Willingboro Public Schools

"Where Excellence is the Expectation"

Anatomy and Physiology

Revised: November 2022

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From New Jersey Student Learning Standards

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Overview	Content Standards	Core Ideas
Unit 1 **Introduction to A&P (Chapters 1 - 4)**	• 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-LS4-1 Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence • HS-PS1-2 Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties. • 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.	• 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) (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) • 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) • The periodic table orders elements horizontally by the number of protons in the atom's nucleus and places those with similar chemical properties in columns. The repeating

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Overview	Content Standards	Core Ideas
		patterns of this table reflect patterns of outer electron states. (HS-PS1-2) ● The fact that atoms are conserved, together with knowledge of the chemical properties of the elements involved, can be used to describe and predict chemical reactions. (HS-PS1-2) ● Each chromosome consists of a single very long DNA molecule, and each gene on the chromosome is a particular segment of that DNA. The instructions for forming species' characteristics are carried in DNA. All cells in an organism have the same genetic content, but the genes used (expressed) by the cell may be regulated in different ways. Not all DNA codes for a protein; some segments of DNA are involved in regulatory or structural functions, and some have no as-yet known function. ● In sexual reproduction, chromosomes can sometimes swap sections during the process of meiosis (cell division), thereby creating new genetic combinations and thus more genetic variation. Although DNA replication is tightly regulated and remarkably accurate, errors do occur and result in mutations, which are also a source of genetic variation. Environmental factors can also cause mutations in genes, and viable mutations are inherited.
Unit 2 **Tissues, Integumentary System, Skeletal System, and**	● 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-LS4-1 Communicates scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.	● 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) (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)

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Overview	Content Standards	Core Ideas
Articular System (Chapters 5 - 8)		• 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) • Genetic information, like the fossil record, provides evidence of evolution. DNA sequences vary among species, but there are many overlaps; in fact, the ongoing branching that produces multiple lines of descent can be inferred by comparing the DNA sequences of different organisms. Such information is also derivable from the similarities and differences in amino acid sequences and from anatomical and embryological evidence.
Unit 3 **Muscular System, Nervous System, and Endocrine System (Chapters 9-12)**	• 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-LS1-6 Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon based molecules. • HS-LS1-7 Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy. • HS-PS1-5 Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs.	• 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) (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) • 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

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Overview	Content Standards	Core Ideas
	• HS-PS4-1 Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media. • HS-PS4-3 Evaluate the claims, evidence, and reasoning behind the idea that electromagnetic radiation can be described either by a wave model or a particle model, and that for some situations one model is more useful than the other. • HS-LS2-3 Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions. • HS-LS4-1 Communicates scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence. • HS-LS4-3 Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait. • HS-PS1-5 Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs.	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 organizational levels of living systems, chemical elements are recombined in different ways to form different products. (HS-LS1-6), (HS-LS1-7) • As a result of these chemical reactions, energy is transferred from one system of interacting molecules to another. Cellular respiration is a chemical process in which the bonds of food molecules and oxygen molecules are broken and new compounds are formed that can transport energy to muscles. Cellular respiration also releases the energy needed to maintain body temperature despite ongoing energy transfer to the surrounding environment. (HSLS1-7) • Chemical processes, their rates, and whether or not energy is stored or released can be understood in terms of the collisions of molecules and the rearrangements of atoms into new molecules, with consequent changes in the sum of all bond energies in the set of molecules that are matched by changes in kinetic energy. (HS-PS1-4), (HS-PS1-5) • Photosynthesis and cellular respiration (including anaerobic processes) provide most of the energy for life processes. (HS-LS2-3) • Genetic information, like the fossil record, provides evidence of evolution. DNA sequences vary among species, but there are many overlaps; in fact, the ongoing branching that produces multiple lines of descent can be inferred by comparing the DNA sequences of different organisms. Such information is also derivable from the similarities and differences in amino acid sequences and from anatomical and embryological evidence. • Natural selection occurs only if there is both (1) variation in the genetic information between organisms in a population and (2) variation in the expression of that genetic information—that is, trait variation—that leads to differences in performance among individuals. • The traits that positively affect survival are more likely to be reproduced, and thus are more common in the population.

Overview	Content Standards	Core Ideas
		• Natural selection leads to adaptation, that is, to a population dominated by organisms that are anatomically, behaviorally, and physiologically well suited to survive and reproduce in a specific environment. That is, the differential survival and reproduction of organisms in a population that have an advantageous heritable trait leads to an increase in the proportion of individuals in future generations that have the trait and to a decrease in the proportion of individuals that do not. • Adaptation also means that the distribution of traits in a population can change when conditions change. • Chemical processes, their rates, and whether or not energy is stored or released can be understood in terms of the collisions of molecules and the rearrangements of atoms into new molecules, with consequent changes in the sum of all bond energies in the set of molecules that are matched by changes in kinetic energy. • The wavelength and frequency of a wave are related to one another by the speed of travel of the wave, which depends on the type of wave and the medium through which it is passing. • Waves can add or cancel one another as they cross, depending on their relative phase (i.e., relative position of peaks and troughs of the waves), but they emerge unaffected by each other. • Electromagnetic radiation (e.g., radio, microwaves, light) can be modeled as a wave of changing electric and magnetic fields or as particles called photons. The wave model is useful for explaining many features of electromagnetic radiation, and the particle model explains other features.
Unit 4 **Cardiovascular**	• 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.	• 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) (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

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Overview	Content Standards	Core Ideas
System and Lymphatic System (Chapters 13 - 15)	• HS-LS4-1 Communicates scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence. • HS-LS4-3 Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait. • HS-PS1-5 Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs • HS-LS2-3 Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.	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) • Genetic information provides evidence of evolution. DNA sequences vary among species, but there are many overlaps; in fact, the ongoing branching that produces multiple lines of descent can be inferred by comparing the DNA sequences of different organisms. Such information is also derivable from the similarities and differences in amino acid sequences and from anatomical and embryological evidence. (HS-LS4-1) • Natural selection occurs only if there is both (1) variation in the genetic information between organisms in a population and (2) variation in the expression of that genetic information—that is, trait variation—that leads to differences in performance among individuals. (HS-LS4-2), (HS-LS4-3) • The traits that positively affect survival are more likely to be reproduced, and thus are more common in the population. (HS-LS4-3) • Natural selection leads to adaptation, that is, to a population dominated by organisms that are anatomically, behaviorally, and physiologically well suited to survive and reproduce in a specific environment. That is, the differential survival and reproduction of organisms in a population that have an advantageous heritable trait leads to an increase in the proportion of individuals in future generations that have the trait and to a decrease in the proportion of individuals that do not. (HS-LS4-3), (HS-LS4-4) • Adaptation also means that the distribution of traits in a population can change when conditions change. (HS-LS4-3) • Chemical processes, their rates, and whether or not energy is stored or released can be understood in terms of the collisions of molecules and the rearrangements of atoms into new molecules, with consequent changes in the sum of all bond

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Overview	Content Standards	Core Ideas
		energies in the set of molecules that are matched by changes in kinetic energy. (HS-PS1-4), (HS-PS1-5) ● Photosynthesis and cellular respiration (including anaerobic processes) provide most of the energy for life processes. (HS-LS2-3)
Unit 5 **Digestive System, Respiratory System, Urinary System, and Reproductive System (Chapters 16 - 19)**	● 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-PS1-4 Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy ● HS-LS1-6 Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon based molecules. ● HS-LS1-7 Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy. ● HS-LS4-1 Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence. ● HS-LS4-3 Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait. ● HS-PS1-5 Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs	● Systems of specialized cells within organisms help them perform the essential functions of life. ● 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. ● 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. ● 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. ● A stable molecule has less energy than the same set of atoms separated; one must provide at least this energy in order to take the molecule apart. ● 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. ● As matter and energy flow through different organizational levels of living systems, chemical elements are recombined in different ways to form different products. ● As a result of these chemical reactions, energy is transferred from one system of interacting molecules to another. Cellular respiration is a chemical process in which the bonds of food molecules and oxygen molecules are broken and new compounds are formed that can transport energy to muscles. Cellular respiration also releases the energy needed to maintain body temperature despite ongoing energy transfer to the surrounding environment.

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Overview	Content Standards	Core Ideas
		• Genetic information provides evidence of evolution. DNA sequences vary among species, but there are many overlaps; in fact, the ongoing branching that produces multiple lines of descent can be inferred by comparing the DNA sequences of different organisms. Such information is also derivable from the similarities and differences in amino acid sequences and from anatomical and embryological evidence. • Natural selection occurs only if there is both (1) variation in the genetic information between organisms in a population and (2) variation in the expression of that genetic information—that is, trait variation—that leads to differences in performance among individuals. • The traits that positively affect survival are more likely to be reproduced, and thus are more common in the population. • Natural selection leads to adaptation, that is, to a population dominated by organisms that are anatomically, behaviorally, and physiologically well suited to survive and reproduce in a specific environment. That is, the differential survival and reproduction of organisms in a population that have an advantageous heritable trait leads to an increase in the proportion of individuals in future generations that have the trait and to a decrease in the proportion of individuals that do not. • Adaptation also means that the distribution of traits in a population can change when conditions change. • Chemical processes, their rates, and whether or not energy is stored or released can be understood in terms of the collisions of molecules and the rearrangements of atoms into new molecules, with consequent changes in the sum of all bond energies in the set of molecules that are matched by changes in kinetic energy. • Chemical processes, their rates, and whether or not energy is stored or released can be understood in terms of the collisions of molecules and the rearrangements of atoms into new molecules, with consequent changes in the sum of all bond energies in the set of molecules that are matched by changes in kinetic energy.

Overview	Content Standards	Core Ideas
Suggested Open Educational Resources	• 20 SEL Activities for High School • Pearson Anatomy and Physiology • Open Educational Resources (OER): Anatomy & Physiology • Lab-Aids	

Unit 1: Introduction to A&P (Chapters 1 - 4)

Overview

Anatomy and physiology is a course that will enable students to develop an understanding of the relationships between the structures and functions of the human body. Students will also learn the mechanisms for maintaining homeostasis within the human body. This course will involve laboratory activities, projects, dissections, textbook material, models, diagrams, journal writings, and clinical studies.

