Anatomy Unit 3: Integration and Coordination - Nervous, Sensory, and Endocrine

Content Area: **Science**
Course(s): **Anatomy and Physiology**
Time Period: **MP3**
Length: **45 days**
Status: **Published**

NJSLS - Science

SCI.HS-LS1-4	Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.
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.
SCI.HS-LS1-1	Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells.

Science and Engineering Practices

Developing and Using Models

Develop and use a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-LS1-2)

Use a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-LS1-4)

Planning and Carrying Out Investigations

Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly. (HS-LS1-3)

Constructing Explanations and Designing Solutions

Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (HS-LS1-1)

Scientific Investigations Use a Variety of Methods

Scientific inquiry is characterized by a common set of values that include: logical thinking, precision, open-mindedness,

objectivity, skepticism, replicability of results, and honest and ethical reporting of findings. (HS-LS1-3)

Disciplinary Core Ideas

LS1.A: Structure and Function

Systems of specialized cells within organisms help them perform the essential functions of life. (HS-LS1-1)

All cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the instructions that code for the formation of proteins, which carry out most of the work of cells. (HS-LS1-1)

Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level. (HS-LS1-2)

Feedback mechanisms maintain a living system's internal conditions within certain limits and mediate behaviors, allowing it to remain alive and functional even as external conditions change within some range. Feedback mechanisms can encourage (through positive feedback) or discourage (negative feedback) what is going on inside the living system. (HS-LS1-3)

LS1.B: Growth and Development of Organisms

In multicellular organisms individual cells grow and then divide via a process called mitosis, thereby allowing the organism to grow. The organism begins as a single cell (fertilized egg) that divides successively to produce many cells, with each parent cell passing identical genetic material (two variants of each chromosome pair) to both daughter cells. Cellular division and differentiation produce and maintain a complex organism, composed of systems of tissues and organs that work together to meet the needs of the whole organism. (HS-LS1-4)

Crosscutting Concepts

Systems and System Models

Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions—including energy, matter, and information flows—within and between systems at different scales. (HS-LS1-2), (HS-LS1-4)

Structure and Function

Investigating or designing new systems or structures requires a detailed examination of the properties of different materials, the structures of different components, and connections of components to reveal its function and/or solve a problem. (HS-LS1-1)

Stability and Change

Feedback (negative or positive) can stabilize or destabilize a system. (HS-LS1-3)

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Rationale and Transfer Goals

In order to survive the human body must evaluate and adapt to its environment. Sensory information is obtained and communicated throughout the body via the joint effort of the nervous and endocrine systems. The nervous system is the master controlling and communicating system of the body. Every thought, action, and emotion reflects its activity. Its cells communicate by electrical and chemical signals, which are rapid and specific, and usually cause almost immediate responses. Long term responses are accomplished by the production and secretion of very potent chemical messengers called hormones. These chemicals are extremely powerful in small doses and affect target organs all over the body. The immune system defends the body via three lines of defense which range from the nonspecific inflammation responses to the specific cellular and immunoglobulin responses that target individual invaders. Transportation of these immune components as well as fluid and fat reabsorption is accomplished through the highly complex network of vessels and organs known as the lymphatic system.

The nervous system is divided into 2 branches (Central and Peripheral) and the main cells of the nervous systems are neurons and neuroglia. Neurons transfer information via an electrical impulse which causes the depolarization of ions on either side of the membrane, and by the transfer of chemicals, called

neurotransmitters, into the synapse which is the space between neurons. Nerves are bundles of nerve cells called neurons which carry sensory information via the afferent pathway and motor information via the efferent pathway. Specialized receptor cells of the eyes, ears, nose, mouth and skin allow us to experience the 5 senses of taste, touch, sight, sound and smell. The endocrine system is made of specialized organs called glands that secrete hormones. The endocrine system works directly in conjunction with the nervous system as the hypothalamus in the brain helps regulate the pituitary gland. The pituitary gland is the master gland, composed of an anterior and posterior side, and responsible for secreting 8 hormones that help regulate homeostasis within the body.

Enduring Understandings

Aging in the nervous system is characterized by loss of neurons, demyelination, and decreased blood flow.

The types of nerve cells are neuroglia, neurons, and neural crest stem. Each differs in structure and function but are essential to the effective transfer of information through the system.

Neurons transfer information via an electrical impulse which causes the depolarization of ions on either side of the membrane, and by the transfer of chemicals, called neurotransmitters, into the synapse which is the space between neurons.

There are ten distinct endocrine glands and master gland is called pituitary, which is composed of an anterior and posterior side.

Nerves are bundles of nerve cells called neurons which carry sensory information via the afferent pathway and motor information via the efferent pathway.

The two major branches of the nervous system is the central nervous system, that is comprised of the brain and spinal cord, and, the peripheral nervous system, comprised of somatic nerves, autonomic nerves, and ganglia.

Essential Questions

What are the major functions and structures of the nervous, sensory and endocrine systems?

How do the nervous, sensory and endocrine systems work together to allow for movement of the human body?

What types of disease and deficiencies affect the nervous, sensory and endocrine systems?

What can a person do to prevent diseases and disorders that affect the nervous, sensory and endocrine systems?

Content - What will students know?

- Analyzing and explaining how nerve cells transfer information by both chemical and electrical means.
- The parts of a neuron.
- The steps of a reflex arc.
- Describing the transfer of information through action potential and neurotransmission.
- The main structures of the cerebrum.
- The main structures of the sensory organs and how they help us process sensations.
- The major glands of the endocrine system and the hormones they secrete.
- The relationship between homeostatic imbalance and disease.

