# **Unit 4: Nervous/Endocrine System**

Content Area:	
Course(s):	
Time Period:	
Length:	
Status:	

): Anatomy and Physiology iod: Second Marking period 3 Weeks Published

Science

# **Unit Overview**

The brain, spinal cord and endocrine system are the three controlling systems of the body. Each system plays a specific role, but all systems works together to provide for balance and coordination.

The nervous system is the body's fast-acting master control center. It monitors changes inside and outside the body, integrates sensory input, and quickly generates an appropriate feedback response. Working together with the slower-acting endocrine system, which is the body's second most important regulating system, the nervous system is able to constantly regulate and maintain homeostasis within narrow limits that are necessary for proper physiological functioning. This chapter looks at both the structural and functional classifications of the nervous system, first separately and then as an integrated whole, to help students conceptua-lize the complexity of this system.

# **STAGE 1- DESIRED RESULTS**

# Standards- 2020 New Jersey Student Learning Standards- Science

SCI.9-12.HS-LS1-2	Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
SCI.9-12.HS-LS1-3	Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.

# **Science and Engineering Practices**

- Analyzing and Interpreting Data
- Asking Questions and Defining Problems
- Constructing Explanations and Designing Solutions
- Engaging in Argument from Evidence

# **Cross Cutting Concepts**

- Cause and Effect
- Interdependence of Science, Engineering, and Technology
- Structure and Functions

#### **Disciplinary Core Ideas**

#### **Physical Sciences**

#### **Life Sciences**

- LS1A: Structure and Functions
- LS1B: Growth and Development of Organisms
- LS1D: Information Processing
- LS3A: Inheritance of Traits
- LS3B: Variation of traits

#### **Earth and Space Sciences**

# **Engineering. Technology. and Applications of Science**

• ETS1B: Developing Possible Solutioins

#### **Essential Questions**

- What distinguishes the types of nerve cells from one another ?
- How do impulses travel throughout the human body?
- How do the general features of the CNS and PNS affect physiological activites?
- How does the human body interpret stimuli?
- How do common nervous system disorders affect homeostasis ?
- How does negative feedback regulate hormone production ?
- What is the result of hormone production in the human body?
- How do general endocrine disorders affect homeostasis?

# **Enduring Understanding**

- The brain and spinal cord have the fastest impulse speed and the most localized effect.
- The endocrine system employs hormones, is slower and has a generalized effect, often over a long period of time.
- Each system demonstrates the principle that structure often determines function in a body system.

# Students will know...

## **Vocabulary Definitions:**

Students will know the following vocabulary definitions: Central Nervous System, Peripheral Nervous System, Sensory Nerves, Motor Nerves, Somatic and Autonomic Nervous system, Parasympathetic and Sympathetic Nervous System, Hormone Action, Control of Hormone Release, Major Endocrine Organs, Major Endocrine glands.

## **Misconceptions:**

Students will be made aware that the Nervous System does not work by itself, but works closely with other organ systems for full functioning of the human body.

Students will understand that nerves are not restricted to just the brain and the spinal cord.

Students will realize that the signaling device or means of communicating within the body cells is through electrical impulses.

Students will understand that the Nervous system does not work alone to regulate and maintain body homeostasis; the endocrine system is the second most important regulating system.

# Students will be able to...

- Interpret interactions among hormones, nerves which makes possible the coordination of functions of the body.
- Discuss the role of neurotransmitters in neuron function.
- Analyze the role of drugs in affecting inhibitory and excitatory neuron function (cocaine, nicotine, alcohol).
- Differentiate between the Central and Peripheral Nervous System.
- Analyze the process by which Endocrine System regulates both biochemical and physiological

pathways in the human body.

## **STAGE 2- EVIDENCE OF LEARNING**

#### **Formative Assessment**

- 3- Minute Pause
- A-B-C Summaries
- Analogy Prompt
- Choral Response
- Debriefing
- Exit Card / Ticket
- Hand Signals
- Idea Spinner
- Index Card Summaries
- Inside-Outside Circle Discussion (Fishbowl)
- Journal Entry
- Misconception Check
- Observation
- One Minute Essay
- One Word Summary
- Portfolio Check
- Questions & Answers
- Quiz
- Self-Assessment
- Student Conference
- Think-Pair-Share
- Web or Concept Map

## **Authentic Assessments**

Homework

Student class participation

Laboratory results

Sheep Brain Dissection

Case studies

Model how a particular drug affects neurons and behavio

Label diagrams

Reflex Lab

Research on drug

Caffeine Lab

#### **Benchmark Assessments**

Unit test on Nervous and Endocrine system.