Essential Questions	Enduring Understandings
• Discuss what homeostasis means, and ask the learners to give examples of how this operates in their own bodies. • Discuss how all bodily functions begin and start at the cellular level of organization. • Compare the functions of the body's two major cavities and relate these to the organs they contain. • Ask the learners what organs they already know as parts of certain systems of the body. • Discuss why salt dissolves in water, whereas sugars go into colloidal suspensions; relate this to bonding. • Compare the significance of carbohydrates, fats, and proteins to the functioning of a cell. • Discuss why water is so critical to bodily functions. • Discuss how the nucleus exerts complete control over cellular functions. • Discuss the significance of ribosomes and protein synthesis to the survival and function of the cell. • Discuss why humans could not exist without plants. • Discuss how a piece of chocolate is converted into ATP, the chemical fuel of cells. • Compare aerobic respiration with anaerobic respiration in terms of energy efficiency. • Discuss why the discovery of the DNA molecule's anatomy is considered the major discovery in biology of the 20th century and relate this to the human genome project. • Compare mitosis with meiosis, indicating similarities and major differences.	• Proper anatomical terminology is required for accurate and universal communication. • The functions of the body are completed based on a division of labor. • The body functions through interactions between systems. • Each organ system has a main organ. • Living things depend on maintaining homeostasis and necessary life functions. • Each organ system has support structures. • Living things can be described, organized and classified based on levels of structural organization • The molecules present in our foods become the molecules building our cells and body systems. • The four main types of macromolecules. • Some of the uses for the four types of macromolecules in living systems. • Each monomer is unique in structure. • Each type of bonding is based on similar reactions. • Functional groups permit identification of monomers and permit molecular activity. • Cellular metabolism is the set of chemical reactions that occur in living organisms in order to maintain life. • In eukaryotes, heritable information is passed to the next generation via processes that include the cell cycle and mitosis or meiosis plus fertilization. • Mitosis passes a complete genome from the parent cell to daughter cells. • Meiosis, a reduction division, followed by fertilization ensures genetic diversity in sexually reproducing organisms.

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Unit 1: Introduction to A&P (Chapters 1 - 4)

Performance Expectations/Core Ideas

- 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-LS4-1 Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence
- HS-PS1-2 Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties.
- 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.

Core Ideas

- 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) (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)
- 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)
- The periodic table orders elements horizontally by the number of protons in the atom's nucleus and places those with similar chemical properties in columns. The repeating patterns of this table reflect patterns of outer electron states. (HS-PS1-2)
- The fact that atoms are conserved, together with knowledge of the chemical properties of the elements involved, can be used to describe and predict chemical reactions. (HS-PS1-2)
- Each chromosome consists of a single very long DNA molecule, and each gene on the chromosome is a particular segment of that DNA. The instructions for forming species' characteristics are carried in DNA. All cells in an organism have the same genetic content, but the genes used (expressed) by the cell may be regulated in different ways. Not all DNA codes for a protein; some segments of DNA are involved in regulatory or structural functions, and some have no as-yet known function.
- In sexual reproduction, chromosomes can sometimes swap sections during the process of meiosis (cell division), thereby creating new genetic combinations and thus more genetic variation. Although DNA replication is tightly regulated and remarkably accurate, errors do occur and result in mutations, which are also a source of genetic variation. Environmental factors can also cause mutations in genes, and viable mutations are inherited.

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Unit 1: Introduction to A&P (Chapters 1 - 4)

Performance Expectations/Core Ideas

- Environmental factors also affect expression of traits, and hence affect the probability of occurrences of traits in a population. Thus the variation and distribution of traits observed depends on both genetic and environmental factors.

Student Learning Objectives

Students will be able to:

- Define the anatomical terms used to refer to the body in terms of directions and geometric planes.
- Describe the major cavities of the body and the organs they contain.
- Explain what a cell is.
- Describe the major functions of the four types of human tissue.
- List the major systems of the body, the organs they contain, and the functions of those systems.
- Define the terms anatomy and physiology.
- Define homeostasis.
- Define the structure of an atom and its component subatomic particles.
- List the major chemical elements found in living systems.
- Compare the differences between ionic and covalent bonding and how molecules formed by either ionic or covalent bonds react in water.
- Understand the basic chemical structure of water, carbon dioxide and oxygen gas, ammonia, the mineral salts, carbohydrates, lipids, proteins, the nucleic acids DNA and RNA, and ATP and their role in living systems.
- Explain the difference between diffusion, osmosis, and active transport and their role in maintaining cellular structure and function.
- Define pH and its significance in the human body.
- Explain why water is so important to the body.
- Define the terms acid, base, and salt.
- Explain how the numbers on the pH scale relate to acidity and alkalinity.
- Name the major contributors to the cell theory.
- State the principles of the modern cell theory.
- Explain the molecular structure of a cell membrane.
- Describe the structure and function of the following cellular organelles: nucleus, endoplasmic reticulum, Golgi body, mitochondria, lysosomes, ribosomes, and centrioles.
- Explain the significance and process of protein synthesis.
- Define metabolism.
- Describe the basic steps in glycolysis and indicate the major products and ATP production.
- Describe the Krebs citric acid cycle and its major products and ATP production.
- Describe the electron transport system and how ATP is produced.
- Compare aerobic glycolysis with anaerobic production of ATP in muscle cells and fermentation.
- Explain how other food compounds besides glucose are used as energy sources.
- Name the discoverers of the anatomy of the DNA molecule.
- Know the basic structure of the DNA molecule.
- Name the nitrogen base pairs and how they pair up in the DNA molecule.

- Define the stages of the cell cycle.
- Explain the significance of mitosis in the survival of the cell and growth in the human body.
- Understand the significance of meiosis as a reduction of the genetic material and for the formation of the sex cells.

Integrated Accommodations and Modifications		
Special Education Students	**English Language Learners**	**At Risk**
• Utilize modifications & accommodations delineated in the student's IEP • Provide additional manipulatives to support instruction • Allow for alternative strategies to solve algorithms or tasks • Provide the steps needed to complete the task • Model frequently • Provide repetition and practice. • Use visuals to demonstrate/model the processes • Restate, reread, and clarify directions/questions • Ask students to restate information, directions, and assignments. • Provide copy of class notes • Distribute study guide for classroom tests. • Provide preferential seating to be mutually determined by the student and teacher • Provide extra textbooks for home. • Provide regular parent/ school communication • Allow extended time to complete assignment • Establish procedures for accommodations / modifications for assessments • Allow student to take/complete tests in an alternate setting as needed	WIDA Can Do Descriptors https://wida.wisc.edu/teach/can-do/descriptors • Modify Assignments • Use testing and portfolio assessment • Utilize Native Language Translation (peer, online assistive technology, translation device, bilingual dictionary) • Repeat, rephrase, paraphrase key concepts and directions • Allow for extended time for assignment completion as needed • Highlight key vocabulary • Define essential vocabulary in context • Use graphic organizers, visuals, manipulatives and other concrete materials • Use gestures, facial expressions and body language • Read aloud • Build on what students already know and prior experience	• Pair visual prompts with verbal presentations • Ask students to restate information, directions, and assignments. • Provide repetition and and practice • Model skills / techniques to be mastered. • Provide extended time to complete class work • Provide copy of class notes • Provide preferential seating to be mutually determined by the student and teacher • Allow the use of a computer to complete assignments. • Establish expectations for correct spelling on assignments • Provide extra textbooks for home. • Provide Peer Support • Increase one on one time

Gifted and Talented Students	504 Plan
• Utilize advanced, accelerated, or compacted content • Provide assignments that emphasize higher- level thinking skills. • Allow for individual student interest • Gear assignments to development in areas of affect, creativity, cognition, and research skills • Allow for a variety in types of resources • Provide problem-based assignments with planned scope and sequence	• Pair visual prompts with verbal presentations • Ask students to restate information, directions, and assignments. • Provide repetition and and practice • Model skills / techniques to be mastered. • Provide extended time to complete class work • Provide copy of class notes • Break long assignments into smaller parts

• Utilize inquiry-based instruction • Adjust the pace of lessons • Utilize Choice Boards • Provide Problem-Based Learning • Establish flexible Grouping	• Assist student in setting short term goals • Allow for preferential seating to be mutually determined by the student and teacher • Provide extra textbooks for home. • Model and reinforce organizational systems (i.e. color-coding) • Write out homework assignments, check student's recording of assignments
Interdisciplinary Connections	**Computer Science and Design Thinking**
Math • HSF-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. • HSF-BF.A.1 Write a function that describes a relationship between two quantities. **English Language Arts** Reading • RST.9-12.1 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. Writing • WHST.9-12.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. • WHST.9-12.5 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. • WHST.9-12.7 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. • WHST.9-12.8 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. • WHST.9-12.9 Draw evidence from informational texts to support analysis, reflection, and research. Speaking and Listening	**Computer Science and Design Thinking Practices** 1. ☐ Fostering an Inclusive Computing and Design Culture 2. ☑ Collaborating Around Computing and Design 3. ☐ Recognizing and Defining Computational Problems 4. ☐ Developing and Using Abstractions 5. ☐ Creating Computational Artifacts 6. ☐ Testing and Refining Computational Artifacts 7. ☑ Communicating About Computing and Design **Computer Science and Design Thinking Standards** • 8.2.12.ED.5: Evaluate the effectiveness of a product or system based on factors that are related to its requirements, specifications, and constraints (e.g., safety, reliability, economic considerations, quality control, environmental concerns, manufacturability, maintenance and repair, ergonomics). • 8.2.12.EC.3: Synthesize data, analyze trends, and draw conclusions regarding the effect of a technology on the individual, culture, society, and environment and share this information with the appropriate audience. **Core Ideas** • Engineering design evaluation, a process for determining how well a solution meets requirements, involves systematic comparisons between requirements, specifications, and constraints. • The ability to ethically integrate new technologies requires deciding whether to introduce a technology, taking into consideration local resources and the role of culture in acceptance.

• 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. • SL.11-12.4 Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation.	• Consequences of technological use may be different for different groups of people and may change over time. • Since technological decisions can have ethical implications, it is essential that individuals analyze issues by gathering evidence from multiple perspectives and conceiving of alternative possibilities before proposing solutions.

Career Readiness, Life Literacies and Key Skills

Career Readiness, Life Literacies and Key Skills Practices

- Act as a responsible and contributing community member and employee.
- Consider the environmental, social and economic impacts of decisions.
- Demonstrate creativity and innovation.
- Utilize critical thinking to make sense of problems and persevere in solving them.
- Use technology to enhance productivity, increase collaboration and communicate effectively.
- Work productively in teams while using cultural/global competence.

- 9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12 prof.CR3a).
- 9.4.12.GCA.1: Collaborate with individuals to analyze a variety of potential solutions to climate change effects and determine why solutions may work better than others (e.g., political, economic, cultural).
- 9.4.12.CT.1: Identify problem-solving strategies used in the development of an innovative product or practice (e.g., 1.1.12acc.C1b, 2.2.12.PF.3).
- 9.4.12.CT.2: Explain the potential benefits of collaborating to enhance critical thinking and problem solving (e.g., 1.3E.12profCR3.a).
- 9.4.12.IML.2: Evaluate digital sources for timeliness, accuracy, perspective, credibility of the source, and relevance of information, in media, data, or other resources (e.g., NJSLSA.W8, Social Studies Practice: Gathering and Evaluating Sources.
- 9.4.12.IML.5: Evaluate, synthesize and apply information on climate change from various sources appropriately.
- 9.4.12.TL.1: Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specific task (e.g., W.11-12.6.).
- 9.4.12.TL.2: Generate data using formula-based calculations in a spreadsheet and draw conclusions about the data.

