

# Unit #4: Nervous System & Special Senses

Content Area: **Science**  
 Course(s): **Anatomy and Physiology**  
 Time Period: **Second Marking period**  
 Length: **6 Weeks**  
 Status: **Published**

## Unit Overview

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This chapter begins with an overview of the functions of the nervous system and then explores in more detail how those functions are carried out and what anatomical features make that possible. The nervous system is the body's fast-acting master control center. It monitors changes inside and outside of the body, integrates sensory input and quickly generates an appropriate feedback response. The special senses play an integral role in collecting information to be sent to the central nervous system for processing.

## STAGE 1- DESIRED RESULTS

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## Educational Standards

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### 2020 New Jersey Student Learning Standards- Science

## Performance Expectations

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## Life Sciences

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

## Science and Engineering Practices

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- Practice 1: Asking Questions and Defining Problems
- Practice 2: Developing and Using Models
- Practice 3: Planning and Carrying Out Information
- Practice 4: Analyzing and Interpreting Data
- Practice 5: Using Mathematics and Computational Thinking
- Practice 6: Constructing Explanations and Designing Solutions
- Practice 7: Engaging in Argument from Evidence
- Practice 8: Obtaining, Evaluating, and Communicating Information

## Cross Cutting Concepts

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- Cause and Effect
- Scale, Proportion, and Quantity
- Systems and System Models
- Energy and Matter
- Stability and Change

## Disciplinary Core Ideas

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## Life Sciences

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- LS1.A: Structure and function
- LS1.B: Growth and development of organisms
- LS1.C: Growth and development of organisms

## Essential Questions

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- What are the general functions of the nervous system?
- How is the nervous system organized (structurally & functionally)?
- What are the functions of the different tissue types?
- How does a neuron's structure relate to its function?
- What are the components of a reflex arc?

- How do impulses travel throughout the human body?
- How do the features of the CNS and PNS affect physiological activities?
- How does the human body interpret stimuli?
- How do common nervous system disorders affect homeostasis?
- How do the special senses respond to different types of stimuli?
- How does the body recover from “fight or flight”?
- How does the body maintain balance?

### **Enduring Understanding**

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- The brain and spinal cord have the fastest impulse speed and the most localized effect.
- Nerve signals are one-way communication.
- Special senses relay chemical, mechanical or photon stimuli to the CNS for processing.
- Each system demonstrates the principle that structure determines function in a body system.

### **Students will know...**

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#### **Vocabulary Definitions:**

central nervous system, peripheral nervous system, sensory (afferent) neurons, motor (efferent) neurons, interneurons, neuroglia (astrocytes, oligodendrocytes, Schwann cells, satellite cells, ependymal cells, microglia), somatic & autonomic nervous system, parasympathetic & sympathetic nervous system, receptor, photoreceptor, mechanoreceptor, chemoreceptor

#### **Predictable misconceptions:**

- Students may assume that the nervous system works independently, controlling all bodily functions with no feedback.
- Students may assume that cranial nerves are part of the central nervous system.
- Students may assume that a travelling action potential is different from the electricity they are familiar with.
- Students may assume that sensory organs work by themselves without the aid of the brain.
- Students may assume that all sensory organs have similar receptors.

- Students may assume that the external ear alone plays a role in hearing.
- Students may assume that balance of the human body is not a function of the ear.

### **Students will be able to...**

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- List the organs and divisions of the nervous system and describe the generalized functions of the system as a whole.
- Identify the major types of cells in the nervous systems and discuss the function of each.
- Identify the anatomical and functional components of a three-neuron reflex arc. Compare and contrast the propagation of a nerve impulse along a nerve fiber and across a synaptic cleft.
- Identify the major anatomical components of the brain and spinal cord and briefly comment on the function of each.
- Compare and contrast spinal and cranial nerves.
- Discuss the anatomical and functional characteristics of the two divisions of the autonomic nervous system.