#### **STAGE 3- LEARNING PLAN**

#### **Instructional Map**

- Show how quickly a reaction can take place to demonstrate the speed at which the brain is able to process sensory information and react to the environment. A good demonstration is throwing a ball softly to a student without prior warning. (This can be combined with lecture hint #1.)
- Demonstrate a knee-jerk reflex. Ask for a student volunteer to come to the front of the class to assist you with the demonstration. Tap their knee with a reflex hammer and note the response. If the student

is nervous and appears to be holding the knee still, distract them by asking them to look at one of their classmates off to the side, then tap their knee and note the difference in response.

- Demonstrate a few other reflexes commonly used as diagnostic tools in medicine, such as Babinski's reflex, the biceps reflex, and Chaddock's reflex.
- Take a sheet of paper and have students note the length. Start crumpling the paper and have students note the paper is shorter, and then crumple up the paper further to demonstrate how the same amount or paper (analogous to brain tissue) can take up less space. Relate this to the concept that higher mental capacity animals have more 'wrinkled' brains. Have on hand a human brain and other animal brains/models for demonstration such as a sheep and a mouse brain. Students will be able to directly observe more gyri and sulci, and also a higher brain size to body size ratio.
- Use a 3-D model of a neuron to point out structural characteristics and organelles of nerve cells. Use in conjunction with a micrograph of a neuron.
- Invite a pharmacist to discuss the effects of selected drugs on the brain and nervous system. Include some of the more common street drugs, such as alcohol and cocaine, on the discussion list.

# **Modification/Differentiation of Instruction**

Differentiation Strategies for Special Education Students

- Remove unnecessary material, words, etc., that can distract from the content
- Use of off-grade level materials
- Provide appropriate scaffolding
- Limit the number of steps required for completion
- Time allowed
- Level of independence required
- Tiered centers, assignments, lessons, or products
- Provide appropriate leveled reading materials
- Deliver the content in "chunks"
- Varied texts and supplementary materials
- Use technology, if available and appropriate
- Varied homework and products
- Varied questioning strategies
- Provide background knowledge
- Define key vocabulary, multiple-meaning words, and figurative language.
- Use audio and visual supports, if available and appropriate
- Provide multiple learning opportunities to reinforce key concepts and vocabulary
- Meet with small groups to reteach idea/skill
- Provide cross-content application of concepts
- Ability to work at their own pace
- Present ideas using auditory, visual, kinesthetic, & tactile means
- Provide graphic organizers and/or highlighted materials
- Strategy and flexible groups based on formative assessment

• Differentiated checklists and rubrics, if available and appropriate

#### Differentiation Strategies for Gifted and Talented Students

- Increase the level of complexity
- Decrease scaffolding
- Variety of finished products
- Allow for greater independence
- Learning stations, interest groups
- Varied texts and supplementary materials
- Use of technology
- Flexibility in assignments
- Varied questioning strategies
- Encourage research
- Strategy and flexible groups based on formative assessment or student choice
- Acceleration within a unit of study
- Exposure to more advanced or complex concepts, abstractions, and materials
- Encourage students to move through content areas at their own pace
- After mastery of a unit, provide students with more advanced learning activities, not more of the same activity
- Present information using a thematic, broad-based, and integrative content, rather than just singlesubject areas

#### Differentiated Strategies for ELL Students

- Remove unnecessary materials, words, etc., that can distract from the content
- Provide appropriate scaffolding
- Limit the number of steps required for completion
- Gradually increase the level of independence required
- Tiered centers, assignments, lessons, or products
- Provide appropriate leveled reading materials
- Deliver the content in "chunks"
- Varied texts and supplementary materials, including visuals
- Use technology, if available and appropriate
- Differentiate homework and products
- Varied questioning strategies
- Provide background knowledge
- Define key vocabulary, multiple-meaning words, and figurative language.
- Use audio and visual supports, if available and appropriate
- Provide multiple learning opportunities to reinforce key concepts and vocabulary
- Meet with small groups to reteach idea/skill

- Provide cross-content application of concepts
- Allow students to work at their own pace
- Presenting ideas through auditory, visual, kinesthetic, & tactile means
- Role play
- Provide graphic organizers, highlighted materials
- Strategy and flexible groups based on formative assessment