SEL Competencies

- **Self - Awareness**
- **Self - Management**
- **Social Awareness**
- **Responsible Decision Making**
- **Relationship Skills**

Formative Assessment Plan	Summative Assessment Plan
Formative assessment informs instruction and is ongoing throughout a unit to determine how students are progressing against the standards.	*Summative assessment is an opportunity for students to demonstrate mastery of the skills taught during a particular unit.*

Teachers are encouraged to incorporate Formative Assessments into all lessons. During instruction, teachers will collect ongoing information on students' mastery of content through a variety of methods: • Questioning: using Socratic method, probing questions, a hierarchical system in complexity (Bloom's Taxonomy) • Exit tickets, rotational activities (stations), quizzes, and small group activities • Classwork, homework, group work • Pre-Assessments, teacher's observation, class discussion, and journal • Journal Writing • Daily Verbal Assessments	• **Chapter 1 Cengage Learning Testing/Chapter 1 Quiz** • **Chapter 2 Cengage Learning Testing/Chapter 2 Quiz** • **Chapter 3 Cengage Learning Testing/Chapter 3 Quiz** • **Chapter 4 Cengage Learning Testing/Chapter 4 Quiz** • **Laboratory Exercises** • **Other Summative Assessments:** Teachers are encouraged to design and their own assessments (topic/module tests and quizzes) individually and/or with their department or grade-level partners, as per Uniform Grading Profile.

Targeted Academic Vocabulary

anatomy, physiology, homeostasis, cavities, structure, function, frontal plane, anterior, posterior, sagittal plane, transverse plane, superior/inferior half, epithelial tissue, connective tissue, muscle tissue, nervous tissue, ionic bonding, covalent bonding, carbohydrates, lipids, proteins, DNA, RNA, ATP, diffusion, osmosis, active transport, pH scale, acid, base/alkaline, Cell Theory, nucleus, endoplasmic reticulum, Golgi body, mitochondria, lysosomes, ribosomes, centrioles, protein synthesis, chromatin, cilia, flagella, plastids, metabolism, glycolysis, Krebs cycle, anaerobic, aerobic, mitosis, interphase, prophase, metaphase, anaphase, telophase, cytokinesis, gametes, pyruvic acid, electron transport, fermentation, meiosis, gametogenesis

Resources:

- Organs On A Chip | PBS LearningMedia
- PBS: Cellular Structure and Function
- The citric acid cycle
- Mitosis vs. Meiosis
- Escaping Nazis, Changing History: The Story Behind the Notorious Krebs Cycle **(Holocaust)**

Pacing Guide

Can be found within Lab-Aids.

Unit 2: Tissues, Integumentary System, Skeletal System, and Articular System (Chapters 5 - 8)

Overview

Anatomy and physiology is a course that will enable students to develop an understanding of the relationships between the structures and functions of the human body. Students will also learn the mechanisms for maintaining homeostasis within the human body. This course will involve laboratory activities, projects, dissections, textbook material, models, diagrams, journal writings, and clinical studies.

Essential Questions	Enduring Understandings
• Discuss why the arrangement of epithelial cells allows epithelial tissue to protect, secrete, and absorb. • Discuss the significance of collagen and elastin fibers and various types of cells in the matrix of connective tissue; relate this to function. • Compare the anatomy of skeletal, smooth, and cardiac muscle. • Discuss the significance of melanocytes and the harmful rays of the sun and relate this to skin pigmentation and skin cancer. • Discuss what skin pH means and relate this to protection from microorganisms. • Compare the functions of sebaceous glands with sweat glands. • Compare the anatomy of compact bone with that of cancellous bone; relate this to function. • Discuss why certain bones of the body are stronger with more compact bone than others. • Discuss why the supply of blood cells in the body is dependent, in part, on the skeletal system. • Compare the nature of the three types of joints; relate this to structure and function. • Discuss what the term capsule means referring to a synovial joint. • Discuss why bursae must be part of a synovial joint.	• The body has levels of organization that build on each other. Cells make up tissues, tissues make up organs, and organs make up organ systems. • Histology is the microscopic study of tissue appearance, organization, and function. • Each type of muscle tissue in the human body has a unique structure and a specific role. • Both sebaceous glands and sweat glands are located near hair follicles and secrete fluids onto the surface of the skin. • The skin is a complex system of epithelial cells and nerve cells which permit it to perform its duties. • Glands appear in a variety of forms and arrangements allowing different secretory needs to be met both in function and quantity of secretion. • The Epidermis presents 4 or 5 layers based on location. • Bones are made up of calcium, phosphorus, sodium, and other minerals, as well as the protein collagen. • Bones perform numerous duties including protecting the body and organs such as the heart and brain. • Bones make blood cells, and work in conjunction with the muscular system to permit movement. • Each of the 206 bones has a name and for many, there are over a dozen important markers such as tuberosities, fossas, etc. • Each articulation point consists of features such as the capitulum, trochlea, olecranon fossa, radial fossa and coronoid fossa of the elbow. • Articulations may be synarthrodial, amphiarthrodial, diarthrodial, etc. • A bone is a living unit with osteocytes, blood vessels, etc • Ligaments are short bands of tough fibrous connective tissue that function to connect one bone to another, forming the joint. • Tendons are made of elastic tissue and also play a key role in the functioning of joints. They connect muscle to bone. • Synovial joints are movable joints. They make up most of the joints in the body and are located mostly in the limbs, where mobility is critical. They contain synovial fluid, which helps them to move freely.

Unit 2: Tissues, Integumentary System, Skeletal System, and Articular System (Chapters 5 - 8)

Performance Expectations/Core Ideas

- 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.

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Unit 2: Tissues, Integumentary System, Skeletal System, and Articular System (Chapters 5 - 8)

Performance Expectations/Core Ideas

- HS-LS1-3 Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.
- HS-LS4-1 Communicates scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.

Core Ideas

- 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) (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)
- Genetic information, like the fossil record, provides evidence of evolution. DNA sequences vary among species, but there are many overlaps; in fact, the ongoing branching that produces multiple lines of descent can be inferred by comparing the DNA sequences of different organisms. Such information is also derivable from the similarities and differences in amino acid sequences and from anatomical and embryological evidence.

Student Learning Objectives

Students will be able to:

- Classify epithelial tissue based on shape and arrangement and give examples.
- Name the types of glands in the body and give examples.
- Name the functions of connective tissue.
- Compare epithelial tissue with connective tissue in terms of cell arrangement and interstitial materials.
- Name the three major types of connective tissue and give examples.
- List the functions of epithelial tissue.
- List the three types of muscle and describe each based on structure and function.
- Describe the anatomy of a neuron and the function of nervous tissue.
- Name the layers of the epidermis.
- Define keratinization.
- Explain why there are skin color differences among people.
- Describe the anatomic parts of a hair.
- Compare the two kinds of glands in the skin based on structure and secretion.
- Explain why sweating is important to survival.
- Explain how the skin helps regulate body temperature.
- Name the functions of the skin.

- Name the functions of the skeletal system.
- Name the two types of ossification.
- Describe why diet can affect bone development in children and bone maintenance in older adults.
- Describe the histology of compact bone.
- Define and give examples of bone markings.
- Name the cranial and facial bones.
- Name the bones of the axial and appendicular skeleton.
- Name and describe the three types of joints.
- Name examples of the two types of synarthroses joints.
- Name examples of the two types of amphiarthroses joints.
- Describe and give examples of the six types of diarthroses or synovial joints.
- Describe the capsular nature of a synovial joint.
- Describe the three types of bursae.
- Name some of the disorders of joints.
- Describe the possible movements at synovial joints.

Integrated Accommodations and Modifications		
Special Education Students	**English Language Learners**	**At Risk**
• Utilize modifications & accommodations delineated in the student's IEP • Provide additional manipulatives to support instruction • Allow for alternative strategies to solve algorithms or tasks • Provide the steps needed to complete the task • Model frequently • Provide repetition and practice. • Use visuals to demonstrate/model the processes • Restate, reread, and clarify directions/questions • Ask students to restate information, directions, and assignments. • Provide copy of class notes • Distribute study guide for classroom tests. • Provide preferential seating to be mutually determined by the student and teacher • Provide extra textbooks for home. • Provide regular parent/ school communication • Allow extended time to complete assignment • Establish procedures for accommodations / modifications for assessments	WIDA Can Do Descriptors https://wida.wisc.edu/teach/can-do/descriptors • Modify Assignments • Use testing and portfolio assessment • Utilize Native Language Translation (peer, online assistive technology, translation device, bilingual dictionary) • Repeat, rephrase, paraphrase key concepts and directions • Allow for extended time for assignment completion as needed • Highlight key vocabulary • Define essential vocabulary in context • Use graphic organizers, visuals, manipulatives and other concrete materials • Use gestures, facial expressions and body language • Read aloud • Build on what students already know and prior experience	• Pair visual prompts with verbal presentations • Ask students to restate information, directions, and assignments. • Provide repetition and and practice • Model skills / techniques to be mastered. • Provide extended time to complete class work • Provide copy of class notes • Provide preferential seating to be mutually determined by the student and teacher • Allow the use of a computer to complete assignments. • Establish expectations for correct spelling on assignments • Provide extra textbooks for home. • Provide Peer Support • Increase one on one time

• Allow student to take/complete tests in an alternate setting as needed		

Gifted and Talented Students	504 Plan
• Utilize advanced, accelerated, or compacted content • Provide assignments that emphasize higher- level thinking skills. • Allow for individual student interest • Gear assignments to development in areas of affect, creativity, cognition, and research skills • Allow for a variety in types of resources • Provide problem-based assignments with planned scope and sequence • Utilize inquiry-based instruction • Adjust the pace of lessons • Utilize Choice Boards • Provide Problem-Based Learning • Establish flexible Grouping	• Pair visual prompts with verbal presentations • Ask students to restate information, directions, and assignments. • Provide repetition and and practice • Model skills / techniques to be mastered. • Provide extended time to complete class work • Provide copy of class notes • Break long assignments into smaller parts • Assist student in setting short term goals • Allow for preferential seating to be mutually determined by the student and teacher • Provide extra textbooks for home. • Model and reinforce organizational systems (i.e. color-coding) • Write out homework assignments, check student's recording of assignments

Interdisciplinary Connections	Computer Science and Design Thinking
Math • HSN.Q.A.2: Define appropriate quantities for the purpose of descriptive modeling. **English Language Arts** Reading • RST.9-12.1 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. Writing • WHST.9-12.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. • WHST.9-12.5 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. • WHST.9-12.7 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.	**Computer Science and Design Thinking Practices** 1. ☐ Fostering an Inclusive Computing and Design Culture 2. ☑ Collaborating Around Computing and Design 3. ☐ Recognizing and Defining Computational Problems 4. ☐ Developing and Using Abstractions 5. ☐ Creating Computational Artifacts 6. ☐ Testing and Refining Computational Artifacts 7. ☑ Communicating About Computing and Design **Computer Science and Design Thinking Standards** • 8.2.12.ED.1: Use research to design and create a product or system that addresses a problem and make modifications based on input from potential consumers. • 8.2.12.ED.4: Design a product or system that addresses a global problem and document decisions made based on research, constraints, trade-offs, and aesthetic and ethical considerations and share this information with an appropriate audience.

