

**Distance Learning Program  
Anatomy of the Human Brain/Sheep Brain Dissection**

This guide is for middle and high school students participating in AIMS Anatomy of the Human Brain and Sheep Brain Dissections. Programs will be presented by an AIMS Anatomy Specialist. In this activity students will become more familiar with the anatomical structures of the human brain by observing, studying, and examining human specimens. The primary focus is on the anatomy, function, and pathology. Those students participating in Sheep Brain Dissections will have the opportunity to dissect and compare anatomical structures. At the end of this document, you will find anatomical diagrams, vocabulary review, and pre/post tests for your students.

The following topics will be covered:

1. The neurons and supporting cells of the nervous system
2. Organization of the nervous system (the central and peripheral nervous systems)
4. Protective coverings of the brain
5. Brain Anatomy, including cerebral hemispheres, cerebellum and brain stem
6. Spinal Cord Anatomy
7. Cranial and spinal nerves

**Objectives:**

**The student will be able to:**

1. Define the selected terms associated with the human brain and spinal cord;
2. Identify the protective structures of the brain;
3. Identify the four lobes of the brain;
4. Explain the correlation between brain surface area, structure and brain function.
5. Discuss common neurological disorders and treatments.
6. Describe the effects of drug and alcohol on the brain.
7. Correctly label a diagram of the human brain

**National Science Education (NSES) Content Standards for grades 9-12**

- Content Standard:K-12 Unifying Concepts and Processes: Systems order and organization; Evidence, models and explanation; Form and Function
- Content Standard F, Science in Personal and Social Perspectives: Personal and community health
- Standard C, Life Science: Matter, energy and organization of living systems
- Content Standard A Science as Inquiry

## **National Science Education (NSES) Content Standards for grades 5-8**

- Content Standard A Science as Inquiry
- Content Standard C, Life Science: Structure and function in living systems; Diversity and adaptations of organisms
- Content Standard F, Science in Personal and Social Perspectives: Personal Health

### **Show Me Standards (Science and Health/Physical Education)**

- Science 3. Characteristics and interactions of living organisms
- Health/Physical Education 1. Structures of, functions of and relationships among human body systems
- Health/Physical Education 2. Principles and practices of physical and mental health
- Health/Physical Education 3. Diseases and methods for prevention, treatment and control
- Health/Physical Education 5. Methods used to assess health, reduce risk factors and avoid high risk behaviors.

### **Vocabulary**

**Alzheimer's disease** - a progressive form of presenile dementia that is similar to senile dementia except that it usually starts in the 40s or 50s; first symptoms are impaired memory which is followed by impaired thought and speech and finally complete helplessness

**Aneurysm** -a cardiovascular disease characterized by a sac-like widening of an artery resulting from weakening of the artery wall

**Arachnoid** - Of or relating to a delicate membrane enclosing the spinal cord and brain.

**Axon** - The usually long process of a nerve fiber that generally conducts impulses away from the body of the nerve cell.

**Brain Stem** - The portion of the brain, consisting of the medulla oblongata, pons Varolii, and midbrain, that connects the spinal cord to the forebrain and cerebrum.

**Central Sulcus** - the sulcus separating the frontal lobe of the cerebral cortex from the parietal lobe called also fissure of Rolando, Rolandic fissure

**Cerebellum** - The tri-lobed structure of the brain, lying posterior to the pons and medulla oblongata and inferior to the occipital lobes of the cerebral hemispheres, that is responsible for the regulation and coordination of complex voluntary muscular movement as well as the maintenance of posture and balance. The second largest part of the brain.

**Cerebrum** - The large rounded structure of the brain occupying most of the cranial cavity, divided into two cerebral hemispheres that are joined at the bottom by the corpus callosum. It controls and integrates motor, sensory, and higher mental functions, such as thought, reason, emotion, and memory.

**Corpus Callosum** - The arched bridge of nervous tissue that connects the two cerebral hemispheres, allowing communication between the right and left sides of the brain.

**Dendrite**- is the part of the nerve cell which conducts impulses toward the cell body

**Dura Mater** - The tough fibrous membrane covering the brain and the spinal cord and lining the inner surface of the skull. It is the outermost of the three meninges that surround the brain and spinal cord.