#### Differentiation Strategies for At Risk Students

- Remove unnecessary materials, words, etc., that can distract from the content
- Provide appropriate scaffolding
- Limit the number of steps required for completion
- Gradually increase the level of independence required
- Tiered centers, assignments, lessons, or products
- Provide appropriate leveled reading materials
- Deliver the content in "chunks"
- Varied texts and supplementary materials
- Use technology, if available and appropriate
- Differentiate homework and products
- Varied questioning strategies
- Provide background knowledge
- Define key vocabulary, multiple-meaning words, and figurative language
- Use audio and visual supports, if available and appropriate
- Provide multiple learning opportunities to reinforce key concepts and vocabulary
- Meet with small groups to reteach idea/skill
- Provide cross-content application of concepts
- Presenting ideas through auditory, visual, kinesthetic, & tactile means
- Provide graphic organizers and/or highlighted materials
- Strategy and flexible groups based on formative assessment

#### 504 Plans

Students can qualify for 504 plans if they have physical or mental impairments that affect or limit any of their abilities to:

- walk, breathe, eat, or sleep
- communicate, see, hear, or speak
- read, concentrate, think, or learn
- stand, bend, lift, or work

Examples of accommodations in 504 plans include:

- preferential seating
- extended time on tests and assignments
- reduced homework or classwork
- verbal, visual, or technology aids
- modified textbooks or audio-video materials
- behavior management support
- adjusted class schedules or grading
- verbal testing
- excused lateness, absence, or missed classwork
- pre-approved nurse's office visits and accompaniment to visits
- occupational or physical therapy

## **Modification Strategies**

- Cooperative Grouping
- Extended Time
- Frequent Breaks
- Highlighted Text
- Interactive Notebook
- Modified Test
- Oral Directions
- Peer Tutoring
- Preferential Seating
- Re-direct
- Repeated Drill and Practice
- Shortened Assisgnment
- Teacher Notes
- Tutorials
- Use of Additional Reference Materials
- Use of Audio Resources

## **Differentiation Strategies**

# **High Preparation**

- Alternative Assessments
- Choice Boards
- Games and Tournaments
- Group Investigations
- Guided Reading
- Independent Research / Project
- Interest Groups
- Learning Contracts
- Leveled Rubrics
- Literature Circles
- Multiple Intelligence Options
- Multiple Texts
- Personal Agendas
- Project Based Learning (PBL)
- Stations / Centers
- Think-Tac-Toe
- Tiered Activities / Assignments
- Varying Graphic Organizers

#### **Low Preparation**

- Choice of Book / Activity
- Cubing Activities
- Exploration by Interest (using interest inventories)
- Flexible Grouping
- Goal Setting With Student
- Homework Options
- Jigsaw
- Mini Workshops to Re-teach or Extend Skills
- Open-ended Activities
- Think-Pair-Share by Readiness, Interest, or Learning Style
- Use of Collaboration
- Use of Reading Buddies
- Varied Journal Prompts

- Varied Product Choice
- Varied Supplemental Materials
- Work Alone / Together

# **Horizontal Intergration- Interdisciplinary Connections**

See Appendix

# **Vertical Integration- Discipline Mapping**

Science classes are designed around the Performance Expectations, Science and Engineering Practices, Disciplinary Core Ideas, and Crosscutting Concepts in the NGSS. In grade 6, students complete a unit on "Diversity of Life". This leads into "Populations and Ecosystems" in grade 7. In grade 8, students study "Human Systems Interactions" and "Heredity and Adaptations." Following Biology in 9th grade, students take Chemistry in 10th grade. Then, students have taken this full year course of Human Anatomy and Physiology. Anatomy and Physiology being a full year course will focus on having students gain a deeper understanding of the Performance Expectations outlined in the NGSS, particularly in Life Sciences and Engineering Design. Following this course, students will have the option to choose from Physics, Human Impact on the Environment, Forensics and Zoology.

## **Additional Materials**

Online Resources:

http://www.pbs.org/wgbh/nova/mind/probe.html.

http://www.pbs.org/wgbh/nova/mind.

Show a 10-minute clip of Lorenzo's Oil, Regarding Henry, or Awakenings and engage the students in a class discussion.

Show the PBS video "How Smart Can We Get?" and have them discuss related concepts discussed in the video: <u>http://www.pbs.org/wgbh/nova/body/how-smart-can-we-get.html</u>