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

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### **Formative Assessment Suggestions**

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- 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 Suggestions**

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1. label structures and identify their functions using drawing and online interactive models
2. Code Fred - game to explore the effects of the sympathetic nervous nervous system
3. research in groups to identify the structure, location & function of each neuroglia
4. analyze, identify components and draw a model of a specific reflex arc (regulating body temperature, blood pressure, etc)
5. phet neuron simulation - answer guiding questions
6. reflex vs reaction lab - test each other's responses and identify them as reflex or reaction
7. build brain-mapping models and use them to answer questions
8. sheep dissection lab (online model available)
9. eye, ear, smell & taste - videos and questions
10. vision lab - test & analyze distance and color vision
11. smell lab - test & analyze smell

### **Benchmark Assessments**

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- chapter 7 test: nervous system
- chapter 8 test: special senses

## **STAGE 3- LEARNING PLAN**

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### **Instructional Map**

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- organization of the nervous system
- sympathetic vs parasympathetic response
- nerve tissue: structure & function
- central nervous system
- peripheral nervous system
- autonomic vs somatic
- anatomy & physiology of vision
- anatomy & physiology of the hearing & equilibrium
- anatomy & physiology of taste
- anatomy & physiology of smell
- anatomy & physiology of touch

### **Modifications/Differentiation of Instruction**

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#### 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 single-subject 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

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- Extended Time
- Frequent Breaks
- Highlighted Text
- Interactive Notebook
- Modified Test
- Oral Directions
- Peer Tutoring
- Preferential Seating
- Re-Direct

- Repeated Drill / Practice
- Shortened Assignments
- Teacher Notes
- Tutorials
- Use of Additional Reference Material
- Use of Audio Resources

## **High Preparation Differentiation**

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

## **Low Preparation Differentiation**

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- Choice of Book / Activity
- Cubing Activities
- Exploration by Interest (using interest inventories)
- Flexible Grouping
- Goal Setting With Student
- Homework Options
- Jigsaw

- Mini Workshops to Extend Skills
- Mini Workshops to Re-teach
- Open-ended Activities
- Think-Pair-Share by Interest
- Think-Pair-Share by Learning Style
- Think-Pair-Share by Learning Style
- Think-Pair-Share by Readiness
- Use of Collaboration
- Use of Reading Buddies
- Varied Journal Prompts
- Varied Product Choice
- Varied Supplemental Materials
- Work Alone / Together

## **Horizontal Integration- Interdisciplinary Connections**

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See Appendix

## **Vertical Integration- Discipline Mapping**

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Prerequisites: Students who wish to take Honors Anatomy & Physiology should have earned an A or B in both Biology and Chemistry courses.

Students who have successfully completed Honors Anatomy & Physiology are encouraged to enroll in: Physics, Zoology, Forensics or Human Impact on the Environment

## **Additional Materials**

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Textbook : Essentials of Human Anatomy & Physiology 11e, Elaine N. Marieb masteringandp.com

Internet Resources

How does anesthesia work? [https://youtu.be/B\\_tTymvDWXk?list=PLwwwk1\\_KCIU\\_WreVj90u\\_a1yY-i3DQlv9](https://youtu.be/B_tTymvDWXk?list=PLwwwk1_KCIU_WreVj90u_a1yY-i3DQlv9)

Could your brain repair itself?

[https://www.youtube.com/watch?v=9D1AwQ0ITsg&index=12&list=PLwwwk1\\_KCIU\\_WreVj90u\\_a1yY-i3DQlv9&t=3s](https://www.youtube.com/watch?v=9D1AwQ0ITsg&index=12&list=PLwwwk1_KCIU_WreVj90u_a1yY-i3DQlv9&t=3s)

What if we could look inside human brains?

[https://www.youtube.com/watch?v=sewhbmh0ECg&index=21&list=PLwwwk1\\_KCIU\\_WreVj90u\\_a1yY-i3DQlv9&t=4s](https://www.youtube.com/watch?v=sewhbmh0ECg&index=21&list=PLwwwk1_KCIU_WreVj90u_a1yY-i3DQlv9&t=4s)

How do nerves work? [https://www.youtube.com/watch?v=uU\\_4uA6-zcE&index=34&list=PLwwwk1\\_KCIU\\_WreVj90u\\_a1yY-i3DQlv9&t=3s](https://www.youtube.com/watch?v=uU_4uA6-zcE&index=34&list=PLwwwk1_KCIU_WreVj90u_a1yY-i3DQlv9&t=3s)

