

NAME _____

Explore the Neuroscience for Kids Web Site (ANSWERS)

Start at: <http://faculty.washington.edu/chudler/neurok.html>

On the left side, click on “Explore,” then click on “The Neuron,” then click on “Millions and Billions of Cells: Type of Neurons” to answer the following questions:

1. A neuron is a NERVE cell. The brain is made up of about 100 billion neurons.
2. Neurons are similar to other cells in the body in some ways such as:
 - a. Neurons are surrounded by a MEMBRANE.
 - b. Neurons have a NUCLEUS that contains GENES.
 - c. Neurons contain cytoplasm, mitochondria and other ORGANELLES.
3. However, neurons differ from other cells in the body in some ways such as:
 - a. Neurons have specialized projections called DENDRITES and AXONS.
 - b. Dendrites bring information to the CELL BODY.
 - c. AXONS take information away from the cell body.
 - d. Neurons communicate with each other through an ELECTROCHEMICAL process.
4. Neurons form specialized connections called SYNAPSES and produce special chemicals called NEUROTRANSMITTERS that are released at the synapse.

Scroll down to the chart comparing axons and dendrites. Fill in the answers:

There are several differences between axons and dendrites:

AXONS

Take information AWAY the cell body

SMOOTH Surface

Generally only 1 per cell

No RIBOSOMES

Can have MYELIN

Branch further from the cell body

DENDRITES

Bring information TOWARD the cell body

ROUGH Surface (dendritic spines)

Usually MANY per cell

Have ribosomes

No MYELIN insulation

Branch NEAR the cell body

Take the short neuron quiz at the bottom of the page, and correctly answer these questions:

1. Neuron part that releases neurotransmitters into the synaptic cleft. **PRESYNAPTIC TERMINAL**.
2. Fatty material that surrounds some axons. **MYELIN**.
3. Takes information away from the cell body. **AXON**.
4. The gaps in the myelin sheath. **NODES OF RANVIER**.
5. Part of neuron that contains the nucleus. **CELL BODY (OR SOMA)**.
6. Takes information to the cell body. **DENDRITE**.
7. Organelle in neuron that contains genetic material. **NUCLEUS**.

Go back to “Explore,” then click on “Brain Basics,” then on “Divisions of the Nervous System” to answer these questions:

1. What is the definition of “neuroanatomy?” **STRUCTURE OF THE NERVOUS SYSTEM**
2. The nervous system can be divided into "systems" -- what are they? **Central Nervous System and Peripheral Nervous System.**
3. The **central nervous system** is divided into two major parts. What are they?
BRAIN and **SPINAL CORD**
4. The brain contains about 100 billion nerve cells (neurons) and trillions of support cells called **GLIA OR (GLIAL CELLS)**.
5. The **peripheral nervous system** is divided into two major parts, the **SOMATIC** nervous system and the **AUTONOMIC** nervous system, and a third part called the **ENTERIC** nervous system.
6. The **somatic** nervous system consists of peripheral nerve fibers that send sensory information to the **CENTRAL** nervous system AND motor nerve fibers that project to **SKELETAL MUSCLES**.
7. The **autonomic nervous** system is divided into three parts: the **SYMPATHETIC** nervous system, the **PARASYMPATHETIC** nervous system and the **ENTERIC** nervous system. The autonomic nervous system controls smooth muscle of the viscera (internal organs) and **GLANDS**.
8. The **ENTERIC** nervous system is a third division of the autonomic nervous system that you do not hear much about. The enteric nervous system is a meshwork of nerve fibers that innervate the viscera (**GASTROINTESTINAL TRACT** **PANCREAS**, and gall bladder).

Scroll down the page to “Brain Structures:”

1. The word "**cortex**" comes from the Latin word for "**BARK**" (of a tree). This is because the cortex is a sheet of tissue that makes up the **OUTER LAYER** of the brain.
2. The thickness of the cerebral cortex varies from **2** to **6** mm. The right and left sides of the cerebral cortex are connected by a thick band of nerve fibers called the "**CORPUS CALLOSUM**".

Go back to “Explore,” click on “Brain Basics,” then click on “Our Divided Brain: Lobes of the Brain” to answer these questions.

