Name: _____ Station 1

How Simple is a Simple Task?

Directions:

1. Trace the outline of the penny in 10 different places on this piece of paper.
2. Number the circles 1 – 10. Write the number ***randomly***, in no particular order.
3. Pick the penny up again. Put it in each circle, one after another, in numerical order, beginning with 1 and ending with 10.

4. Make a list of all the sense organs, muscle movements, and thought processes involved in this activity.

5. What organ system coordinated all the different processes involved in this task?

Name: _____ Station 2

Movie Clip: Neurons & Synapses

e the headphones to watch the four minute movie called "Neurons & Synapses" and answer the questions below.

If the movie is not up on the computer, go to:
W:\SHS Rbio\Nervous System and click on the movie

1. Explain how information is transmitted ***within*** each neuron.

2. Describe how information is transmitted ***between*** neurons & other neurons and other kinds of cells (like muscle cells).

3. Where in the brain are images from the eye interpreted and reconstructed?

4. How does the ear transmit information to the brain?

5. What is present in our nose that enables humans to distinguish between different odors?

Name: _____ Station 3

Movie Clip: Diseases of the Central Nervous System

Use the headphones to watch the four minute movie called "Diseases of the Central Nervous System" and answer the questions below.

If the movie is not up on the computer, go to:
W:\SHS Rbio\Nervous System and click on the movie

1. The most devastating spinal injuries occur in the high part of the neck. Why are injuries in this location worse than those that occur lower in the spinal column?

2. Describe what happens in the brain to cause Alzheimer's disease.

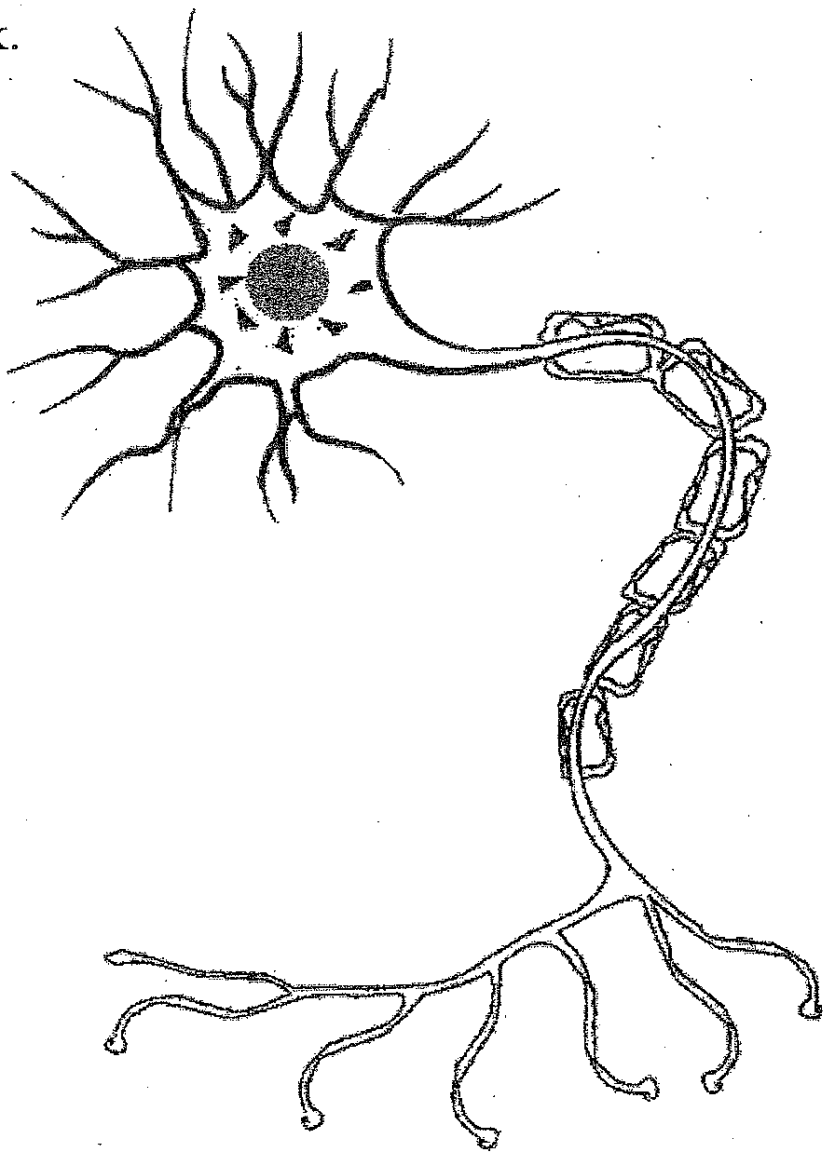
3. Describe what happens in the brain to cause an epileptic seizure.