The unfixed brain [https://www.youtube.com/watch?v=jHxyP-nUhUY&index=36&list=PLwwwk1\\_KCIU\\_WreVj90u\\_a1yY-i3DQlv9&t=9s](https://www.youtube.com/watch?v=jHxyP-nUhUY&index=36&list=PLwwwk1_KCIU_WreVj90u_a1yY-i3DQlv9&t=9s)

How we see color? [https://www.youtube.com/watch?v=jHxyP-nUhUY&index=36&list=PLwwwk1\\_KCIU\\_WreVj90u\\_a1yY-i3DQlv9&t=9s](https://www.youtube.com/watch?v=jHxyP-nUhUY&index=36&list=PLwwwk1_KCIU_WreVj90u_a1yY-i3DQlv9&t=9s)

The Nervous System, Part 1: Crash Course A&P #8 [https://www.youtube.com/watch?v=jHxyP-nUhUY&index=36&list=PLwwwk1\\_KCIU\\_WreVj90u\\_a1yY-i3DQlv9&t=9s](https://www.youtube.com/watch?v=jHxyP-nUhUY&index=36&list=PLwwwk1_KCIU_WreVj90u_a1yY-i3DQlv9&t=9s)

The Nervous System, Part 2 - Action! Potential!: Crash Course A&P #9 [https://www.youtube.com/watch?v=OZG8M\\_IdA1M&list=PLK6OXn46jYQIU1MYIxcShx4\\_6mfPZ6j&index=2](https://www.youtube.com/watch?v=OZG8M_IdA1M&list=PLK6OXn46jYQIU1MYIxcShx4_6mfPZ6j&index=2)

The Nervous System, Part 3 - Synapses!: Crash Course A&P #10 [https://www.youtube.com/watch?v=VitFvNvRIIY&list=PLK6OXn46jYQIU1MYIxcShx4\\_6mfPZ6j&index=3](https://www.youtube.com/watch?v=VitFvNvRIIY&list=PLK6OXn46jYQIU1MYIxcShx4_6mfPZ6j&index=3)

Central Nervous System: Crash Course A&P #11 [https://youtu.be/q8NtmDrb\\_qo?list=PLK6OXn46jYQIU1MYIxcShx4\\_6mfPZ6j](https://youtu.be/q8NtmDrb_qo?list=PLK6OXn46jYQIU1MYIxcShx4_6mfPZ6j)

Peripheral Nervous System: Crash Course A&P #12 [https://youtu.be/QY9NTVh-Awo?list=PLK6OXn46jYQIU1MYIxcShx4\\_6mfPZ6j](https://youtu.be/QY9NTVh-Awo?list=PLK6OXn46jYQIU1MYIxcShx4_6mfPZ6j)

Autonomic Nervous System: Crash Course A&P #13 [https://www.youtube.com/watch?v=71pCilo8k4M&index=6&list=PLK6OXn46jYQIU1MYIxcShx4\\_6mfPZ6j](https://www.youtube.com/watch?v=71pCilo8k4M&index=6&list=PLK6OXn46jYQIU1MYIxcShx4_6mfPZ6j)

Sympathetic Nervous System: Crash Course A&P #14 [https://www.youtube.com/watch?v=0IDgBICHVsA&list=PLK6OXn46jYQIU1MYIxcShx4\\_6mfPZ6j&index=7](https://www.youtube.com/watch?v=0IDgBICHVsA&list=PLK6OXn46jYQIU1MYIxcShx4_6mfPZ6j&index=7)

Parasympathetic Nervous System: Crash Course A&P #15 [https://www.youtube.com/watch?v=qqU-VjqczE&index=8&list=PLK6OXn46jYQIU1MYIxcShx4\\_6mfPZ6j](https://www.youtube.com/watch?v=qqU-VjqczE&index=8&list=PLK6OXn46jYQIU1MYIxcShx4_6mfPZ6j)

Taste & Smell: Crash Course A&P #16 <https://www.youtube.com/watch?v=mFm3yA1nslE&t=406s>

Hearing & Balance: Crash Course A&P #17 <https://www.youtube.com/watch?v=le2j7GpC4JU&t=470s>

Vision: Crash Course A&P #18 <https://www.youtube.com/watch?v=o0DYP-u1rNM>