Unit 9 - The Special Senses

Content Area: **Science**
Course(s): **Anatomy, Physiology, and Kinesology**
Time Period: **Marking Period 4**
Length: **10 blocks**
Status: **Published**

Transfer Skills

Students will understand the nervous system relates to and affects the special senses of vision, hearing, balance, smell, and taste.

Vocabulary

Accommodation, astigmatism, blind spot, cataract, emmetropia, glaucoma, hyperopia, myopia, refraction, conjunctiva, conjunctivitis, lacrimal apparatus, lacrimal gland, lysozyme, fibrous layer, retina, lens, sclera, cornea, vascular layer, choroid, ciliary body, iris, pupil, photoreceptor, bipolar cell, ganglion cell, optic nerve, blind spot, rod cell, cone cell, auricle, pinna, auditory canal, tympanic membrane, cerumen, ossicles, inner ear, middle ear, outer ear, semicircular canals, cochlea, basilar membrane, hair cells, volume, pitch, timbre, vestibular sense, kinesthetic sense, otoliths

Enduring Understandings

- An understanding of the somatic and special senses is necessary to knowing how the nervous system receives input and responds to support life.
- Special senses produced by the nervous system senses process and respond to the environment.

Essential Questions

1. What are the special senses and organs related to them?
2. How do special senses function to process and act on sensory information?
3. How do the special senses respond to different types of energetic stimuli involved in vision, hearing, balance, smell, and taste?
4. How do we smell? How do we taste? How do we hear? How do we see? How do we maintain equilibrium?
5. What happens to our special senses as we age?

Learning Objectives

Students will be able to:

- Distinguish between somatic and special senses.
- Describe the receptors associated with the senses of touch, pressure, temperature, and pain.
- Identify the main structures and functions of the special senses.
- Identify the structures and the functions of the eye.
- Explain how the function of rod and cone cells differs.
- Describe how an image is formed on the retina.
- Trace the pathway of light through the eye to the retina.
- Identify/state the function of the structures of the external, middle and inner ear.
- Describe how the equilibrium organs help maintain balance.
- Describe the location, structure and function of the olfactory and gustatory receptors.
- Name the basic taste sensations and list factors that modify the sense of taste.
- Describe changes that occur with age in the special sense organs.
- Describe changes to nervous system that occur during a lifetime.

Resources

Text: Hole's Essentials of Human Anatomy & Physiology 2012

PBS LearningMedia

KhanAcademy: Health and Medicine

YouTube: Crash Course: Anatomy & Physiology

Get Body Smart

Discovery: www.unitedstreaming.com

NBC Learn Videos: www.nbclearn.com

eLibrary science: http://science.bigchalk.com/sciweb/science/do/search

Web simulators: www.pHET.colorado.edu

Web Video Clips: www.Learning4mastery.com(Flipped Learning)

Case studies - http://sciencecases.lib.buffalo.edu/cs/

Standards

Science and Engineering Practices

Constructing Explanations and Designing Solutions

- Construct and revise 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-LS1-6)
- 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),(HS-LS1- 5),(HS-LS1-7)

Planning and Carrying Out Investigations

- Planning and carrying out in 9-12 builds on K-8 experiences and progresses to include investigations that provide evidence for and test conceptual, mathematical, physical, and empirical models.
- 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. (HSLS1-3)

Constructing Explanations and Designing Solutions

- Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student- generated sources of evidence consistent with scientific ideas, principles, and theories.
- 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)
- Construct and revise 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-LS1-6)

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. (HSLS1-1) (Note: This Disciplinary Core Idea is also addressed by HS-LS3- 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)

LS1.C: Organization for Matter and Energy Flow in Organisms

- The process of photosynthesis converts light energy to stored chemical energy by converting carbon dioxide plus water into sugars plus released oxygen. (HS-LS1-5)
- The sugar molecules thus formed contain carbon, hydrogen, and oxygen: their hydrocarbon backbones are used to make amino acids and other carbon-based molecules that can be assembled into larger molecules (such as proteins or DNA), used for example to form new cells. (HS-LS1-6)
- As matter and energy flow through different

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)

Energy and Matter

- Changes of energy and matter in a system can be described in terms of energy and matter flows into, out of, and within that system. (HS-LS1-5), (HS-LS1-6) § Energy cannot be created or destroyed—it only moves between one place and another place, between objects and/or fields, or between systems. (HS-LS1-7)

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)

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.
HS-LS1-2	Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
HS-LS1-3	Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.
HS-LS1-4	Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.
HS-LS3-1	Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.
HS-LS3-2	Make and defend a claim based on evidence that inheritable genetic variations may result from (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors.
HS-LS3-3	Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.