School Gets On Our Nervous System

Grade Level: 3rd Grade
Written by: Amy Arndt, Crown Pointe Academy, Westminster, CO
Length of Unit: Five lessons (30-50 minutes each)

I. ABSTRACT

This science unit builds student knowledge of the human nervous system through the multi-intelligence approach. Students will gain a better understanding of the functions their bodies play in everyday activities. Students will see themselves as scientists when they explore the brain, spinal cord, and nerves. These young scientists will be able to build, perform, and experiment with their own nervous system. Students will enjoy this unit and at the same time challenge themselves to find out more about the human body.

II. OVERVIEW

A. Concept Objectives (these are taken from the 1995 Colorado Model Content Standards for Science that align with Crown Pointe Academy's standards)
   1. Students know and understand the characteristics and structure of living things. (Standard 3)
   2. Students understand how the body functions and factors that influence its structures and functions. (Standard 3.3)
   3. Students understand the process of scientific investigation. (Standard 1)

B. Content from the *Core Knowledge Sequence,* pg. 82-Grade 3
   1. Brain: medulla, cerebellum, cerebrum, and cerebral cortex
   2. Spinal cord
   3. Nerves
   4. Reflexes

C. Skill Objectives
   1. Students will be able to label the three main parts of the brain-cerebrum, cerebellum, and the medulla.
   2. Students will be able to assess their knowledge from what they knew to what they know by the end of the lesson.
   3. Students will be able to describe as well as distinguish between the functions of the cerebrum, cerebellum, and the medulla.
   4. Students will be able to define reflexes.
   5. Students will be able to define nerves.
   6. Students will be able to define spinal cord.
   5. Students will be able to compare the relationships between reflexes and involuntary muscles using their knowledge from muscular system unit.
   6. Students will be able to use the scientific method to help them answer questions.
   7. Students will be able to create their own model of the central nervous system.
   8. Students will be able to describe how the parts of the nervous system function together as one system.

III. BACKGROUND KNOWLEDGE

A. For Teachers
   1. *What Your Third Grader Needs to Know,* by E.D. Hirsch Jr.
   2. *A True Book:The Nervous System,* by Darlene Stille
   3. *A New True Book: Your Brain and Nervous System,* by Leslie LeMaster
   4. *How Your Body Works: How Do We Think?* by Carol Ballard

B. For Students
   1. Students should have a third grade knowledge of the skeletal system and the muscular system.
   2. Students should know what the spinal cord is from the unit on the skeletal system.
   3. Students should know the location of brain and nerves from first grade in the *Core Knowledge Sequence*.
   4. Students should know how to find topics in an encyclopedia or other resource books.
   5. With help, students should already be able to find information on the Internet.

IV. RESOURCES

A. *What Your Third Grader Needs to Know,* by E.D. Hirsch Jr. (Lessons One and Two)
B. Encyclopedia set (regular or children's) (Lesson One)
C. Student Dictionaries (Lesson One)
D. *A True Book:The Nervous system,* by Darlene Stille (Lessons Two and Three)
E. *The Magic School Bus,* by Joanna Cole and Bruce Degen (Lesson Two)
F. *A New True Book: Your Brain and Nervous System* by Leslie LeMaster (Lessons Three and Four)
G. *How Your Body Works: How Do We Think?* by Carol Ballard (Lesson Four)
H. Model of the brain (Lesson Two)
I. A ball about the size of a tennis ball (Lesson Three)

V. LESSONS

Lesson One: Operation Brain

A. *Daily Objectives*
   1. Concept Objective
      a. Students know and understand the characteristics and structure of living things.
   2. Lesson Content
      a. Brain: medulla, cerebellum, cerebrum, and cerebral cortex
   3. Skill Objective
      a. Students will be able to label the three main parts of the brain-cerebrum, cerebellum, and the medulla.
      b. Students will be able to assess their knowledge from what they knew to what they know by the end of the lesson.