	Core Ideas ● Engineering design is a complex process in which creativity, content knowledge, research, and analysis are used to address local and global problems. ● Decisions on trade-offs involve systematic comparisons of all costs and benefits, and final steps that may involve redesigning for optimization.

Career Readiness, Life Literacies and Key Skills

Career Readiness, Life Literacies and Key Skills Practices

- Act as a responsible and contributing community members and employee
- Consider the environmental, social and economic impacts of decisions.
- Demonstrate creativity and innovation.
- Utilize critical thinking to make sense of problems and persevere in solving them.
- Use technology to enhance productivity increase collaboration and communicate effectively.
- Work productively in teams while using cultural/global competence.

- 9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).
- 9.4.12.CI.2: Identify career pathways that highlight personal talents, skills, and abilities (e.g., 1.4.12prof.CR2b, 2.2.12.LF.8).
- 9.4.12.CI.3: Investigate new challenges and opportunities for personal growth, advancement, and transition (e.g., 2.1.12.PGD.1).
- 9.4.12.TL.4: Collaborate in online learning communities or social networks or virtual worlds to analyze and propose a resolution to a real-world problem (e.g., 7.1.AL.IPERS.6).

SEL Competencies

- **Self - Awareness**
- **Self - Management**
- **Social Awareness**
- **Responsible Decision Making**
- **Relationship Skills**

District/School Formative Assessment Plan	District/School Summative Assessment Plan
Formative assessment informs instruction and is ongoing throughout a unit to determine how students are progressing against the standards.	*Summative assessment is an opportunity for students to demonstrate mastery of the skills taught during a particular unit.* ● **Chapter 5 Cengage Learning Testing/Chapter 5 Quiz** ● **Chapter 6 Cengage Learning Testing/Chapter 6 Quiz** ● **Chapter 7 Cengage Learning Testing/Chapter 7 Quiz**

Teachers are encouraged to incorporate Formative Assessments into all lessons. During instruction, teachers will collect ongoing information on students' mastery of content through a variety of methods: ● Questioning: using Socratic method, probing questions, a hierarchical system in complexity (Bloom's Taxonomy) ● Exit tickets, rotational activities (stations), quizzes, and small group activities ● Classwork, homework, group work ● Pre-Assessments, teacher's observation, class discussion, and journal ● Journal Writing ● Daily Verbal Assessments	● **Chapter 8 Cengage Learning Testing/Chapter 8 Quiz** ● **Laboratory Exercises** ● **Other Summative Assessments:** Teachers are encouraged to design and their own assessments (topic/module tests and quizzes) individually and/or with their department or grade-level partners, as per Uniform Grading Profile.

Targeted Academic Vocabulary

epithelial tissue (simple, stratified, pseudostratified, and transitional), connective tissue (areolar, adipose, and reticular tissue), glands, neuron, dendrite, axon, cell body, tendons, ligaments, aponeuroses, muscle sheaths, capsules, fascia, cartilage, bone, dentin, blood, lymphoid tissue, reticuloendothelial system, collagen, elastin fibers, epidermis, stratum basale, stratum spinosum, stratum granulosum, stratum lucidum, stratum corneum, keratinization, hair follicle, hair shaft, sebaceous glands, sweat glands, thermoregulation, ossification, axial skeleton, appendicular skeleton, osteoblasts, osteocytes, osteoporosis, herniated disk, synarthroses joints, amphiarthrosis joints, diarthroses, synovial joints, bursae, arthritis,

Resources:

- Cancer Diagnosis and Screening | STEAM: Ideas That Shape Our World | PBS LearningMedia
- Skeletal remains at Sobibór death camp identified as Ashkenazi Jews | Daily Mail Online **(Holocaust Law)**
- Biomechanics: Just Moving Along | NC Science Now | PBS LearningMedia **(Disabilities Awareness)**
- The Skeletal System: It's ALIVE! | Crash Course Biology | PBS LearningMedia
- Skeletal System: Anatomy and Function, Diagram, Diseases, and More (healthline.com)
- Introduction to the Skeletal System In 7 Minutes - YouTube

Pacing Guide

Unit 3: Muscular System, Nervous System, and Endocrine System (Chapters 9-12)

Overview

Anatomy and physiology is a course that will enable students to develop an understanding of the relationships between the structures and functions of the human body. Students will also learn the mechanisms for maintaining homeostasis within the human body. This course will involve laboratory activities, projects, dissections, textbook material, models, diagrams, journal writings, and clinical studies.

Essential Questions	Enduring Understandings

• Discuss why knowing the microscopic anatomy of a skeletal muscle cell is crucial to understanding muscle contraction. • Compare the three types of muscle cells and relate this to the arrangement of fibers and anatomy. • Discuss the sources of ATP for muscle contraction. • Compare the physiology of a muscle cell contraction with that of a nerve cell contraction. • Compare the structure of a sensory, internuncial, and motor neuron and relate this to function. • Discuss the path of a reflex arc, beginning at a receptor site and ending up at a motor neuron near a muscle or gland. • Discuss the significance of the hypothalamus to controlling major bodily functions. • Discuss how the size of the cerebral hemispheres relates to thought, interpretation, and emotions. • Discuss how the autonomic nervous system stimulates and restores bodily activities. • Discuss how tasting food relates to food staying in the mouth for a short period of time; relate this to smell. • Discuss the connections between the nervous system and the endocrine system. • Discuss negative feedback and its role in the endocrine system; compare this to positive feedback. • Compare the different effects the sex hormones have on male and female body development. • Discuss the role of the pituitary gland as a “master gland” of the system.	• The muscular system plays a major role in movement, support, and homeostasis of the human body • Muscle types vary in structure to support their specific function. • Muscles are named based on their location and action performed. • Muscles related to the bones they attach to. • Beginning with the cellular level of function and intracellular components such as the sarcoplasmic reticulum. • Muscle contraction as relation to actin and myosin fibers leading to an understanding of macroscopic content • Cellular differences between smooth, skeletal and cardiac muscle will be studied in conjunction with histological studies of microscope slides. • The brain and body work in synchronous harmony as messages of sensory and motor function are continuously being transmitted through a network of structures and circuits. • They hypothalamus connect the CNS and the pituitary. • The pineal is found in the third ventricle. • Each gyrus and sulcus increases surface area and neuron density. • Directs immediate responses to stimuli, internal and external in nature. • Coordinates or moderates activities of other organ systems. • The eyes receive light and transmit a message to the brain via the optic nerve. • The ears have basilar fibers in the cochlea to receive sound impulses. • Balance and its association with the ear. • The nose contains chemoreceptors aligned with the olfactory nerve • The tongue contains taste buds with specialized receptors. • The skin is innervated with specialized nerves for different stimuli. • Parts of the brain that interpret each sensory organ. • Hormones are part of a control system which uses the bloodstream to deliver messages which control the functioning of organs distinct from the organ serving as the origin. • Hormones are the chemical messengers of the human body and the second control system, joining the nervous system in eliciting responses to stimuli. • Understanding the system involves a study of the glands, the hormones and the target cells. • Environmental factors that may trigger endocrine system responses. • The Endocrine system in terms of regulation of several bodily functions. • The anatomy of organs and structures of the endocrine system are directly related to their physiology.

Unit 3: Muscular System, Nervous System, and Endocrine System (Chapters 9-12)

Performance Expectations/Core Ideas

- 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-LS1-6 Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon based molecules.
- HS-LS1-7 Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy.
- HS-PS1-5 Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs.
- HS-PS4-1 Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.
- HS-PS4-3 Evaluate the claims, evidence, and reasoning behind the idea that electromagnetic radiation can be described either by a wave model or a particle model, and that for some situations one model is more useful than the other.
- HS-LS2-3 Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.
- HS-LS4-1 Communicates scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.
- HS-LS4-3 Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait.
- HS-PS1-5 Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs.
- HS-ESS3-3: Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations and biodiversity. **(Climate Change)**

Core Ideas

- 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) (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)
- 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 organizational levels of living systems, chemical elements are recombined in different ways to form different products. (HS-LS1-6), (HS-LS1-7)
- The sustainability of human societies and the biodiversity that supports them requires responsible management of natural resources. **(Climate Change)**

Unit 3: Muscular System, Nervous System, and Endocrine System (Chapters 9-12)

Performance Expectations/Core Ideas

- As a result of these chemical reactions, energy is transferred from one system of interacting molecules to another. Cellular respiration is a chemical process in which the bonds of food molecules and oxygen molecules are broken and new compounds are formed that can transport energy to muscles. Cellular respiration also releases the energy needed to maintain body temperature despite ongoing energy transfer to the surrounding environment. (HSLS1-7)
- Chemical processes, their rates, and whether or not energy is stored or released can be understood in terms of the collisions of molecules and the rearrangements of atoms into new molecules, with consequent changes in the sum of all bond energies in the set of molecules that are matched by changes in kinetic energy. (HS-PS1-4), (HS-PS1-5)
- Photosynthesis and cellular respiration (including anaerobic processes) provide most of the energy for life processes. (HS-LS2-3)
- Genetic information, like the fossil record, provides evidence of evolution. DNA sequences vary among species, but there are many overlaps; in fact, the ongoing branching that produces multiple lines of descent can be inferred by comparing the DNA sequences of different organisms. Such information is also derivable from the similarities and differences in amino acid sequences and from anatomical and embryological evidence.
- Natural selection occurs only if there is both (1) variation in the genetic information between organisms in a population and (2) variation in the expression of that genetic information—that is, trait variation—that leads to differences in performance among individuals.
- The traits that positively affect survival are more likely to be reproduced, and thus are more common in the population.
- Natural selection leads to adaptation, that is, to a population dominated by organisms that are anatomically, behaviorally, and physiologically well suited to survive and reproduce in a specific environment. That is, the differential survival and reproduction of organisms in a population that have an advantageous heritable trait leads to an increase in the proportion of individuals in future generations that have the trait and to a decrease in the proportion of individuals that do not.
- Adaptation also means that the distribution of traits in a population can change when conditions change.
- Chemical processes, their rates, and whether or not energy is stored or released can be understood in terms of the collisions of molecules and the rearrangements of atoms into new molecules, with consequent changes in the sum of all bond energies in the set of molecules that are matched by changes in kinetic energy.
- The wavelength and frequency of a wave are related to one another by the speed of travel of the wave, which depends on the type of wave and the medium through which it is passing.
- Waves can add or cancel one another as they cross, depending on their relative phase (i.e., relative position of peaks and troughs of the waves), but they emerge unaffected by each other.
- Electromagnetic radiation (e.g., radio, microwaves, light) can be modeled as a wave of changing electric and magnetic fields or as particles called photons. The wave model is useful for explaining many features of electromagnetic radiation, and the particle model explains other features.

