School District of Marshfield Course Syllabus

Course Name: Human Body Systems PS PLTW
Length of Course: Year
Credit: 1 Credit

Program Goal:

The School District of Marshfield K-12 Science Program will prepare and motivate learners to explore, problem solve and collaborate with their classmates to interpret science and explain the world around them. Learners will acquire knowledge and evidence that promotes creative solutions through the evaluation and understanding of scientific theories and evidence. Learners will collect, analyze and reason with scientific data through investigations that ultimately allow for the generation of scientific explanations. Critical thinking skills will elevate natural curiosity, make sense of scientific data and promote scientific literate citizens.

Course Description:

Human Body Systems is a full-year high school course in the PLTW Biomedical Science program. Students examine the interactions of human body systems as they explore identity, power, movement, protection, and homeostasis in the body. Exploring science in action, students build organs and tissues on a skeletal Maniken ®; use data acquisition software to monitor body functions such as muscle movement, reflex and voluntary action, and respiration; and take on the roles of biomedical professionals to solve real-world medical cases.

Common Core State Standards for English Language Arts Anchor Standards (AS)

Reading (R)

- AS.R.1 Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.
- AS.R.2 Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.
- AS.R.4 Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.
- AS.R.7 Integrate and evaluate content presented in diverse formats and media, including visually and quantitatively, as well as in words.
- AS.R.8 Delineate and evaluate the argument and specific claims in a text, including the validity of the reasoning as well as the relevance and sufficiency of the evidence.
- AS.R.10 Read and comprehend complex literary and informational texts independently and proficiently.

Writing (W)

- AS.W.1 Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.
- AS.W.2 Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.
- AS.W.3 Write narratives to develop real or imagined experiences or events using effective technique, well- chosen details, and well-structured event sequences.
- AS.W.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
- AS.W.5 Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach.
- AS.W.6 Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.
- AS.W.7 Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation.
- AS.W.8 Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism.
- AS.W.9 Draw evidence from literary or informational texts to support analysis, reflection, and research.
- AS.W.10 Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.

Speaking and Listening (SL)

- AS.SL.1 Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.
- AS.SL.2 Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally.
- AS.SL.4 Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience.
- AS.SL.5 Make strategic use of digital media and visual displays of data to express information and enhance understanding of presentations.
- AS.SL.6 Adapt speech to a variety of contexts and communicative tasks, demonstrating command of formal English when indicated or appropriate.

Language (L)

- AS.L.1 Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.
- AS.L.2 Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.
- AS.L.4 Determine or clarify the meaning of unknown and multiple-meaning words and phrases by using context clues, analyzing meaningful word parts, and consulting general and specialized reference materials, as appropriate.
- AS.L.5 Demonstrate understanding of word relationships and nuances in word meanings.
- AS.L.6 Acquire and use accurately a range of general academic and domain-specific words and phrases sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.

Common Core State Standards for Mathematics

Quantities (Q)

- N.Q.1 Use units as a way to understand problems and to guide the solution of multistep problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.
- N.Q.2 Define appropriate quantities for the purpose of descriptive modeling.
- N.Q.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

Seeing Structure in Expression (SSE)

- A.SSE.1 Interpret expressions that represent a quantity in terms of its context.

Creating Equations (CED)

- A.CED.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
- A.CED.4 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. For example, rearrange Ohm's law $V = IR$ to highlight resistance R.

Reasoning with Equations and Inequalities (REI)

- A.REI.1 Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.
- A.REI.3 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
- A.REI.10 Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line).

Interpreting Functions (IF)

- F.IF.4 For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.
- F.IF.7 Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.
- F.IF.7a Graph linear and quadratic functions and show intercepts, maxima, and minima.

Modeling with Geometry (MG)

- G.MG.1 Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).

Interpreting Categorical and Quantitative Data (ID)

- S.ID.1 Represent data with plots on the real number line (dot plots, histograms, and box plots).
- S.ID.2 Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.
- S.ID.3 Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).
- S.ID.6 Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.
- S.ID.6a Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models.
- S.ID.6c Fit a linear function for a scatter plot that suggests a linear association.
- S.ID.7 Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.

Making Inferences and Justifying Conclusion (IC)

- S.IC.6 Evaluate reports based on data.

National Consortium for Health Science Education

Foundation Standard 1: Academic Foundation: Understand human anatomy, physiology, common diseases and disorders, and medical math principles.

Human Anatomy and Physiology 1:1	1.11 Identify basic levels of organization of the human body. a. Chemical b. Cellular c. Tissue d. Organs e. Systems f. Organism 1.12 Identify body planes, directional terms, cavities, and quadrants. a. Body planes (sagittal, mid-sagittal, coronal/frontal, transverse/horizontal) b. Directional terms (superior, inferior, anterior/ventral, posterior/dorsal, medial, lateral, proximal, distal, superficial, and deep) c. Cavities (dorsal, cranial, spinal, thoracic, abdominal, and pelvic) d. Quadrants (upper right, lower right, upper left, and lower left) 1.13 Analyze basic structures and functions of human body systems (skeletal, muscular, integumentary, cardiovascular, lymphatic, respiratory, nervous, special senses, endocrine, digestive, urinary, and reproductive). a. Skeletal (bone anatomy, axial and appendicular skeletal bones, functions of bones, ligaments, types of joints) b. Muscular (microscopic anatomy of muscle tissue, types of muscle, locations of skeletal muscles, functions of muscles, tendons, directional movements) c. Integumentary (layers, structures and functions of skin) d. Cardiovascular (components of blood, structures and functions of blood components, structures and functions of the cardiovascular system, conduction system of the heart, cardiac cycle) e. Lymphatic (structures and functions of lymphatic system, movement of lymph fluid) f. Respiratory (structures and functions of respiratory system, physiology of respiration) g. Nervous (structures and functions of nervous tissue and system, organization of nervous system) h. Special senses (structures and functions of eye, ear, nose and tongue; identify senses for sight, hearing, smell, taste, touch) i. Endocrine (endocrine versus exocrine, structures and functions of endocrine system, hormones, regulation of hormones) j. Digestive (structures and functions of gastrointestinal tract, chemical and mechanical digestion,