4. List some of the risk factors that increase a person's risk for stroke.

5. Explain what happens when a person has a stroke.

Name: _____ Station 4

Using the textbook p. 897 and your notes as a guide ***make a key*** and color and label the parts of the neuron below. Then answer the question below and those on back.



☐ Cell Body ☐ Dendrites ☐ Nucleus ☐ Axon
☐ Nodes ☐ Myelin Sheath ☐ Axon Terminals

On page 898, read about the Myelin Sheath at the top of the page. Describe the role of the myelin sheath in nerve impulse transmission.

35–2 The Nervous System

Play any team sport—basketball, softball, soccer—and you will discover that communication is one of the keys to success. Coaches call plays, players signal to one another, and the very best teams communicate in a way that enables them to play as a single unit. Communication can make the difference between winning and losing.

The same is true for living organisms. Nearly all multicellular organisms have communication systems. Specialized cells carry messages from one cell to another so that communication among all body parts is smooth and efficient. In humans, these cells include those of the nervous system. **The nervous system controls and coordinates functions throughout the body and responds to internal and external stimuli.**

Guide for Reading

Key Concepts

- What are the functions of the nervous system?
- How is a nerve impulse transmitted?

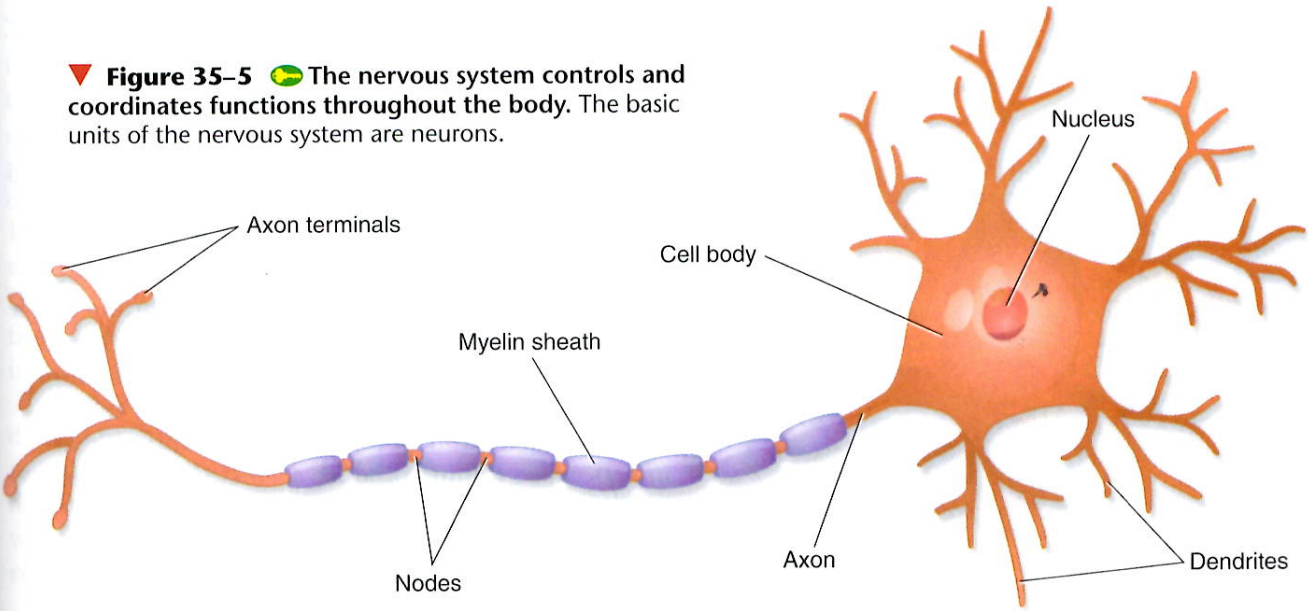
Vocabulary

neuron
cell body
dendrite
axon
myelin sheath
resting potential
action potential
threshold
synapse
neurotransmitter

Reading Strategy: Summarizing As you read, find the main ideas for each paragraph. Write down a few key words from each main idea. Then, use the key words in your summary.

Neurons

The messages carried by the nervous system are electrical signals called impulses. The cells that transmit these impulses are called **neurons.** Neurons can be classified into three types according to the direction in which an impulse travels. Sensory neurons carry impulses from the sense organs to the spinal cord and brain. Motor neurons carry impulses from the brain and the spinal cord to muscles and glands. Interneurons connect sensory and motor neurons and carry impulses between them. Although neurons come in all shapes and sizes, they have certain features in common. **Figure 35–5** shows a typical neuron. The largest part of a typical neuron is the **cell body.** The cell body contains the nucleus and much of the cytoplasm. Most of the metabolic activity of the cell takes place in the cell body.