Student Learning Objectives

Students will be able to:

- Describe the gross and microscopic anatomy of skeletal muscle.
- Describe and compare the basic differences between the anatomy of skeletal, smooth, and cardiac muscles.
- Explain the current concept of muscle contraction based on three factors: neuroelectrical, chemical, and energy sources.
- Define muscle tone and compare isotonic and isometric contractions.
- List factors that can cause muscles to malfunction, causing various disorders.
- Name and identify the location of major superficial muscles of the body.
- Name the major subdivisions of the nervous system.

- Classify the different types of neuroglia cells.
- List the structural and functional classification of neurons.
- Explain how a neuron transmits a nerve impulse.
- Name the different types of neural tissues and their definitions.
- Describe the structure of the spinal cord.
- Name and number the spinal nerves.
- List the principal parts of the brain.
- Name the functions of the cerebrospinal fluid.
- List the principal functions of the major parts of the brain.
- List the 12 cranial nerves and their functions.
- Name the parts of the autonomic nervous system and describe how it functions.
- Describe the basic anatomy of the sense organs and explain how they function.
- List the functions of hormones.
- Classify hormones into their major chemical categories.
- Describe how the hypothalamus of the brain controls the endocrine system.
- Name the endocrine glands and state where they are located.
- List the major hormones and their effects on the body.
- Discuss some of the major diseases of the endocrine system and their causes.

Integrated Accommodations and Modifications		
Special Education Students	**English Language Learners**	**At Risk**
• Utilize modifications & accommodations delineated in the student's IEP • Provide additional manipulatives to support instruction • Allow for alternative strategies to solve algorithms or tasks • Provide the steps needed to complete the task • Model frequently • Provide repetition and practice. • Use visuals to demonstrate/model the processes • Restate, reread, and clarify directions/questions • Ask students to restate information, directions, and assignments. • Provide copy of class notes • Distribute study guide for classroom tests. • Provide preferential seating to be mutually determined by the student and teacher • Provide extra textbooks for home. • Provide regular parent/ school communication	WIDA Can Do Descriptors https://wida.wisc.edu/teach/can-do/descriptors • Modify Assignments • Use testing and portfolio assessment • Utilize Native Language Translation (peer, online assistive technology, translation device, bilingual dictionary) • Repeat, rephrase, paraphrase key concepts and directions • Allow for extended time for assignment completion as needed • Highlight key vocabulary • Define essential vocabulary in context • Use graphic organizers, visuals, manipulatives and other concrete materials • Use gestures, facial expressions and body language • Read aloud	• Pair visual prompts with verbal presentations • Ask students to restate information, directions, and assignments. • Provide repetition and and practice • Model skills / techniques to be mastered. • Provide extended time to complete class work • Provide copy of class notes • Provide preferential seating to be mutually determined by the student and teacher • Allow the use of a computer to complete assignments. • Establish expectations for correct spelling on assignments • Provide extra textbooks for home. • Provide Peer Support • Increase one on one time

• Allow extended time to complete assignment • Establish procedures for accommodations / modifications for assessments • Allow student to take/complete tests in an alternate setting as needed	• Build on what students already know and prior experience	

Gifted and Talented Students	504 Plan
• Utilize advanced, accelerated, or compacted content • Provide assignments that emphasize higher- level thinking skills. • Allow for individual student interest • Gear assignments to development in areas of affect, creativity, cognition, and research skills • Allow for a variety in types of resources • Provide problem-based assignments with planned scope and sequence • Utilize inquiry-based instruction • Adjust the pace of lessons • Utilize Choice Boards • Provide Problem-Based Learning • Establish flexible Grouping	• Pair visual prompts with verbal presentations • Ask students to restate information, directions, and assignments. • Provide repetition and and practice • Model skills / techniques to be mastered. • Provide extended time to complete class work • Provide copy of class notes • Break long assignments into smaller parts • Assist student in setting short term goals • Allow for preferential seating to be mutually determined by the student and teacher • Provide extra textbooks for home. • Model and reinforce organizational systems (i.e. color-coding) • Write out homework assignments, check student's recording of assignments

Interdisciplinary Connections	Computer Science and Design Thinking
Math • HSF-BF.A.1: Write a function that describes a relationship between two quantities. • HSS.IC.A.1: Understand statistics as a process for making inferences about population parameters based on a random sample from that population. • HSS.IC.B.5: Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant. **English Language Arts** Reading • RST.9-12.1 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. Writing • WHST.9-12.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.	**Computer Science and Design Thinking Practices** 1. □ Fostering an Inclusive Computing and Design Culture 2. ☑ Collaborating Around Computing and Design 3. □ Recognizing and Defining Computational Problems 4. □ Developing and Using Abstractions 5. □ Creating Computational Artifacts 6. □ Testing and Refining Computational Artifacts 7. ☑ Communicating About Computing and Design **Computer Science and Design Thinking Standards** • 8.1.12.IC.1: Evaluate the ways computing impacts personal, ethical, social, economic, and cultural practices. • 8.1.12.IC.3: Predict the potential impacts and implications of emerging technologies on larger social, economic, and political structures, using evidence from credible sources. • 8.1.12.DA.5: Create data visualizations from large data sets to summarize, communicate, and support different interpretations of real-world phenomena.

- WHST.9-12.5 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.
- WHST.9-12.7 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.
- WHST.9-12.8 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.
- WHST.9-12.9 Draw evidence from informational texts to support analysis, reflection, and research.

Speaking and Listening

- SL.9-10.5 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.

- 8.1.12.DA.6: Create and refine computational models to better represent the relationships among different elements of data collected from a phenomenon or process.

Core Ideas

- The design and use of computing technologies and artifacts can positively or negatively affect equitable access to information and opportunities.
- Large data sets can be transformed, generalized, simplified, and presented in different ways to influence how individuals interpret and understand the underlying information.
- The accuracy of predictions or inferences made from a computer model is affected by the amount, quality, and diversity of data.

Career Readiness, Life Literacies and Key Skills

Career Readiness, Life Literacies and Key Skills Practices

- Act as a responsible and contributing community members and employee
- Consider the environmental, social and economic impacts of decisions.
- Demonstrate creativity and innovation.
- Utilize critical thinking to make sense of problems and persevere in solving them.
- Use technology to enhance productivity increase collaboration and communicate effectively.
- Work productively in teams while using cultural/global competence.

- 9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).
- 9.4.12.CI.2: Identify career pathways that highlight personal talents, skills, and abilities (e.g., 1.4.12prof.CR2b, 2.2.12.LF.8).
- 9.4.12.CI.3: Investigate new challenges and opportunities for personal growth, advancement, and transition (e.g., 2.1.12.PGD.1)
- 9.4.12.CT.1: Identify problem-solving strategies used in the development of an innovative product or practice (e.g., 1.1.12acc.C1b, 2.2.12.PF.3).
- 9.4.12.CT.2: Explain the potential benefits of collaborating to enhance critical thinking and problem solving (e.g., 1.3E.12profCR3.a).
- 9.4.12.DC.7: Evaluate the influence of digital communities on the nature, content and responsibilities of careers, and other aspects of society (e.g., 6.1.12.CivicsPD.16.a).
- 9.4.12.IML.2: Evaluate digital sources for timeliness, accuracy, perspective, credibility of the source, and relevance of information, in media, data, or other resources (e.g., NJSLSA.W8, Social Studies Practice: Gathering and Evaluating Sources.
- 9.4.12.TL.1: Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specific task (e.g., W.11-12.6.).
- 9.4.12.TL.2: Generate data using formula-based calculations in a spreadsheet and draw conclusions about the data.

SEL Competencies

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- **Self - Awareness**
- **Self - Management**
- **Social Awareness**
- **Responsible Decision Making**
- **Relationship Skills**

District/School Formative Assessment Plan	District/School Summative Assessment Plan
Formative assessment informs instruction and is ongoing throughout a unit to determine how students are progressing against the standards. Teachers are encouraged to incorporate Formative Assessments into all lessons. During instruction, teachers will collect ongoing information on students' mastery of content through a variety of methods: ● Questioning: using Socratic method, probing questions, a hierarchical system in complexity (Bloom's Taxonomy) ● Exit tickets, rotational activities (stations), quizzes, and small group activities ● Classwork, homework, group work ● Pre-Assessments, teacher's observation, class discussion, and journal ● Journal Writing ● Daily Verbal Assessments	*Summative assessment is an opportunity for students to demonstrate mastery of the skills taught during a particular unit.* ● **Chapter 9 Cengage Learning Testing/Chapter 9 Quiz** ● **Chapter 10 Cengage Learning Testing/Chapter 10 Quiz** ● **Chapter 11 Cengage Learning Testing/Chapter 11 Quiz** ● **Chapter 12 Cengage Learning Testing/Chapter 12 Quiz** ● **Laboratory Exercises** ● **Other Summative Assessments:** Teachers are encouraged to design and their own assessments (topic/module tests and quizzes) individually and/or with their department or grade-level partners, as per Uniform Grading Profile.

Targeted Academic Vocabulary

gross anatomy, skeletal muscle, smooth muscle, cardiac muscle, muscle tone, isotonic contractions, isometric contractions, superficial muscles, phosphocreatine, muscular dystrophy, efferent system, synaptic transmission, reflex arc, spina bifida, anterior root, ventral root, brainstem, thalamus, hypothalamus, cerebrum, cerebellum, diencephalon, autonomic nervous system, cranial nerves, hormones, growth cycles, acidosis, epinephrine, testosterone, estrogen, progesterone, ductless glands, hyper/hypothyroidism, glucagon

Resources:

- Biomechanics: Just Moving Along | NC Science Now | PBS LearningMedia **(Disabilities Awareness)**
- Big Guns: The Muscular System | Crash Course Biology | PBS LearningMedia
- Introduction to the Muscular System | SEER Training (cancer.gov)
- 11 functions of the muscular system: Diagrams, facts, and structure (medicalnewstoday.com)
- Muscular System - Muscles of the Human Body (innerbody.com)
- How climate change could impact people with neurological conditions (medicalnewstoday.com) **(Climate Change)**
- The Brain and Climate Change - Neuroscience News **(Climate Change)**
- Newsela - Shelter dog protects owner with epilepsy **(Disabilities Awareness)**
- The Nervous System | Crash Course Biology | PBS LearningMedia

- Mirror Therapy: Tricking the Nervous System to Help People Heal | PBS LearningMedia
- Dr. Damirez Fossett | Career Spotlights: Inspired by Oliver Sacks | PBS LearningMedia **(Amistad Law)**
- Newsela - Heading to high school, teen who is blind sees opportunities, not obstacles **(Disabilities Awareness)**
- Newsela - Doctors try first CRISPR editing in the body for blindness **(Disabilities Awareness)**
- A Cure for the Colorblindness Blues | PBS LearningMedia **(Disabilities Awareness)**
- Newsela - How our eyes make sense of light
- Newsela - Astronauts' eyes are at risk after too much time in space
- Endocrine Disruptor Hypothesis | PBS LearningMedia
- Intro to the endocrine system (video) | Khan Academy

Pacing Guide

Unit 4: Cardiovascular System and Lymphatic System (Chapters 13 - 15)

Overview

Anatomy and physiology is a course that will enable students to develop an understanding of the relationships between the structures and functions of the human body. Students will also learn the mechanisms for maintaining homeostasis within the human body. This course will involve laboratory activities, projects, dissections, textbook material, models, diagrams, journal writings, and clinical studies.