B. *Materials*
   1. Nervous System Pretest (Appendix A), two copies for each student
   2. *What Your Third Grader Needs to Know,* by E.D. Hirsch Jr. (two transparencies of top of page 287, one labeled and one not labeled
   3. Non-labeled picture of the brain, page 287 (one copy for each student)
   4. Encyclopedia set (regular or children's)
   5. Student Dictionaries
   6. Overhead projector
   7. Copy of Appendix B for each student

C. *Key Vocabulary*
   1. Medulla-the lowest part of the brain, where the brain merges into the spinal cord
   2. Cerebellum-the two small wrinkled lobes at the lower rear of the brain; they are involved in making movements smooth and coordinated
   3. Cerebrum-the top part of the brain consisting of the two cerebral hemispheres
   4. Cerebral cortex-the outer layers of the cerebrum

D. *Procedures/Activities*

1. Using the overhead projector, show an unlabeled picture of the brain. A modified picture of the brain from page 287 of *What Your Third Grader Needs to Know,* by E.D. Hirsch, Jr. works great. Some students will start to generate background knowledge. Some students might tell friends that they already know everything about the brain. They may tell about their parents working at a hospital.
2. Give students two to three minutes for oral discussion with their peers.
3. Let students know that you will be studying the nervous system. Tell them that this is one of many systems in the body that makes your body whole.
4. Tell them another system is the skeletal system, which includes all your bones.
5. Ask students if they can name any other systems. Some answers may include the circulatory system (heart, veins, and arteries) or the respiratory system (lungs).
6. While students are looking at the picture, ask them what they think the nervous system is made of (brain, spinal cord, nerves).
7. Remind students that some of them studied the brain in first grade.
9. Students will be able to show you how much they remember by completing Appendix A.
10. When students have completed the worksheet on their own they will be given the opportunity to research the brain using encyclopedias, dictionaries, Internet, and books at a research center.
11. They can record their research on Appendix B. Allow time for recording.
12. Students will replace research material where it belongs.
13. Using the overhead projector and transparency of unlabeled picture of brain, label the parts of the brain that the students were to label.
14. On the overhead, record students' facts randomly as you call on them to read their facts.
15. Students should record information on Appendix B as you review their research on the overhead.

E. *Assessment/Evaluation*

1. Give students a blank copy of Appendix A for them to fill out on their own at their desk.
2. Students will be able to self assess their work as they compare what they did know to what they know now.
3. As students finish their Appendix A (second copy), they may buddy read on the research books (a variety of books you can find on the nervous system).
4. Students may keep their worksheet to use to study for unit test.

Lesson Two: Brainiac

A. *Daily Objectives*

1. Concept Objective(s)
   a. Students understand how the body functions and factors that influence its structures and functions.
2. Lesson Content
   a. Brain: medulla, cerebellum, cerebrum, and cerebral cortex
3. Skill Objective(s)
   a. Students will be able to describe as well as distinguish between the functions of the cerebrum, cerebellum, and the medulla.

B. *Materials*

1. Model of the brain

2. If you do not have a model, use *A True Book: The Nervous System*, by Darlene Stille, page 16 has a great picture
3. Overhead projector with colored markers
4. *What Your Third Grader Needs to Know,* by E.D. Hirsch Jr.
5. *The Magic School Bus: Inside the Human Body,* by Joanna Cole and Bruce Degen
6. Student Dictionary
7. Fact sheet located at research center (Appendix C)
8. All the resource books you can have at a research center (refer to the resources located in the overview portion of this unit plan)

C. *Key Vocabulary*
1. Medulla-the lowest part of the brain, where the brain merges into the spinal cord
2. Cerebellum-the two small wrinkled lobes at the lower rear of the brain; they are involved in making movements smooth and coordinated
3. Cerebrum-the top part of the brain consisting of the two cerebral hemispheres
4. Cerebral cortex-the outer layers of the cerebrum