**Epilepsy** - Any of various neurological disorders characterized by sudden recurring attacks of motor, sensory, or psychic malfunction with or without loss of consciousness or convulsive seizures.

**Fontanelle** - Any of the soft membranous gaps between the incompletely formed cranial bones of a fetus or an infant. Also called soft spot.

**Frontal Lobe** - The largest and most anterior part of each cerebral hemisphere

**Gray Matter** - Brownish-gray nerve tissue, especially of the brain and spinal cord, composed of nerve cell bodies and their dendrites and some supportive tissue.

**Gyri** - Any of the prominent, rounded, elevated convolutions on the surfaces of the cerebral hemispheres

**Hemorrhage** - Excessive discharge of blood from the blood vessels; profuse bleeding.

**Hypothalamus** - The part of the brain that lies below the thalamus, forming the major portion of the ventral region of the diencephalon and functioning to regulate bodily temperature, certain metabolic processes, and other autonomic activities.

**Medulla Oblongata** - The lowermost portion of the vertebrate brain, continuous with the spinal cord, responsible for the control of respiration, circulation, and certain other bodily functions.

**Meninges** - A membrane, especially one of the three membranes enclosing the brain and spinal cord in vertebrates.

**Meningiomas**- A slow-growing tumor of the meninges, occurring most often in adults.

**Midbrain**- the middle of the three primary divisions of the developing vertebrate brain or the corresponding part of the adult brain -- called also *mesencephalon*;

**Multiple Sclerosis**- a demyelinating disease marked by patches of hardened tissue in the brain or the spinal cord and associated especially with partial or complete paralysis and jerking muscle tremor

**Myelin**- A white fatty material, composed chiefly of lipids and lipoproteins, that encloses certain axons and nerve fibers.

**Nervous system** - the bodily system that in vertebrates is made up of the brain and spinal cord, nerves, ganglia, and parts of the receptor organs and that receives and interprets stimuli and transmits impulses to the effector organs

**Neurosurgeon**- A physician who does surgery on the nervous system

**Neurons** - Any of the conducting cells of the nervous system. A typical neuron consists of a cell body, containing the nucleus and the surrounding cytoplasm (perikaryon); several short radiating processes (dendrites); and one long process (the axon), which terminates in twiglike branches (telodendrons) and may have branches (collaterals) projecting along its course.

**Occipital Lobe** - The posterior lobe of each cerebral hemisphere, having the shape of a three-sided pyramid and containing the visual center of the brain.

**Parkinson's Disease**- A progressive nervous disease occurring most often after the age of 50, associated with the destruction of brain cells that produce dopamine and characterized by muscular tremor, slowing of movement, partial facial paralysis, peculiarity of gait and posture, and weakness. Also called **paralysis agitans, shaking palsy**.

**Parietal Lobe** - The middle portion of each cerebral hemisphere, separated from the frontal lobe by the central sulcus, from the temporal lobe by the lateral sulcus, and from the occipital lobe only partially by the parieto-occipital sulcus on its medial aspect.

**Peripheral Nervous System**- The part of the vertebrate nervous system constituting the nerves outside the central nervous system and including the cranial nerves, spinal nerves, and sympathetic and parasympathetic nervous systems.

**Pia Mater** - The fine vascular membrane that closely envelops the brain and spinal cord under the arachnoid and the dura mater.

**Pituitary Gland**- A small oval endocrine gland attached to the base of the vertebrate brain and consisting of an anterior and a posterior lobe, the secretions of which control the other endocrine glands and influence growth, metabolism, and maturation.

**Pons** - A band of nerve fibers on the ventral surface of the brain stem that links the medulla oblongata and the cerebellum with upper portions of the brain.

**Postcentral gyrus** - The anterior convolution of the parietal lobe, bounded in front by the central sulcus and in back by the interparietal sulcus.

**Precentral gyrus** - The posterior convolution of the frontal lobe, bounded in back by the central sulcus and in front by the precentral sulcus.