Essential Questions	Enduring Understandings
• Compare the anatomy of erythrocytes to leukocytes and relate this to functions. • Discuss the factors involved in the clotting mechanism. • Discuss why blood typing is critical to blood transfusions. • Compare the thickness of the walls of the chambers of the heart and relate this to the function of the chambers. • Discuss why exchange of gases, nutrients, and wastes between the blood and body cells can only occur through capillaries and not arteries and veins. • Discuss how an artificial pacemaker can replace a defective conduction system of the heart. • Discuss the possible events in an immune response when the body is invaded by foreign microorganisms such as bacteria or viruses. • Compare the different functions of a T lymphocyte with a B lymphocyte and relate this to the two types of immunity in the body. • Discuss why the AIDS virus can hide from the immune response of our bodies.	• Blood brings oxygen and nutrients to all the parts of the body so they can keep working. • There are four basic components that comprise human blood: plasma, red blood cells, white blood cells and platelets. • The heart is a muscle that pumps blood. • Blood vessels provide the conduits within which blood circulates to all body tissues. • • •

Unit 4: Cardiovascular System and Lymphatic System (Chapters 13 - 15)

Performance Expectations/Core Ideas

Performance Expectations

- 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-LS4-1 Communicates scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.
- HS-LS4-3 Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait.
- HS-PS1-5 Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs
- HS-LS2-3 Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.

Core Ideas

- 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) (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)
- Genetic information provides evidence of evolution. DNA sequences vary among species, but there are many overlaps; in fact, the ongoing branching that produces multiple lines of descent can be inferred by comparing the DNA sequences of different organisms. Such information is also derivable from the similarities and differences in amino acid sequences and from anatomical and embryological evidence. (HS-LS4-1)
- Natural selection occurs only if there is both (1) variation in the genetic information between organisms in a population and (2) variation in the expression of that genetic information—that is, trait variation—that leads to differences in performance among individuals. (HS-LS4-2), (HS-LS4-3)
- The traits that positively affect survival are more likely to be reproduced, and thus are more common in the population. (HS-LS4-3)
- Natural selection leads to adaptation, that is, to a population dominated by organisms that are anatomically, behaviorally, and physiologically well suited to survive and reproduce in a specific environment. That is, the differential survival and reproduction of organisms in a population that have an advantageous heritable trait leads to an increase in the proportion of individuals in future generations that have the trait and to a decrease in the proportion of individuals that do not. (HS-LS4-3), (HS-LS4-4)
- Adaptation also means that the distribution of traits in a population can change when conditions change. (HS-LS4-3)
- Chemical processes, their rates, and whether or not energy is stored or released can be understood in terms of the collisions of molecules and the rearrangements of atoms into new molecules, with consequent changes in the sum of all bond energies in the set of molecules that are matched by changes in kinetic energy. (HS-PS1-4), (HS-PS1-5)
- Photosynthesis and cellular respiration (including anaerobic processes) provide most of the energy for life processes. (HS-LS2-3)

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Student Learning Objectives

Students will be able to:

- Describe the functions of blood.
- Classify the different types of blood cells.
- Describe the anatomy of erythrocytes relative to their function.
- Compare the functions of the different leukocytes.
- Explain how and where blood cells are formed.
- Explain the clotting mechanism.
- Name the different blood groups.
- Describe how the heart is positioned in the thoracic cavity.
- List and describe the layers of the heart wall.
- Name the chambers of the heart and their valves.
- Name the major vessels that enter and exit the heart.
- Describe blood flow through the heart.
- Explain how the conduction system of the heart controls proper blood flow.
- Describe the stages of the cardiac cycle.
- Compare the anatomy of a vein, artery, and capillary.
- Name the major blood circulatory routes.
- Name the functions of the lymphatic system.
- Explain what lymph is and how it forms.
- Describe lymph flow through the body.
- Name the principal lymphatic trunks.
- Describe the functions of the tonsils and spleen.
- Explain the unique role the thymus gland plays as part of the lymphatic system.
- Describe the different types of immunity.
- Explain the difference between blood and lymphatic capillaries.
- Explain the difference between active and passive immunity.
- Define an antigen and an antibody.

Integrated Accommodations and Modifications

Special Education Students	English Language Learners	At Risk
• Utilize modifications & accommodations delineated in the student's IEP • Provide additional manipulatives to support instruction • Allow for alternative strategies to solve algorithms or tasks • Provide the steps needed to complete the task • Model frequently	WIDA Can Do Descriptors https://wida.wisc.edu/teach/can-do/descriptors • Modify Assignments • Use testing and portfolio assessment • Utilize Native Language Translation (peer, online assistive technology, translation device, bilingual dictionary)	• Pair visual prompts with verbal presentations • Ask students to restate information, directions, and assignments. • Provide repetition and and practice • Model skills / techniques to be mastered. • Provide extended time to complete class work • Provide copy of class notes

• Provide repetition and practice. • Use visuals to demonstrate/model the processes • Restate, reread, and clarify directions/questions • Ask students to restate information, directions, and assignments. • Provide copy of class notes • Distribute study guide for classroom tests. • Provide preferential seating to be mutually determined by the student and teacher • Provide extra textbooks for home. • Provide regular parent/ school communication • Allow extended time to complete assignment • Establish procedures for accommodations / modifications for assessments • Allow student to take/complete tests in an alternate setting as needed	• Repeat, rephrase, paraphrase key concepts and directions • Allow for extended time for assignment completion as needed • Highlight key vocabulary • Define essential vocabulary in context • Use graphic organizers, visuals, manipulatives and other concrete materials • Use gestures, facial expressions and body language • Read aloud • Build on what students already know and prior experience	• Provide preferential seating to be mutually determined by the student and teacher • Allow the use of a computer to complete assignments. • Establish expectations for correct spelling on assignments • Provide extra textbooks for home. • Provide Peer Support • Increase one on one time

Gifted and Talented Students	504 Plan
• Utilize advanced, accelerated, or compacted content • Provide assignments that emphasize higher- level thinking skills. • Allow for individual student interest • Gear assignments to development in areas of affect, creativity, cognition, and research skills • Allow for a variety in types of resources • Provide problem-based assignments with planned scope and sequence • Utilize inquiry-based instruction • Adjust the pace of lessons • Utilize Choice Boards • Provide Problem-Based Learning • Establish flexible Grouping	• Pair visual prompts with verbal presentations • Ask students to restate information, directions, and assignments. • Provide repetition and and practice • Model skills / techniques to be mastered. • Provide extended time to complete class work • Provide copy of class notes • Break long assignments into smaller parts • Assist student in setting short term goals • Allow for preferential seating to be mutually determined by the student and teacher • Provide extra textbooks for home. • Model and reinforce organizational systems (i.e. color-coding) • Write out homework assignments, check student's recording of assignments

Interdisciplinary Connections	Computer Science and Design Thinking
English/Language Arts Reading • RST.9-12.1 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. Writing	**Computer Science and Design Thinking Practices** 1. □ Fostering an Inclusive Computing and Design Culture 2. ☑ Collaborating Around Computing and Design 3. □ Recognizing and Defining Computational Problems 4. □ Developing and Using Abstractions 5. □ Creating Computational Artifacts 6. □ Testing and Refining Computational Artifacts

- WHST.9-12.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.
- WHST.9-12.5 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.
- WHST.9-12.7 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.
- WHST.9-12.8 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.
- WHST.9-12.9 Draw evidence from informational texts to support analysis, reflection, and research.

Speaking and Listening

- 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.
- SL.11-12.4 Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation.

7. ☑ Communicating About Computing and Design

Computer Science and Design Thinking Standards

- 8.2.12.ED.5: Evaluate the effectiveness of a product or system based on factors that are related to its requirements, specifications, and constraints (e.g., safety, reliability, economic considerations, quality control, environmental concerns, manufacturability, maintenance and repair, ergonomics).
- 8.2.12.EC.3: Synthesize data, analyze trends, and draw conclusions regarding the effect of a technology on the individual, culture, society, and environment and share this information with the appropriate audience.

Core Ideas

- Engineering design evaluation, a process for determining how well a solution meets requirements, involves systematic comparisons between requirements, specifications, and constraints.
- The ability to ethically integrate new technologies requires deciding whether to introduce a technology, taking into consideration local resources and the role of culture in acceptance.
- Consequences of technological use may be different for different groups of people and may change over time.
- Since technological decisions can have ethical implications, it is essential that individuals analyze issues by gathering evidence from multiple perspectives and conceiving of alternative possibilities before proposing solutions.

Career Readiness, Life Literacies and Key Skills

Career Readiness, Life Literacies and Key Skills Practices

- Act as a responsible and contributing community members and employee
- Consider the environmental, social and economic impacts of decisions.
- Demonstrate creativity and innovation.
- Utilize critical thinking to make sense of problems and persevere in solving them.
- Use technology to enhance productivity increase collaboration and communicate effectively.
- Work productively in teams while using cultural/global competence.

- 9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12 prof.CR3a).
- 9.4.12.CT.1: Identify problem-solving strategies used in the development of an innovative product or practice (e.g., 1.1.12acc.C1b, 2.2.12.PF.3).
- 9.4.12.CT.2: Explain the potential benefits of collaborating to enhance critical thinking and problem solving (e.g., 1.3E.12profCR3.a).

- 9.4.12.IML.2: Evaluate digital sources for timeliness, accuracy, perspective, credibility of the source, and relevance of information, in media, data, or other resources (e.g., NJSLSA.W8, Social Studies Practice: Gathering and Evaluating Sources.
- 9.4.12.TL.1: Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specific task (e.g., W.11-12.6.).
- 9.4.12.TL.2: Generate data using formula-based calculations in a spreadsheet and draw conclusions about the data.