D. *Procedures/Activities*
1. For an anticipatory set, read *The Magic School Bus: Inside the Human Body* by Joanna Cole and Bruce Degen. You may choose to only read the part on the brain located on pages 24-27.
2. Have students get their notes out from the previous lesson. (Appendix A).
3. Discuss the brain with the students. Let them know the color of the brain (gray). How much it weighs (about 3 pounds). The size of the brain does not determine how smart you are. The brain grows until you are 18 years old.
4. Show students where research books, dictionaries, encyclopedias, and Internet are located, whether they are in class or library.
5. Divide students into three groups. Assign group one the medulla, group two the cerebellum, and group three the cerebrum.
6. Tell students their job is to find the job of the part of the brain that they are assigned to.
7. Tell them that its job will show some sort of action. For example: the job of the nose is to smell.
8. Students should find that the medulla (located at the base of the brain and also called the brain stem) is used to control involuntary muscles of the body such as heartbeat, blood circulation, and breathing.
9. Students should find that the cerebrum (the top of the brain, and largest part) is divided into two halves and controls the voluntary muscles. It also contains certain sections that control thinking, memory, sensations, and emotions.
10. Students should find that the cerebellum (located in the back of the cerebrum) controls your ability to stay balanced while you do your daily activities.
11. Have students regroup when most students are finished.
12. Use the overhead, transparencies, and pictures/model to review the functions of each part of the brain. (Appendix A)
13. Students should record notes from the overhead to the side of their worksheet.
14. Students should keep their sheet to study for their unit test.
15. As an extension, have research materials available at a research center for students to catch up or get ahead for future lessons.
16. Have students write down the facts they found and the book it came from. When the fact sheet is full make a copy for each student to have. (Appendix C)

E. *Assessment/Evaluation*
1. Ask students the following questions:

a. "What would happen if your cerebellum stopped working properly?"
b. "What might happen if your medulla stopped functioning properly?"
c. "What might happen if your cerebrum stopped functioning properly?"

2. Some possible answers are:
   a. "You might have trouble moving or walking."
   b. "Your heart might stop, or you could stop breathing."
   c. "You might not be able to move, think, remember, have certain feelings, see, hear, feel, or taste."

Lesson Three: How it Works

A. *Daily Objectives*

1. Concept Objectives
   a. Students know and understand the characteristics and structure of living things.
   b. Students understand how the body functions and factors that influence its structures and functions.
2. Lesson Content
   a. Nerves
   b. Spinal cord
3. Skill Objectives
   a. Students will be able to define nerves.
   b. Students will be able to define spinal cord.
   c. Students will be able to describe how the parts of the nervous system function together as one system.

B. *Materials*

1. Picture of a nerve (from *A True Book: The Nervous System*, by Darlene Stille, pages 25 and 32)
2. Marker board or chalkboard
3. *A New True Book: Your Brain and Nervous System*, by Leslie LeMaster
4. A ball about the size of a tennis ball labeled "message (Impulse)"
5. *A True Book: The Nervous System,* by Darlene Stille

C. *Key Vocabulary*

1. Nerve cell- cell of the nervous system with fibers that send and receive nerve impulses
2. Impulse-signal or message that that is carried from nerve cell to nerve cell
3. Dendrite-tiny fiber that carries signals toward a nerve cell
4. Spinal cord-long piece of nerve tissue that runs from the brain down through the backbone; it is the connector for the brain to the rest of the body through nerves

D. *Procedures/Activities*

1. Ask an anticipatory question such as, "How does the brain control movement when your hands/feet are so far away from your head?"
2. Draw a model of a brain with a spinal cord on the marker board.
3. Have one student look up the definition for spinal cord.
4. Review with the students that their vertebrae protect their spinal cord.
5. Write the definition of spinal cord on the board.
6. Tell the students that you body has a way to send messages from one part of your body to another. These messages are called impulses.
7. Tell the students that the right side of the brain controls the left side of the body, and the left side of the brain controls the right side of the body.
8. Tell children that many authors compare the nervous system to a busy airport or a computer.