**Seizures** - A sudden attack or convulsion characterized by generalized muscle spasms and loss of consciousness; it is recurrent in grand mal

**Skull** - the skeleton of the head forming a bony case that encloses and protects the brain and chief sense organs and supports the jaws

**Spinal Cord** - The thick, whitish cord of nerve tissue that extends from the medulla oblongata down through the spinal column and from which the spinal nerves branch off to various parts of the body.

**Stroke** - A sudden loss of brain function caused by a blockage or rupture of a blood vessel to the brain, characterized by loss of muscular control, diminution or loss of sensation or consciousness, dizziness, slurred speech, or other symptoms that vary with the extent and severity of the damage to the brain

**Sulci** - Any of the narrow fissures, groove or depression separating adjacent convolutions or gyri of the brain.

**Suture** - The line of junction or an immovable joint between two bones, especially of the skull.

**Thalamus** - A large ovoid mass of gray matter situated in the posterior part of the forebrain that relays sensory impulses to the cerebral cortex.

**Temporal Lobe** - The lower lateral lobe of either cerebral hemisphere, located in front of the occipital lobe and containing the sensory center of hearing in the brain.

**Transverse fissure** - The cerebrum is separated from the cerebellum by the transverse fissure

**Tumor** - An abnormal growth of tissue resulting from uncontrolled, progressive multiplication of cells and serving no physiological function

**Ventricle** - A small cavity or chamber within a body or organ . Any of the interconnecting cavities of the brain.

**White Matter** - Whitish nerve tissue, especially of the brain and spinal cord, consisting chiefly of myelinated nerve fibers

**Supplemental Materials/Websites:**

Kids Health –Brain and Nervous System

[http://www.kidshealth.org/parent/general/body\\_basics/brain\\_nervous\\_system.html](http://www.kidshealth.org/parent/general/body_basics/brain_nervous_system.html)

Mysterymaster Brain Document

[http://www.mysterymaster.com/links/The\\_Brain.doc](http://www.mysterymaster.com/links/The_Brain.doc)

**AIMS**  
**Anatomy of the Human Brain**  
**Pre/Post Test**

1. The two main components of the Central Nervous System are:  
\_\_\_\_\_ & \_\_\_\_\_
2. Control of voluntary movements of specific body parts is located in this lobe. \_\_\_\_\_
3. The outer layer of the brain or grey matter, that is the highest center of nervous system activity is called the \_\_\_\_\_.
4. The middle meningeal layer, which contains the cerebrospinal fluid, is called the \_\_\_\_\_.
5. The cerebrospinal fluid (CSF) is produced deep within the ventricles of the brain by specialized vessels called the \_\_\_\_\_.
6. The convoluted (folded) surface of the brain is comprised of a system of rounded ridges separated by deep grooves. The elevated ridges are called \_\_\_\_\_, and the grooves are called \_\_\_\_\_.
7. Name the four main lobes of the brain: \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_.
8. The part of the brain involved in the coordination of voluntary motor movements, balance, equilibrium, and muscle tone.  
\_\_\_\_\_
9. This is the term used to describe brain damage caused by a blocked blood vessel or bleeding in the brain. \_\_\_\_\_
10. This is the lower portion of the brain stem which deals with autonomic functions including breathing, blood pressure, and control of heart rate. \_\_\_\_\_
11. Axons of the brain are coated with a fatty substance which helps to speed impulses between neurons and gives “white matter” of the brain its color. This coating is called \_\_\_\_\_.
12. This lobe is responsible for processing sensory stimulation from receptors throughout the body. \_\_\_\_\_

Bonus: Are you interested in a career in medicine, as either a doctor, nurse, or some other member of the healthcare community?  
Y or N

**AIMS**  
**Anatomy of the Human Brain**  
**Pre/Post Test**  
**Answer Sheet**

- 1) Brain      Spinal Cord
- 2) Frontal
- 3) Cerebral Cortex
- 4) Arachnoid
- 5) Choroid Plexus
- 6) Gyri      Sulci
- 7) Frontal   Parietal   Occipital   Temporal
- 8) Cerebellum
- 9) Stroke
- 10) Medulla Oblongata
- 11) Myelin
- 12) Parietal