SEL Competencies

- **Self - Awareness**
- **Self - Management**
- **Social Awareness**
- **Responsible Decision Making**
- **Relationship Skills**

District/School Formative Assessment Plan	District/School Summative Assessment Plan
Formative assessment informs instruction and is ongoing throughout a unit to determine how students are progressing against the standards. Teachers are encouraged to incorporate Formative Assessments into all lessons. During instruction, teachers will collect ongoing information on students' mastery of content through a variety of methods: • Questioning: using Socratic method, probing questions, a hierarchical system in complexity (Bloom's Taxonomy) • Exit tickets, rotational activities (stations), quizzes, and small group activities • Classwork, homework, group work • Pre-Assessments, teacher's observation, class discussion, and journal • Journal Writing • Daily Verbal Assessments	*Summative assessment is an opportunity for students to demonstrate mastery of the skills taught during a particular unit.* • **Chapter 13 Cengage Learning Testing/Chapter 13 Quiz** • **Chapter 14 Cengage Learning Testing/Chapter 14 Quiz** • **Chapter 15 Cengage Learning Testing/Chapter 15 Quiz** • **Chapter 16 Cengage Learning Testing/Chapter 16 Quiz** • **Laboratory Exercises** • **Other Summative Assessments:** Teachers are encouraged to design and their own assessments (topic/module tests and quizzes) individually and/or with their department or grade-level partners, as per Uniform Grading Profile.

Targeted Academic Vocabulary

plasma, heart, atria, ventricles/blood, plasma, leukocytes, erythrocytes/blood vessels, arteries, veins, platelets, erythrocytes, leukocytes, neutrophils, eosinophils, basophils, agranular,monocytes, lymphocytes, thrombocytes, albumin, globulins, fibrinogen, hematopoiesis, hemoglobin, clotting mechanism, antihistamines, serotonin, capillaries, lymph, lymph nodes, microorganisms, T-cells, allergies, antigen

Resources:

- Cardiovascular Diseases | Division of Global Health Protection | Global Health | CDC **(Disabilities Awareness)**
- How Cancer Cells Grow and Divide | PBS LearningMedia
- Why We Can't Deliver Drugs to the Brain | Braincraft | PBS LearningMedia
- Newsela | The Circle of Life: The Circulatory System

- Circulatory & Respiratory Systems | Crash Course Biology | PBS LearningMedia
- The whitewashed history of HIV: A Black teen died of AIDS in 1969 **(Amistad)**

Pacing Guide

Unit 5: Digestive System, Respiratory System, Urinary System, and Reproductive System (Chapters 16 - 19)

Overview

Anatomy and physiology is a course that will enable students to develop an understanding of the relationships between the structures and functions of the human body. Students will also learn the mechanisms for maintaining homeostasis within the human body. This course will involve laboratory activities, projects, dissections, textbook material, models, diagrams, journal writings, and clinical studies.

Essential Questions	Enduring Understandings
• Compare the roles of the liver and the pancreas to the digestive process. • Discuss the significance of specific enzymes to the breakdown of food so that it can be absorbed by the intestinal cells. • Discuss the anatomy of a villus and relate this to absorption. • Discuss how the blood, the cardiovascular system, and the muscular system as well as the respiratory system all contribute to respiration. • Discuss the unique anatomy of terminal bronchioles and relate this to the exchange of gases with the blood. • Discuss how breathed-in air pollutants, such as smoke or asbestos, interfere with the respiration process and may lead to cancer. • Discuss how the nephrons of the kidney both filter and reabsorb materials from the blood; relate this to glomerular filtration, tubular reabsorption, and tubular secretion. • Discuss how the digestive, respiratory, and integumentary systems also contribute to excretion of waste products from the body. • Discuss why we would die if kidney failure occurs. • Compare the process of spermatogenesis with that of oogenesis; relate this to meiosis and the final end products. • Discuss how mental sexual stimulation affects the three cylindrical masses of spongy tissue in the male penis. • Discuss how various external factors could disrupt a female's menstrual cycle. • Discuss the effects a developing fetus has on a female body; relate this to the growth of the fetus.	• The digestive system breaks down ingested food to particles small enough to be absorbed into the blood. • The anatomy of organs and structures of the digestive system are directly related to their physiology • The anatomy and physiology of the organs and structures that compose and are accessory to the alimentary canal. • Enzymes and acids providing chemical digestion will be linked with a study of mechanical digestion as provided by peristalsis. • Each portion of the digestive system from mouth to rectum. • Associated organs such as the liver and pancreas will also be studied with an emphasis on their roles in digestion. • Absorbing oxygen and discharging carbon dioxide permits cellular respiration as discussed in biology class. • The structures and processes that permit exchange of gasses with the atmosphere are to be understood in context with understanding the air flow and the biochemistry of gas exchange. • The anatomy of organs and structures of the respiratory system are directly related to their physiology. • Lung volumes vary based on body size. • Blood flow associated with alveoli permits blood to absorb oxygen and release carbon dioxide across the concentration gradient. • The effects of harmful substances on the respiratory system. • Common respiratory pathology and the effects they have on overall lung performance.

	• Waste products collect in the body and the blood must be cleaned of nitrogenous waste. • The excretory system filters the blood and releases the wastes. • Blood enters and exits the kidney via a series of blood vessels: Renal, Segmental, Interlobar, Arcuate , Cortical Radiate (Arteries and Veins). • Once in the kidney, the nephrons filter the blood and form, then concentrate the urine in a series of tubules. • The process of meiosis occurs differently in the two genders, leading to either four sperm, or one egg and polar bodies. • The complex pathway each gender system takes in allowing gamete union. • The hormones associated in each gender, as associated with reproduction.

Unit 5: Digestive System, Respiratory System, Urinary System, and Reproductive System (Chapters 16 - 19)

Performance Expectations/Core Ideas

Performance Expectations

- 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-PS1-4 Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy
- HS-LS1-6 Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon based molecules.
- HS-LS1-7 Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy.
- HS-LS4-1 Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.
- HS-LS4-3 Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait.
- HS-PS1-5 Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs

Core Ideas

- Systems of specialized cells within organisms help them perform the essential functions of life.
- 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.
- 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.
- 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.

Unit 5: Digestive System, Respiratory System, Urinary System, and Reproductive System (Chapters 16 - 19)

Performance Expectations/Core Ideas

- A stable molecule has less energy than the same set of atoms separated; one must provide at least this energy in order to take the molecule apart.
- 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.
- As matter and energy flow through different organizational levels of living systems, chemical elements are recombined in different ways to form different products.
- As a result of these chemical reactions, energy is transferred from one system of interacting molecules to another. Cellular respiration is a chemical process in which the bonds of food molecules and oxygen molecules are broken and new compounds are formed that can transport energy to muscles. Cellular respiration also releases the energy needed to maintain body temperature despite ongoing energy transfer to the surrounding environment.
- Genetic information provides evidence of evolution. DNA sequences vary among species, but there are many overlaps; in fact, the ongoing branching that produces multiple lines of descent can be inferred by comparing the DNA sequences of different organisms. Such information is also derivable from the similarities and differences in amino acid sequences and from anatomical and embryological evidence.
- Natural selection occurs only if there is both (1) variation in the genetic information between organisms in a population and (2) variation in the expression of that genetic information—that is, trait variation—that leads to differences in performance among individuals.
- The traits that positively affect survival are more likely to be reproduced, and thus are more common in the population.
- Natural selection leads to adaptation, that is, to a population dominated by organisms that are anatomically, behaviorally, and physiologically well suited to survive and reproduce in a specific environment. That is, the differential survival and reproduction of organisms in a population that have an advantageous heritable trait leads to an increase in the proportion of individuals in future generations that have the trait and to a decrease in the proportion of individuals that do not.
- Adaptation also means that the distribution of traits in a population can change when conditions change.
- Chemical processes, their rates, and whether or not energy is stored or released can be understood in terms of the collisions of molecules and the rearrangements of atoms into new molecules, with consequent changes in the sum of all bond energies in the set of molecules that are matched by changes in kinetic energy.
- Chemical processes, their rates, and whether or not energy is stored or released can be understood in terms of the collisions of molecules and the rearrangements of atoms into new molecules, with consequent changes in the sum of all bond energies in the set of molecules that are matched by changes in kinetic energy.

Student Learning Objectives

Students will be able to:

- List and describe the five basic activities of the digestive process.
- List the four layers or tunics of the walls of the digestive tract.
- Name the major and accessory organs of the digestive tract and their component anatomic parts.
- Explain the major digestive enzymes and how they function.
- Explain the functions of the liver.
- Explain how absorption of nutrients occurs in the small intestine and how the feces form in the large intestine.
- Name and describe the functions of the organs of the digestive tract.
- Explain the function of the respiratory system.
- Name the organs of the system.
- Define the parts of the internal nose and their functions.
- Name the three areas of the pharynx and explain their anatomy.
- Name the cartilages and membranes of the larynx and how they function.
- Explain how the anatomy of the trachea prevents collapse during breathing and allows for esophageal expansion during swallowing.
- Explain what is meant by the term bronchial tree.
- Describe the structure and function of the lungs and pleura.
- Describe the overall process of gas exchange in the lungs and tissues.
- Define ventilation, external respiration, and internal respiration.
- Define the function of the urinary system.
- Name the external layers of the kidney.
- Define the following internal parts of the kidneys: cortex, medulla, medullary pyramids, renal papillae, renal columns, and major and minor calyces.
- Name the parts of a nephron and describe the flow of urine through this renal tubule.
- List the functions of the nephrons.
- Explain how urine flows down the ureters.
- Describe micturition and the role of stretch receptors in the bladder.
- Compare the length and course of the male urethra to the female urethra.
- Name the normal constituents of urine.
- Name the internal parts of a testis.
- Explain the effects of testosterone on the male body.
- Describe the process of spermatogenesis.
- Follow the path of a sperm from the seminiferous tubules to the outside.
- Define semen and what glands contribute to its composition.
- Name the three parts of the male urethra.
- Describe the development of a follicle, before and after ovulation.
- Describe the process of oogenesis.
- Name the parts of the uterus.
- Name the external genitalia of the female.
- Describe the phases of the menstrual cycle.
- Describe lactation and the function of the mammary glands.
- Name the phases of labor.