9. Read *A New True Book: Your Brain and Nervous System*, by Leslie LeMaster. Be sure to read Chapter 7: "The Brain and Spinal Cord Work Together."
10. Review that nerves carry messages and connect the body to the brain.
11. Show pictures of nerves that show the fibers, dendrites, axons, and the synapse. (*A True Book: The Nervous System*, by Darlene Stille pages 25 and 32.)
12. Tell students that nerve cells are located all throughout the body.
13. Tell students that there are two types of nerves (motor and sensory).
14. Read page 27 from *A True Book: The Nervous System*, by Darlene Stille.
15. Review that sensory nerves receive messages from eyes, ears, and skin.
16. Review that motor nerves send messages back from the brain and spinal cord that tell the muscles and other organs how to react.
17. Tell the students that the job of the nerve cells is to send and receive messages or impulses from all over your body.
18. Ask students if they can think of any places that might not have nerves. Fingernails and hair are good answers.
19. Write "message, nerve cell, dendrite, synapse, hot surface, hand, brain, and spinal cord" on the board.
20. Assign students to all parts except the message and the synapse. You will need several students to be the nerve cells, and the dendrites. You will need one student for the spinal cord, one student for the hand, one student or yourself for the brain, and one student for the hot surface.
21. Line students up in order from the hot surface to the brain with the empty spaces between the nerve cells being the synapses.
22. Students will send the message (tennis ball) from the hand to the brain. The message will travel from the end of the hand, through the spinal cord to the cerebrum by being **impulsed** (passed) from nerve cell to nerve cell. Don't forget to toss the message between the synapse.
23. Have students go back to seats and explain to them that messages are sent to the brain very fast (about 400 ft. per second).

E. *Assessment/Evaluation*
1. Students will tell you the job of each word you have written on the board except the hot surface.
2. Record students' answers on the board next to the definition.
3. Have the students record the notes from the board (Appendix A) to be able to study for the unit test.
4. Check students' notes to make sure they are studying the correct information.

Lesson Four: Reflexes: Don't Think About It

A. *Daily Objectives*
1. Concept Objectives
   a. Students know and understand the characteristics and structure of living things.
   b. Students understand how the body functions and factors that influence its structures and functions.
   c. Students understand the process of scientific investigation.
2. Lesson Content
   a. Reflexes
   b. Spinal Cord
   c. Brain
3. Skill Objectives
   a. Students will be able to define reflexes.

b. Students will be able to compare the relationship between reflexes and involuntary muscles using their knowledge from muscular system unit.
c. Students will be able to use the scientific method to help them answer questions.

B. *Materials*
1. *How Your Body Works: How Do We Think?* by Carol Ballard, pages 16 and 17 (one copy for each student)
2. One ruler for every two students
3. *A New True Book: Your Brain and Nervous System,* by Leslie LeMaster
4. Appendix D, one copy for each student

C. *Key Vocabulary*
1. Scientific Method-a process scientists use to solve questions or problems
2. Hypothesis-an educated guess
3. Reflex-an automatic reaction that makes your body move correctly and quickly