▼ **Figure 35–5** **The nervous system controls and coordinates functions throughout the body.** The basic units of the nervous system are neurons.

Go Online NSTA SCILINKS
For: Links on the nervous system
Visit: www.SciLinks.org
Web Code: cbn-0352

Spreading out from the cell body are short, branched extensions called **dendrites.** Dendrites carry impulses from the environment or from other neurons toward the cell body. The long fiber that carries impulses away from the cell body is called the **axon.** The axon ends in a series of small swellings called axon terminals, located some distance from the cell body. Neurons may have dozens of dendrites but usually have only one axon. In most animals, axons and dendrites are clustered into bundles of fibers called nerves. Some nerves contain only a few neurons, but many others have hundreds or even thousands of neurons.

In some neurons, the axon is surrounded by an insulating membrane known as the **myelin** (MY-uh-lin) **sheath.** The myelin sheath that surrounds a single long axon leaves many gaps, called nodes, where the axon membrane is exposed. As an impulse moves along the axon, it jumps from one node to the next, which increases the speed at which the impulse can travel.

The Nerve Impulse

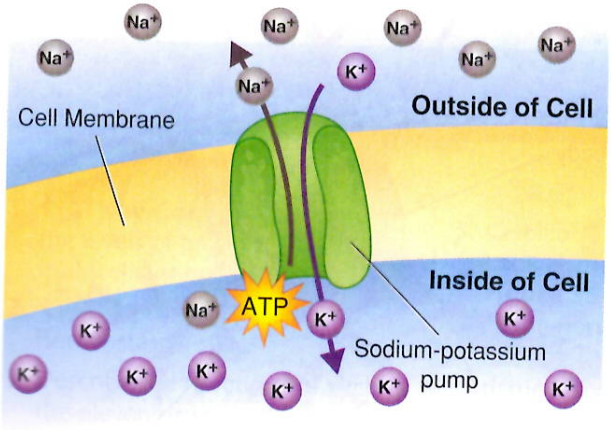
A nerve impulse is similar to the flow of electrical current through a metal wire. The best way to understand a nerve impulse is to first look at a neuron at rest.

The Resting Neuron When a neuron is resting (not transmitting an impulse), the outside of the cell has a net positive charge, and the inside of the cell has a net negative charge. The cell membrane is said to be electrically charged because there is a difference in electrical charge between its outer and inner surfaces. Where does this difference come from? Some of the differences come from the selective permeability of the membrane. Most of the differences, however, are the result of active transport of ions across the cell membrane.