Integrated Accommodations and Modifications		
Special Education Students	**English Language Learners**	**At Risk**
• Utilize modifications & accommodations delineated in the student's IEP • Provide additional manipulatives to support instruction • Allow for alternative strategies to solve algorithms or tasks • Provide the steps needed to complete the task • Model frequently • Provide repetition and practice. • Use visuals to demonstrate/model the processes • Restate, reread, and clarify directions/questions • Ask students to restate information, directions, and assignments. • Provide copy of class notes • Distribute study guide for classroom tests. • Provide preferential seating to be mutually determined by the student and teacher • Provide extra textbooks for home. • Provide regular parent/ school communication • Allow extended time to complete assignment • Establish procedures for accommodations / modifications for assessments • Allow student to take/complete tests in an alternate setting as needed	WIDA Can Do Descriptors https://wida.wisc.edu/teach/can-do/descriptors • Modify Assignments • Use testing and portfolio assessment • Utilize Native Language Translation (peer, online assistive technology, translation device, bilingual dictionary) • Repeat, rephrase, paraphrase key concepts and directions • Allow for extended time for assignment completion as needed • Highlight key vocabulary • Define essential vocabulary in context • Use graphic organizers, visuals, manipulatives and other concrete materials • Use gestures, facial expressions and body language • Read aloud • Build on what students already know and prior experience	• Pair visual prompts with verbal presentations • Ask students to restate information, directions, and assignments. • Provide repetition and and practice • Model skills / techniques to be mastered. • Provide extended time to complete class work • Provide copy of class notes • Provide preferential seating to be mutually determined by the student and teacher • Allow the use of a computer to complete assignments. • Establish expectations for correct spelling on assignments • Provide extra textbooks for home. • Provide Peer Support • Increase one on one time

Gifted and Talented Students	**504 Plan**
• Utilize advanced, accelerated, or compacted content • Provide assignments that emphasize higher- level thinking skills. • Allow for individual student interest • Gear assignments to development in areas of affect, creativity, cognition, and research skills • Allow for a variety in types of resources • Provide problem-based assignments with planned scope and sequence • Utilize inquiry-based instruction • Adjust the pace of lessons • Utilize Choice Boards • Provide Problem-Based Learning • Establish flexible Grouping	• Pair visual prompts with verbal presentations • Ask students to restate information, directions, and assignments. • Provide repetition and and practice • Model skills / techniques to be mastered. • Provide extended time to complete class work • Provide copy of class notes • Break long assignments into smaller parts • Assist student in setting short term goals • Allow for preferential seating to be mutually determined by the student and teacher • Provide extra textbooks for home. • Model and reinforce organizational systems (i.e. color-coding) • Write out homework assignments, check student's recording of assignments

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Interdisciplinary Connections	Computer Science and Design Thinking
Math ● HSN-Q.A.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. ● HSN-Q.A.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. **English/Language Arts** Reading ● RST.9-12.1 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. Writing ● WHST.9-12.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. ● WHST.9-12.5 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. ● WHST.9-12.7 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. ● WHST.9-12.8 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. ● WHST.9-12.9 Draw evidence from informational texts to support analysis, reflection, and research. Speaking and Listening ● 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.	**Computer Science and Design Thinking Practices** 1. □ Fostering an Inclusive Computing and Design Culture 2. ☑ Collaborating Around Computing and Design 3. □ Recognizing and Defining Computational Problems 4. □ Developing and Using Abstractions 5. □ Creating Computational Artifacts 6. □ Testing and Refining Computational Artifacts 7. ☑ Communicating About Computing and Design **Computer Science and Design Thinking Standards** ● 8.1.12.DA.1: Create interactive data visualizations using software tools to help others better understand real world phenomena, including climate change. ● 8.1.12.DA.5: Create data visualizations from large data sets to summarize, communicate, and support different interpretations of real-world phenomena. ● 8.1.12.DA.6: Create and refine computational models to better represent the relationships among different elements of data collected from a phenomenon or process. ● 8.1.12.IC.1: Evaluate the ways computing impacts personal, ethical, social, economic, and cultural practices. ● 8.1.12.IC.3: Predict the potential impacts and implications of emerging technologies on larger social, economic, and political structures, using evidence from credible sources. **Core Ideas** ● Individuals select digital tools and design automated processes to collect, transform, generalize, simplify, and present large data sets in different ways to influence how other people interpret and understand the underlying information. ● Large data sets can be transformed, generalized, simplified, and presented in different ways to influence how individuals interpret and understand the underlying information. ● The accuracy of predictions or inferences made from a computer model is affected by the amount, quality, and diversity of data. ● The design and use of computing technologies and artifacts can positively or negatively affect equitable access to information and opportunities.

• SL.11-12.4 Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation. **Health and Physical Education** • 2.1.12.PP.4: List the major milestones of each trimester of fetal development utilizing medically accurate information. • 2.1.12.PP.5: Analyze factors that can impact the health of a baby (e.g., fetal alcohol syndrome, sudden infant death syndrome, low birth weight, premature birth, genetics). • 2.1.12.PP.6: Analyze personal and societal factors that can influence decisions about pregnancy options, including parenting, abortion, safe haven, and adoption. • 2.1.12.PP.7: Analyze the emotional, social, physical, and financial effects of being a teen or young adult parent. • 2.1.12.PP.8: Assess the skills needed to be an effective parent. • 2.1.12.PP.9: Evaluate parenting strategies used at various stages of child development based on reliable sources of information.	

Career Readiness, Life Literacies and Key Skills

Career Readiness, Life Literacies and Key Skills Practices

- Act as a responsible and contributing community members and employee
- Consider the environmental, social and economic impacts of decisions.
- Demonstrate creativity and innovation.
- Utilize critical thinking to make sense of problems and persevere in solving them.
- Use technology to enhance productivity increase collaboration and communicate effectively.
- Work productively in teams while using cultural/global competence.

- 9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).
- 9.4.12.CI.2: Identify career pathways that highlight personal talents, skills, and abilities (e.g., 1.4.12prof.CR2b, 2.2.12.LF.8).
- 9.4.12.CI.3: Investigate new challenges and opportunities for personal growth, advancement, and transition (e.g., 2.1.12.PGD.1)
- 9.4.12.CT.1: Identify problem-solving strategies used in the development of an innovative product or practice (e.g., 1.1.12acc.C1b, 2.2.12.PF.3).
- 9.4.12.CT.2: Explain the potential benefits of collaborating to enhance critical thinking and problem solving (e.g., 1.3E.12profCR3.a).
- 9.4.12.DC.7: Evaluate the influence of digital communities on the nature, content and responsibilities of careers, and other aspects of society (e.g., 6.1.12.CivicsPD.16.a).
- 9.4.12.DC.8: Explain how increased network connectivity and computing capabilities of everyday objects allow for innovative technological approaches to climate protection.
- 9.4.12.GCA.1: Collaborate with individuals to analyze a variety of potential solutions to climate change effects and determine why some solutions (e.g., political. economic, cultural) may work better than others (e.g., SL.11-12.1., HS-ETS1-1, HS-ETS1-2, HS-ETS1-4, 6.3.12.GeoGI.1, 7.1.IH.IPERS.6, 7.1.IL.IPERS.7, 8.2.12.ETW.3).
- 9.4.12.IML.2: Evaluate digital sources for timeliness, accuracy, perspective, credibility of the source, and relevance of information, in media, data, or other resources (e.g., NJSLSA.W8, Social Studies Practice: Gathering and Evaluating Sources.

- 9.4.12.IML.5: Evaluate, synthesize, and apply information on climate change from various sources appropriately (e.g., 2.1.12.CHSS.6, S.IC.B.4, S.IC.B.6, 8.1.12.DA.1, 6.1.12.GeoHE.14.a, 7.1.AL.PRSNT.2)
- 9.4.12.IML.6: Use various types of media to produce and store information on climate change for different purposes and audiences with sensitivity to cultural, gender, and age diversity (e.g., NJSLSA.SL5).
- 9.4.12.TL.1: Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specific task (e.g., W.11-12.6.).
- 9.4.12.TL.2: Generate data using formula-based calculations in a spreadsheet and draw conclusions about the data.

SEL Competencies

- **Self - Awareness**
- **Self - Management**
- **Social Awareness**
- **Responsible Decision Making**
- **Relationship Skills**

District/School Formative Assessment Plan	District/School Summative Assessment Plan
Formative assessment informs instruction and is ongoing throughout a unit to determine how students are progressing against the standards. Teachers are encouraged to incorporate Formative Assessments into all lessons. During instruction, teachers will collect ongoing information on students' mastery of content through a variety of methods: • Questioning: using Socratic method, probing questions, a hierarchical system in complexity (Bloom's Taxonomy) • Exit tickets, rotational activities (stations), quizzes, and small group activities • Classwork, homework, group work • Pre-Assessments, teacher's observation, class discussion, and journal • Journal Writing • Daily Verbal Assessments	*Summative assessment is an opportunity for students to demonstrate mastery of the skills taught during a particular unit.* • **Chapter 16 Cengage Learning Testing/Chapter 16 Quiz** • **Chapter 17 Cengage Learning Testing/Chapter 17 Quiz** • **Chapter 18 Cengage Learning Testing/Chapter 18 Quiz** • **Chapter 19 Cengage Learning Testing/Chapter 19 Quiz** • **Laboratory Exercises** • **Other Summative Assessments:** Teachers are encouraged to design and their own assessments (topic/module tests and quizzes) individually and/or with their department or grade-level partners, as per Uniform Grading Profile.

Targeted Academic Vocabulary

Enzyme / Substrate complex, pharynx, esophagus, stomach, intestines (duodenum, jejunum, ileum), large intestine, rectum, anus, lacteals, villi, ingestion, liver, large intestine, small intestine, respiration, larynx, pharynx, ventilation, expiratory reserve, inspiratory reserve, tidal volume, vital capacity, trachea, bronchi, alveoli, bicarbonate, carbonic acid, bronchi, bronchioles, lung lobes, nasopharynx, oropharynx, laryngopharynx, renal, ureters, bladder, urethra, renal pyramids, collecting tubules, meiosis, spermatogenesis, oogenesis, testes, ovaries, fallopian tubes, uterus, endometrium, vas deferens, epididymis, perineum

Resources:

- Eating Disorders in LGBTQ+ Populations | National Eating Disorders Association **(LGBTQ+)**
- Newsela - Inside the digestive system
- Guts: The Small Intestines and Digestion | PBS LearningMedia
- Newsela - Why can't humans digest corn?
- Guts: Technology To Track Digestion | PBS LearningMedia
- The Digestive System | Crash Course Biology | PBS LearningMedia
- Connecting Climate Change Effects to Respiratory Health | Columbia School of Nursing **(Climate Change)**
- Climate Change and Lung Health | American Lung Association **(Climate Change)**
- Circulatory & Respiratory Systems | Crash Course Biology | PBS LearningMedia
- Images of the Past | The Respiratory System: Iron Lung | PBS LearningMedia
- How the Coronavirus Attacks Your Lungs | Deep Look | PBS LearningMedia
- Excretory System Resources | TeacherVision
- Guts: The Small Intestines and Digestion | PBS LearningMedia
- The Excretory System: From Your Heart to the Toilet | Crash Course Biology | PBS LearningMedia
- What Overturning Roe v. Wade Might Mean for Reproductive Rights | PBS NewsHour | PBS LearningMedia **(Diversity, Equity and Inclusion)**
- Chemical Risks to a Fetus | PBS LearningMedia
- Test Tube Babies - Biography: Robert Edwards | PBS LearningMedia
- Cell Differentiation | PBS LearningMedia
- Reproductive System Resources | TeacherVision
- The Reproductive System: How Gonads Go | Crash Course Biology | PBS LearningMedia

Pacing Guide