D. *Procedures/Activities*
1. Ask students if they have ever touched a hot surface. Ask them what they did when they touched it.
2. Tell students that their body has built in safety devices in their bodies.
3. Read *A New True Book: Your Brain and Nervous System,* by Leslie LeMaster, page 29, "Reflex Actions Protect You."
4. Ask students what the difference between an involuntary muscle (previous unit) and reflex is. They might say they are the same. They may not see how they relate at all.
5. Record their answers on the board.
6. Tell students that involuntary muscles work all the time. The heart and lungs are examples of involuntary muscles. They are related in that one does not have to think about them. They happen automatically or without help.
7. Tell students that both reflexes and involuntary movement is produced by the medulla. This way it does not take the time to go all the way to the brain.
8. A reflex happens when your body needs to react to a situation quickly.
9. Tell the students that you are going to do an experiment with them.
10. Pass out Appendix D. Give each student one copy.
11. Review the Scientific Method with your class.
12. We will try to answer which one of my hands (left or right) has the fastest reflex or reaction time. (State the Problem)
13. Pick one student and a ruler to demonstrate the experiment with. This will be done first as the rest of the class watches.
14. Let the students know that they will be doing this experiment in pairs, so they need to pay close attention.
15. Tell the students which hand you write with. (Gathering information)
16. Can they form a hypothesis or guess which hand has the fastest reflex? (Form a hypothesis)
17. (For a picture see handout page 16 & 17) Have the student hold the ruler at the 12-in. end. You will stand with your finger and thumb level with the 0-in., but do not touch the ruler. (Perform Experiment)
18. When the student lets go of the ruler, you must try to catch the ruler as quickly as you can.
19. Look at the number between your finger and thumb where you caught the ruler.
20. Explain to students that it is important to organize data, and write it neatly so others may read the results of their experiment.

21. Record on the board how many inches the ruler dropped before you caught it. (Report Results)
22. Do each hand three times. (Check Results)
23. Were the students' hypotheses correct?
24. Pair students up so they may do this experiment.
25. Pass out a copy of the experiment on pages 16 and 17 from *How Your Body Works: How Do We Think?* by Carol Ballard.
26. Tell students they will be graded on their completeness and neatness of their experiment. (Appendix D)
27. Students are to fill in Appendix D as they work.

E. *Assessment/Evaluation*
1. Students will hand their experiments (Appendix D) to you to grade. Take points off it is illegible or unorganized. Check to see that their answers are in the appropriate spaces.

Lesson Five: Review Day

A. *Daily Objectives*
1. Concept Objectives
   a. Students know and understand the characteristics and structure of living things.
   b. Students understand how the body functions and factors that influence its structures and functions.
2. Lesson Content
   a. Brain: medulla, cerebellum, cerebrum, and cerebral cortex
   b. Spinal cord
   c. Nerves
   d. Reflexes
3. Skill Objectives
   a. Students will be able to create their own model of the central nervous system (brain and spinal cord).

B. *Materials*
1. Five sheets of different colored pale construction paper for each student (pink, yellow, white, light green, and light purple paper will work)
2. Glue

C. *Key Vocabulary*
1. There are no new vocabulary words.

D. *Procedures/Activities*
1. Explain to students that they will make their own nervous system out of torn paper to help them review for the unit test.
2. Students need to use a different color for each of the following: medulla, cerebrum, cerebellum, spinal cord, and nerves.
3. Students need to make their model big enough to record at least three facts about each part.
4. They will write the facts on one side of the model and the name of the part on the other.
5. Complete the review sheet with students to study with (Appendix E).

E. *Assessment/Evaluation*
1. Students will be graded on completeness of the project.
2. Students may use Appendix B to complete their project.
3. Students will be graded on whether or not they have their parts in about the same scale. For example, the brain should not be longer than the spinal cord.

VI. CULMINATING ACTIVITY (Optional)

A. Complete unit test (Appendix F)

VII. HANDOUTS/WORKSHEETS

A. Appendix A: Nervous System Pretest
B. Appendix B: Brain Fact Sheet
C. Appendix C: Research Facts
D. Appendix D: Scientific Method
E. Appendix E: The Nervous System Study Guide and Answer Key
F. Appendix F: The Nervous System Unit Test and Answer Key