Skills - What will students be able to do?

- Identify the major divisions and anatomical structures associated with the nervous system.
- Label the major parts of a neuron.
- Trace a nerve pathway in a reflex arc.
- Describe the difference between excitatory and inhibitory NTs and their role in nerve impulses.
- Explain the process by which the nerve establishes and maintains an impulse.
- Label the 4 lobes of the brain, and the major structures in the brain cross section.
- Examine the external and internal anatomy of sheep brain.

- Dissect a sheep eye to ID the main structures of the eye involved in processing vision.
- Test the sensory organs with various lab stations related to vision, smell, taste, touch and hearing.
- Identify the major endocrine glands of the endocrine system along with the hormones they secrete.
- Students will diagnose case studies related to the nervous and endocrine system.

Activities - How will we teach the content and skills?

- CH.9 guided notes CH.9 student notes- Nervous System
- Brain Lobes and Cross Section Labeling-DiMartine (remote)
- nerve impulse practice labeling
- Ch.10 guided notes
- Chap10student notes-sensory
- Ch.11 guided notes Chap11student notes-endocrine system.doc
- Lab- eye dissection Eye dissection-slideshow- dimartine
- Lab: sensory stations
- Lab: sheep brain dissection HST-Sheep-Brain-Dissection.pdf
- Literacy- Is Pain Necessary?
- Vocab key terms for each section Vocab template
- Concept map review concept map review template
- Ck12 review concepts (free online text that all teachers can access and use)
- Edpuzzle videos to reinforce concepts (all teachers have access to LHS)
- Lab stations
- Case study appropriate to the body system being covered (Bell's Palsy, Hypercalcemia)

Evidence/Assessments - How will we know what students have learned?

- Quizzes/test CH.9 test-nervous system.docx

- Test-CH11-endcorine system.docx Wanted slide show -hormones of endocrine system
- Kahoot scores
- Literacy rubrics
- Anatomy Benchmark #3

Spiraling for Mastery

Content or Skill for this Unit	Spiral Focus from Previous Unit	Instructional Activity
• Analyzing and explaining how nerve cells transfer information by both chemical and electrical means. • Recognizing that there are many divisions and subdivisions of the nervous system and that these divisions have a specific function in transferring information. • Describing the transfer of information through action potential and neurotransmission. • Identifying the endocrine glands, their target organs, the hormone transmitters they utilize, and their overall effect on the body.	• In multicellular organisms, the body is a system of multiple, interacting subsystems. • Organs are groups of tissues that work together to perform a particular body function. • Systems interact with other systems.	• Pre-unit vocabulary • Microscope slides • Lab exercises • Notes and group work • literacy • Labeling and online practice

21st Century Life and Careers

WRK.9.2.12.CAP.2	Develop college and career readiness skills by participating in opportunities such as structured learning experiences, apprenticeships, and dual enrollment programs.
WRK.9.2.12.CAP.8	Determine job entrance criteria (e.g., education credentials, math/writing/reading comprehension tests, drug tests) used by employers in various industry sectors.

Career Readiness, Life Literacies, & Key Skills

TECH.9.4.2.CI.1	Demonstrate openness to new ideas and perspectives (e.g., 1.1.2.CR1a, 2.1.2.EH.1, 6.1.2.CivicsCM.2).
TECH.9.4.2.CT.1	Gather information about an issue, such as climate change, and collaboratively brainstorm ways to solve the problem (e.g., K-2-ETS1-1, 6.3.2.GeoGI.2).
TECH.9.4.2.CT.2	Identify possible approaches and resources to execute a plan (e.g., 1.2.2.CR1b, 8.2.2.ED.3).
TECH.9.4.2.CT.3	Use a variety of types of thinking to solve problems (e.g., inductive, deductive).
TECH.9.4.2.TL.1	Identify the basic features of a digital tool and explain the purpose of the tool (e.g., 8.2.2.ED.1).
TECH.9.4.2.TL.2	Create a document using a word processing application.
TECH.9.4.2.TL.3	Enter information into a spreadsheet and sort the information.
TECH.9.4.2.TL.4	Navigate a virtual space to build context and describe the visual content.
TECH.9.4.2.IML.2	Represent data in a visual format to tell a story about the data (e.g., 2.MD.D.10).
TECH.9.4.2.IML.3	Use a variety of sources including multimedia sources to find information about topics such as climate change, with guidance and support from adults (e.g., 6.3.2.GeoGI.2, 6.1.2.HistorySE.3, W.2.6, 1-LSI-2).
TECH.9.4.2.IML.4	Compare and contrast the way information is shared in a variety of contexts (e.g., social, academic, athletic) (e.g., 2.2.2.MSC.5, RL.2.9).

Interdisciplinary Connections/Companion Standards

LA.SL.11-12.5	Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.
LA.RST.11-12.1	Accurately cite strong and thorough evidence from the text to support analysis of science and technical texts, attending to precise details for explanations or descriptions.
LA.WHST.11-12.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.
LA.WHST.11-12.5	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
LA.WHST.11-12.7	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
LA.WHST.11-12.8	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
LA.WHST.11-12.9	Draw evidence from informational texts to support analysis, reflection, and research.
MA.F-BF.A.1	Write a function that describes a relationship between two quantities.
MA.F-IF.C.7	Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.

MA.K-12.4 Model with mathematics.