The nerve cell membrane pumps Na^+ ions out of the cell and K^+ ions into the cell by means of active transport. The active transport mechanism that performs this pumping action is called the sodium-potassium pump, shown in **Figure 35–6.** As a result of active transport, the inside of the cell contains more K^+ ions and fewer Na^+ ions than the outside.

The neuron cell membrane allows more K^+ ions to leak across it than Na^+ ions. As a result, K^+ ions leak out of the cell to produce a negative charge on the inside of the membrane. Because of this, there is a positive charge on the outside of the membrane and a negative charge on the inside. The electrical charge across the cell membrane of a neuron in its resting state is known as the **resting potential** of the neuron. The neuron, of course, is not actually "resting," because it must produce a constant supply of ATP to fuel active transport.

CHECKPOINT *What is resting potential?*

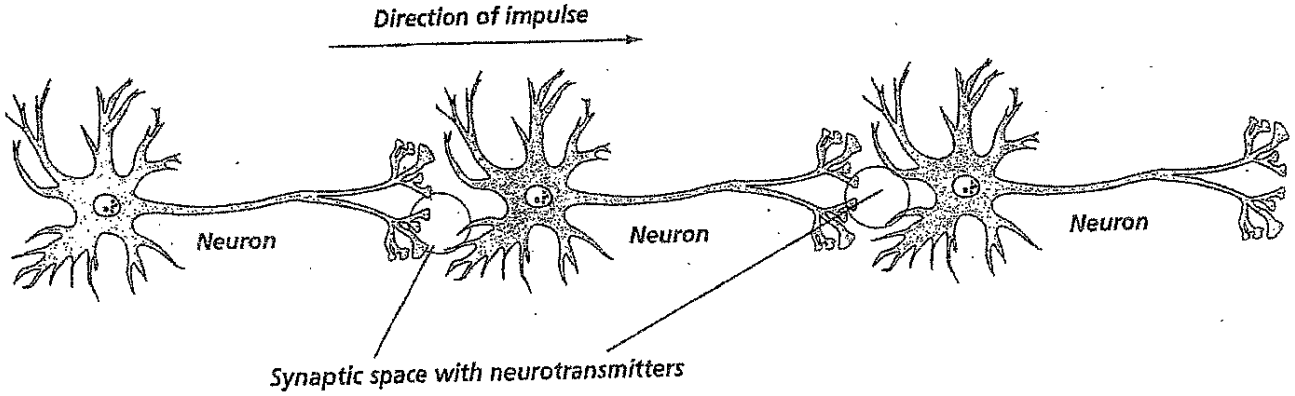


▼ **Figure 35–6** The sodium-potassium pump in the neuron cell membrane uses the energy of ATP to pump Na^+ out of the cell and, at the same time, to pump K^+ in. This ongoing process maintains resting potential. **Applying Concepts** *Is this process an example of diffusion or active transport?*

Study the Diagram

Read the paragraph in the box and study the diagram. Then answer the questions that follow.

Electrical signals travel throughout your nervous system, carrying information from one place to another. The nervous system is made up of nerve cells, or **neurons**. The neurons have gaps between them, called **synaptic spaces**, which an electrical signal has to jump across in order to continue. In some electrical machinery, electrical signals jump across a tiny gap as a spark. In your body, an electrical impulse is passed by a chemical signal called a **neurotransmitter**.



1. What would happen to your nervous system if the neurotransmitters in your body were suddenly blocked from passing into the synaptic spaces?

2. What do you think would happen if a lot of neurotransmitters were suddenly released throughout your nervous system?

Nervous System

R J X Q H N H S T R N S
H P F E N C Z O O O W T
D N T O L V V R R T R I
R E X I I F E U J O F M
I A N T C S E N F M V U
R E C D P N W R X B E L
U Z L O R K E Q H S A U
C X N E Z I B Q R V D S
Z S T H F W T N U M S E
E N Y R O S N E S N R E
I V Q B C F K T O J H X
E L E C T R I C A L S G

AXON
DENDRITE
ELECTRICAL
INTERNEURON
MOTOR
RESPONSE
SENSORY
STIMULUS
REFLEX