VIII. BIBLIOGRAPHY

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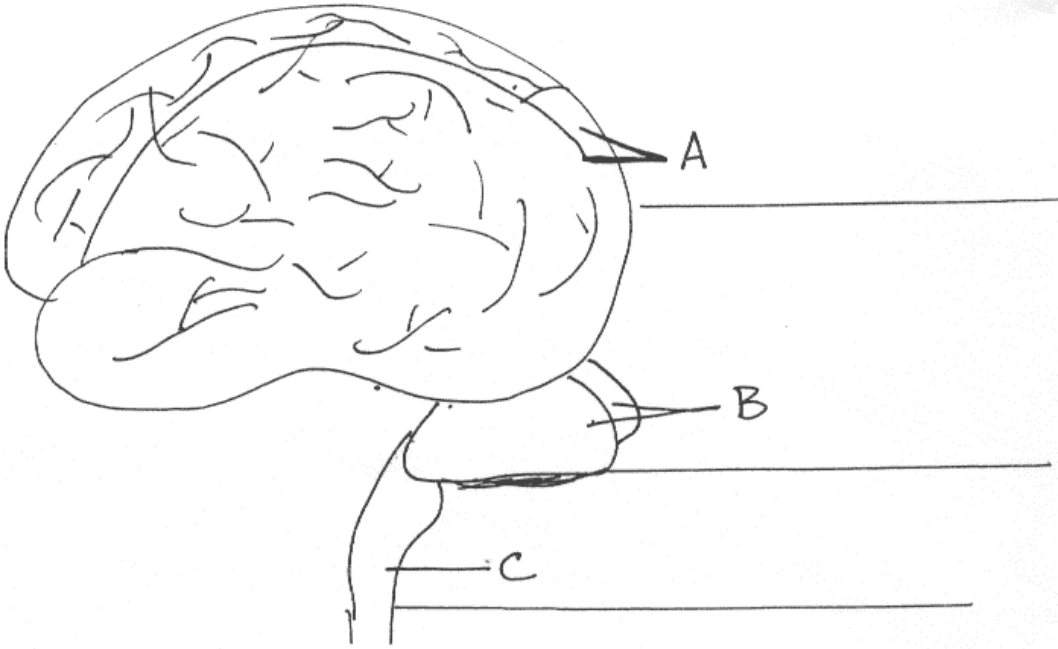
Appendix A-School Gets on My Nervous System
Nervous System Pretest



1. **Label the parts of the brain using the following words.**
   Cerebrum **Cerebellum** **Medulla**

2. **What is the job of the Cerebrum?**

_____

3. **What is the job of the Cerebellum?**

_____

4. **What is the job of the Medulla?**

_____

Votes about the brain:

Appendix B-School Gets on My Nervous System

Cerebrum Facts

1. **Where is it located?** _____

2. **What is the main job of the cerebrum?** _____

_____

3. **An interesting fact about the cerebrum is:** _____

_____

Cerebellum Facts

1. **Where is it located?** _____

2. **What is the main job of the cerebellum?** _____

_____

3. **An interesting fact about the cerebellum is:** _____

_____

Medulla Facts

1. **Where is it located?** _____

2. **What is the main job of the cerebellum?** _____

_____

3. **An interesting fact about the cerebellum is:** _____

_____

Notes on the Nervous System

Appendix C-School Gets on My Nervous System

Research Facts

Name:_____
Interesting Fact:_____
_____
Book Title:_____Pg. #_____
Author(s):_____

Name:_____
Interesting Fact:_____
_____
Book Title:_____Pg. #_____
Author(s):_____

Name:_____
Interesting Fact:_____
_____
Book Title:_____Pg. #_____
Author(s):_____

Name:_____
Interesting Fact:_____
_____
Book Title:_____Pg. #_____
Author(s):_____

Name:_____
Interesting Fact:_____
_____
Book Title:_____Pg. #_____
Author(s):_____

Appendix D-School Gets on My Nervous System

The Scientific Method

Step 1.) State the problem or question.

Step 2.) Gather background information.

