellum on the diagram above.
4. What does the cerebellum do?

5. The limbic system is often referred to as the _____ brain.
6. Where is the limbic system found?

7. List the function of each of the parts of the limbic system:
   Thalamus:

   Hypothalamus:

   Amygdala:

   Hippocampus:

8. Label the Brain Stem on the diagram above.
9. What does the Brain Stem do?

10. List the function of each of the parts of the Brain Stem:
    Midbrain:

    Pons:

    Medulla:

The Synapse

In this section we will focus on the synapse. As you will recall, the synapse is the space between the axon terminal of on neuron and the dendrites of another. It is important to remember that the two neurons aren't touching; they are just really close to each other.

Go to the following web site and answer the questions below:
http://www.mind.ilstu.edu/flash/synapse_1.swf

11. Neurotransmission occurs between the _____ _____ of one neuron and the _____ of another.
12. At the synapse, information is transmitted from one neuron to another via what kind of messengers?

13. An action potential is an _____ signal.
14. Why are chemical messengers, or neurotransmitters, needed to get information across the synapse?

15. What are ions?

16. Why are ions important for neurotransmission?

17. What are the 4 most common ions?

18. How do ions get across the neuron membrane?

19. An ion channel will only open when a specific _____ binds to its _____ _____.
20. If enough ions flow into the post synaptic neuron, the neuron's threshold will be reached and the neuron will fire an _____ _____.
21. What are vesicles?

22. What effect does an action potential have on a vesicle?

23. What happens to the neurotransmitter once it has done its job?

24. What do mitochondria do?

25. List the 5 steps that take place in transmitting information across a synapse (these are in the "Summary" section of the movie).
    a.

    b.

    c.

    d.

    e.

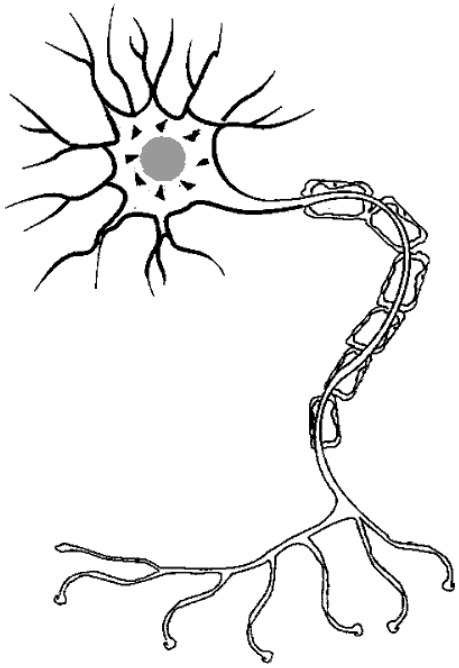
The Synapse and Learning

In this section we are going to focus on how nerve impulses travel from neuron to neuron and how we learn new things.

NOTES: 1. Use the PAUSE button as you go through the video if you want to slow things down.
2. Yes, I know that some of this information is a repeat of what you did in the last section.

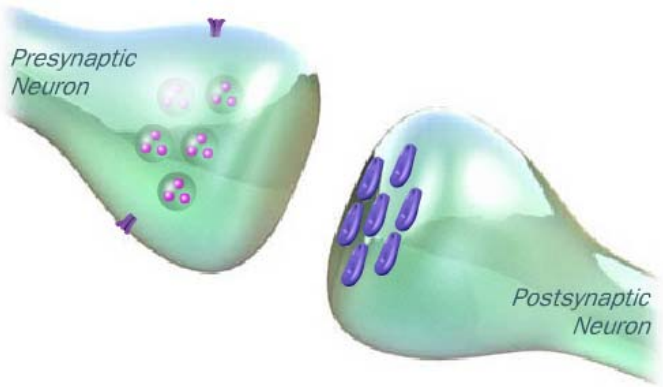
http://outreach.mcb.harvard.edu/animations/synaptic.swf

26. Label the following parts of the neuron and describe what it is /what it does:
Dendrite, Cell Body, Axon and Axon Terminal



27. Signals are sent from one neuron to another by jumping across a tiny space or _____.

28. Label the following parts of the synapse and describe what it is /what it does:
Presynaptic Neuron, Vesicles, Calcium Channels, Synaptic Cleft, Receptor Molecule and Postsynaptic Neuron



29. The list below is what happens when a neuron fires and sends a signal along to another neuron. Fill in the missing blanks in each statement. (Remember to use the Pause button!)
    a. When an _____ _____ begins in a neuron, it travels down the _____.
    b. When the action potential reaches the _____ terminal, _____ _____ open and calcium ions rush into the neuron.
    c. When calcium binds to the _____, the vesicles carry _____ toward the presynaptic membrane.
    d. The neurotransmitter is released into the _____ _____.
    e. Neurotransmitter diffuses across the synaptic cleft and binds to _____ on the _____ _____.
    f. The post synaptic neuron receptors are activated. In this case, these receptors allow _____ ions in, causing an _____ potential to start in the postsynaptic membrane.
    g. Neurotransmitters are _____ back into the _____ cleft.

Exercises

In this section you will learn how we learn new things. Do the exercises and answer the following questions.

30. By changing how nerves are connected, we _____ _____.
31. In the first exercise, the star is always _____.
32. How do we learn?

33. We have specific neurons for recognizing _____ and _____.
34. How did you learn to match the neurons, the star shape, and the color orange?

35. In the second exercise, what change did you make in your synapse?

36. List the ways that you might change a synapse.