1. Name the **4 lobes of the brain**. **FRONTAL, PARIETAL, OCCIPITAL, TEMPORAL**
2. Which lobe is concerned with **perception of stimuli** related to **touch, pressure, temperature and pain**? **PARIETAL LOBE**
3. Which lobe is concerned with many aspects of **vision**? **OCCIPITAL LOBE**
4. Which lobe is concerned with **reasoning, planning, parts of speech and movement** (motor cortex), **emotions, and problem-solving**? **FRONTAL LOBE**
5. Which lobe is concerned with perception and recognition of **auditory stimuli** (hearing) and **memory** (hippocampus)? **TEMPORAL LOBE**
6. In the “Did You Know” section he frontal lobe, click “more about poor Mr. Gage.” What happened to Phineas Gage,” a worker who had a large iron stake pierce his skull. Answer these questions:
 - a. In what year did the accident take place? **1848**
 - b. How thick was the tamping rod that went through his skull? **ABOUT 1.25 INCHES**
 - c. How long was the tamping rod? **3 FEET, 7 INCHES**
 - d. How much did the rod weigh? **13.5 POUNDS**
 - e. What happened after the rod went through? **Rod landed several yards away.**
 - f. Did the rod injure his eye? **YES**
 - g. How long did Phineas stay in the hospital to recover from his injury? **10 WEEKS**
 - h. Who is the doctor who treated Phineas? **DR. HARLOW**
 - i. List some of the adjectives used to describe the “new” Phineas: **FITFUL, IRREVERENT, GROSSLY PROFANE, IMPATIENT, OSTINATE, CAPRICIOUS**
 - j. Why was Phineas not hired back to his old job after he recovered? **CHANGED PERSONALITY**
 - k. When did Phineas die? **1860**

l. Where is Phineas' skull today? WARREN MEDICAL MUSEUM AT HARVARD UNIVERSITY

m. The part of Phineas' brain that was damaged was most likely the FRONTAL LOBE, which controls PERSONALITY/SOCIAL BEHAVIOR.

Return to "BRAIN BASICS," scroll down and click on "Compare the Brains of 9 Species." Take the test to see how many brains you can identify.

1. How many did you answer correctly? _____
2. Which animal has the smallest brain of those pictured? LEAST WEASEL
3. Which animal has the largest? DOLPHIN
4. The dolphin brain is the most "convoluted" of all. What does this suggest? (The answer is not stated; can you come up with a plausible explanation?" MOST CEREBRAL CORTEX _

Choose one other topic from the list of items under Explore the Brain and Spinal Cord that appeals to you, and read it. Take notes below on some of the interesting/ informational points: _____

Finished Early? Answer these for Extra Credit

<http://faculty.washington.edu/chudler/neurok.html>

1. About how many neurons are there in the average human brain? _____ **100 BILLION** _____
2. What features do neurons have in common with other cells in the body?
HAVE CELL MEMBRANE; HAVE NUCLEUS WITH GENES; CONTAIN ORGANELLES, CARRY OUT BASIC CELLULAR PROCESSES
3. In what ways are neurons unique? **SPECIALIZED EXTENSIONS, COMMUNICATE WITH OTHER NEURONS ELECTROCHEMICALLY; CONTAIN SPECIALIZED STRUCTURES**
4. What's inside a neuron? **ORGANELLES**
5. The axons of neurons differ in the speed with which they conduct neural impulses. How many different basic neural speeds are there? **FOUR** (<http://faculty.washington.edu/chudler/cv.html>)
6. Is there a relationship between the type of information conveyed by an axon and the speed at which it conducts impulses? **YES** (<http://faculty.washington.edu/chudler/cv.html>)
7. What defensive weapon do spiders, snakes, scorpions and some bees share in common? **NEUROTOXINS** (<http://faculty.washington.edu/chudler/toxin1.html>)
8. How are these substances similar to nerve agents and other chemical weapons? **AFFECT CHEMICAL TRANSMISSION**
9. Why are glial cells referred to as the "forgotten brain cells?" **LESS RESEARCH ON GLIAL CELLS COMPARED TO THAT ON NERVE CELLS**
10. State five ways that glia differ from neurons.
Neurons have TWO "processes" called axons and dendrites....glial cells only have ONE; Neurons CAN generate action potentials...glial cells CANNOT. However, glial cells do have a resting potential; neurons HAVE synapses that use neurotransmitters...glial cells do NOT have chemical synapses; there are many MORE (10-50 times more) glial cells in the brain compared to the number of neurons.
11. What would happen to your behavior if your glia suddenly stopped functioning?
ENTIRE NERVOUS SYSTEM WOULD NOT FUNCTION PROPERLY.

(This worksheet was created by Joyce Taaffe, at teacher at Wheeler High School, Marietta, GA.)