Step 3.) Form a hypothesis. (Make an educated guess)

Step 4.) Design and perform an experiment. (Explain what you are going to do).

Name	Right	Hand		Left	Hand	
	Test 1	Test 2	Test 3	Test 1	Test 2	Test 3
1.						
2.						

Step 5.) Report your results. (What is the answer to your problem or question)?

Appendix E-School Gets on My Nervous System

The Nervous System Study Guide

1. _____, _____, and _____are the three main parts of the brain.
2. The largest part of the brain is the _____.
3. The _____(part of the brain) helps our muscles work together.
4. The _____(part of the brain) helps control breathing and heart rate.
5. The _____, _____, and _____ work together to make up the central nervous system.
6. The brain of an adult weighs about _____ pounds.
7. Our brain stops growing by the time we are _____ years old.
8. The _____of our brain has nothing to do with how smart or intelligent we are.
9. Our brain is _____ (color).
10. Signals from the _____ side of our brain control the right side of our body.
11. Signals from the _____side of our brain control the left side of our body.
12. We would probably fall down if we damaged our _____(part of the brain).
13. Which hand (left or right) has the fastest reflex time? _____
14. Another word for hypothesis is a _____.
15. What part of the brain makes a reflex occur? _____

Appendix E, page 2-School Gets on My Nervous System

The Nervous System Study Guide Answer Key

1. Cerebrum, cerebellum, medulla
2. cerebrum
3. cerebrum
4. medulla
5. brain, spinal cord, nerves
6. 3
7. 18
8. size
9. gray
10. left
11. right
12. cerebellum
13. answers will vary
14. guess
15. medulla

Appendix F-School Gets on My Nervous System

Unit Test
The Human Nervous System

Name:_____
Date:_____

True or False

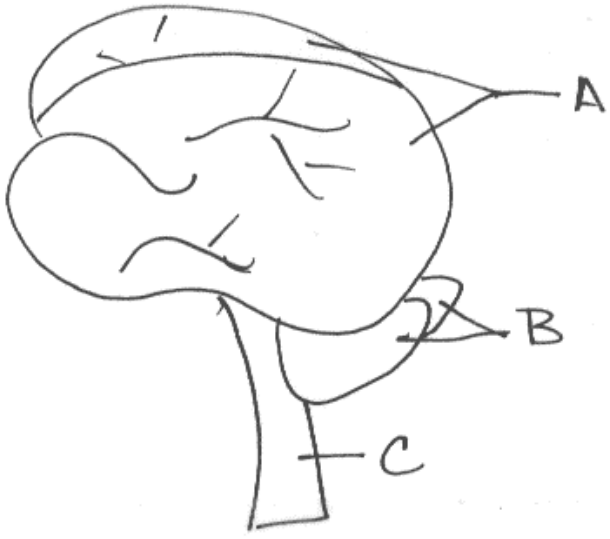
1. T F Our brain never stops growing.
2. T F The size of our brain determines how smart we are.
3. T F Our right side of our brain controls the left side of our body.

Fill in the Blank

4. Hypothesis also means _____.
5. The _____, _____, and _____ work together to make our central nervous system.
6. Our brain is _____. (color)
7. _____, _____, and _____ are the three main parts of the brain.
8. An adult brain is about _____ pounds.

Labeling: Look at the diagram below.

9. What part of the brain is A?_____
10. What is part A's job?_____
11. What part of the brain is B?_____
12. What is part B's job?_____
13. What part of the brain is C?_____
14. What is part C's job?_____



Appendix F, page 2-School Gets on My Nervous System

Unit Test
The Human Nervous System Answer Key

1. False
2. False
3. True
4. guess
5. brain, spinal cord, nerves
6. gray
7. Cerebrum, cerebellum, medulla
8. 3
9. cerebrum
10. controls body movements
11. cerebellum
12. balance
13. medulla
14. controls involuntary organs and reflexes