



Lesson Summary: Scientists regularly use microscopes, recording and synthesizing their observations in a lab notebook. Students view slides of brain tissue under a microscope, describe and identify neuronal structures resulting from their observations.

Grade Level 5-12

Lesson Length
1 class period

Standards Alignment

Next Generation Science Standards

- 5-PS1-1. Develop a model to describe that matter is made of particles too small to be seen.
- MS-LS1-1. Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells.
- MS-LS1-2. Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function.
- **Framework for K-12 Science Education:** Science & Engineering Practices 1,3,7,8

National Science Standards – Project 2061: Atlas of Science Literacy reference

- a) Scientific inquiry: Evidence and reasoning in inquiry – observations and evidence (p.17, Atlas Vol. 1)
Research on student learning: “Middle-school students tend to invoke personal experiences as evidence to justify a particular hypothesis. They seem to think of evidence as selected from what is already known or from personal experience or second-hand sources, not as information produced by experiment.” (p.72, Atlas Vol. 1)
- b) Cells: Cell functions – basic needs and basic functions (p. 73, Atlas Vol. 1)
Research on student learning: “Preliminary research indicates that it may be easier for students to understand that the cell is the basic unit of structure (which they can observe) than that the cell is the basic unit of function (which has to be inferred from experiments.” (p.72, Atlas Vol. 1)

Objectives—Students will be able to

- identify slides of cerebrum, cerebellum, and spinal cord under a microscope.
- distinguish between images based on written descriptions.
- demonstrate appropriate use of a microscope using different magnification.
- develop verbal and written skills in description and observation.

Assessment Options

- Draw and label different parts of the cerebrum, cerebellum, and spinal cord under the microscope.
- Compare and contrast between the written descriptions and the students’ descriptions of the actual structure.
- Use a microscope during observations.



Terms

- axon – single extension connected to the neuron the fiber-like part of a neuron that sends the signal/message away from the cell body and towards target cells/neurons
- cell body (soma) – the core part of the neuron that decides whether or not to send a signal/message along the axon and contains the nucleus
- cerebellum – structure located at the roof of the hindbrain that helps control movement, balance, and muscle coordination
- cerebrum (cortex) – the outer gray layer of the cerebral hemispheres that is responsible for all forms of conscious experience including perception, emotion, thought, and planning
- dendrite – tree-like extension of the neuron cell body that receives a signal/message from other neurons
- dorsal horn – dorsal (top) part of spinal cord gray matter where axons from sensory neurons enter and make their first synapses
- ganglion/ganglia – a group or collection of nerve cell bodies
- myelin – compact fatty material that surrounds axons of some neurons; acts as an insulator to enhance electrical conduction of action potentials
- neuron – basic functional unit of the nervous system, also called a nerve cell
- Purkinje cells – cell body layers of large, single neurons that send messages to other areas of the brain that influence or refine movement
- spinal cord – part of the central nervous system that runs inside the backbone
- ventral horn - ventral (bottom) part of spinal cord gray matter containing large motor neuron cell bodies

Materials (for each group of students)

- light microscopes with 4x-20x power available
- one slide each of the following, numbered as indicated:
 - #1 Mammalian Spinal Cord (H1550, 31-3726 Carolina Biological)
 - #2 Mammalian Spinal Ganglion and nerve (31-3792 Carolina Biological)
 - #3 Mammalian Cerebrum (H-1490, 31-3624 Carolina Biological)
 - #4 Mammalian Cerebellum (H1510, 31-36666 Carolina Biological)
 - #5 Mammalian Cerebellum stained w/ Calbindin (purple writing surface)

Engage and Explore

1. Inform students that they will be using a microscope to look at neurons in different parts of the nervous system.
2. Place copies of “How to Use a Microscope” next to the students' stations along with the slides.
3. Allow students some time to go over the instructions and manipulate the microscope.
4. Distribute the lab guide.



Teacher Guide

Close-up of the Nervous System

Develop Questions

1. Encourage students to discuss their observations among each other and with the group.
2. Allow students to share any questions about their observations.

Explore and Explain

1. If available, use a video-scope and projector/television to display each slide up in front of the class. If one is not available, draw a basic outline of each slide on the board.
2. Ask students to describe what the slides show as they view the screen or the board.

Expand

1. Tell students to locate an entire neuron and determine the neuron parts they see.
2. Ask how the students know what a neuron should look like under the microscope.

Do all neurons look alike?

No two are perfectly identical. Neurons from different areas of brain or even from the same region often have very different branching patterns.

Do all neurons always have all the same parts?

No, some are missing dendrites; some have branched axons that act both to receive and send signals; some are missing axons.

Does every part of the nervous system have synapses in it?

No, bundles of axons running together - whether myelinated or not - do not have synapses between them.