	structures and functions of accessory organs) k. Urinary (structures and functions of urinary system, gross and microscopic anatomy, process of urine formation, urine composition, homeostatic balance) l. Reproductive (structures and functions of male and female reproductive systems, formation of gametes, hormone production and effects, menstrual cycle, and conception)
Diseases and Disorders 1:2	1.21 Describe common diseases and disorders of each body system (such as: cancer, diabetes, dementia, stroke, heart disease, tuberculosis, hepatitis, COPD, kidney disease, arthritis, ulcers). a. Etiology b. Pathology c. Diagnosis d. Treatment e. Prevention 1.23 Describe biomedical therapies as they relate to the prevention, pathology, and treatment of disease. a. Gene testing b. Gene therapy c. Human proteomics d. Cloning e. Stem cell research
Medical Mathematics 1:3	1.31 Demonstrate competency in basic math skills and mathematical conversions as they relate to healthcare. a. Metric system (such as: centi, milli, kilo) b. Mathematical (average, ratios, fractions, percentages, addition, subtraction, multiplication, division) c. Conversions (height, weight/mass, length, volume, temperature, household measurements) 1.32 Demonstrate the ability to analyze diagrams, charts, graphs, and tables to interpret healthcare results.
Foundation Standard 2: Communications: Demonstrate methods of delivering and obtaining information, while communicating effectively.	
Concepts of Effective Communication 2:1	2.11 Model verbal and nonverbal communication. 2.12 Identify common barriers to communication. a. Physical disabilities (aphasia, hearing loss, impaired vision) b. Psychological barriers (attitudes, bias, prejudice, stereotyping) 2.13 Identify the differences between subjective and objective information. 2.15 Practice speaking and active listening skills. 2.16 Modify communication to meet the needs of the patient/client and be appropriate to the situation.
Medical Terminology 2:2	2.21 Use common roots, prefixes, and suffixes to communicate information.

	2.22 Interpret medical abbreviations to communicate information. a. Common abbreviations b. Joint Commission official "Do Not Use List"
Written Communication Skills 2:3	2.31 Utilize proper elements of written and electronic communication (spelling, grammar, and formatting). 2.32 Prepare examples of technical, informative, and creative writing.
Foundation Standard 4: Employability Skills: Use employability skills to enhance employment opportunities and job satisfaction.	
Career Decision-making 4:3	4.31 Research levels of education, credentialing requirements, and employment trends in health professions.
Employability Preparation 4:4	4.41 Develop components of a personal portfolio. a. Letter of introduction b. Resume c. Sample Projects d. Writing Sample e. Work-based Learning Documentation f. Oral Report g. Service Learning/Community Service h. Credentials i. Technology Skills j. Leadership Examples
Foundation Standard 7: Safety Practices: Identify existing and potential hazards to clients, co-workers, and self. Employ safe work practices and follow health and safety policies and procedures to prevent injury and illness.	
Personal Safety 7:2	7.21 Apply personal safety procedures based on Occupational Safety and Health Administration (OSHA) and Centers for Disease Control (CDC) regulations. 7.22 Demonstrate principles of body mechanics.
Common Safety Hazards 7:4	7.41 Observe all safety standards related to the Occupational Exposure to Hazardous Chemicals Standard (Safety Data Sheets (SDSs)). (www.osha.gov)
Foundation Standard 8: Teamwork: Identify roles and responsibilities of individual members as part of the healthcare team.	
Healthcare Teams 8:1	8.11 Evaluate roles and responsibilities of team members. a. Examples of healthcare teams b. Responsibilities of team members c. Benefits of teamwork 8.12 Identify characteristics of effective teams. a. Active participation b. Commitment c. Common goals d. Cultural sensitivity e. Flexibility f. Open to feedback g. Positive attitude

	h. Reliability i. Trust j. Value individual contributions
Team Member Participation 8:2	8.21 Recognize methods for building positive team relationships (such as: mentorships and teambuilding). 8.22 Analyze attributes and attitudes of an effective leader. a. Characteristics (interpersonal skills, focused on results, positive) b. Types (autocratic, democratic, laissez faire) c. Roles (sets vision, leads change, manages accountability) 8.23 Apply effective techniques for managing team conflict (negotiation, assertive communication, gather the facts, clear expectations, mediation).
Foundation Standard 9: Health Maintenance Practices: Differentiate between wellness and disease. Promote disease prevention and model healthy behaviors.	
Healthy Behaviors 9:1	9.11 Promote behaviors of health and wellness (such as: nutrition, weight control, exercise, sleep habits).
Foundation Standard 10: Technical Skills: Apply and demonstrate technical skills and knowledge common to health career specialties.	
Technical Skills 10:1	10.11 Apply procedures for measuring and recording vital signs including the normal ranges (temperature, pulse, respirations, blood pressure, pain).
Foundation Standard 11: Information Technology in Healthcare: Apply information technology practices common across health professions.	
Basic Computer Skills 11:3	11.31 Apply basic computer concepts and terminology necessary to use computers and other mobile devices. 11.32 Demonstrate basic computer troubleshooting procedures (such as: restart, check power supply, refresh browser, check settings). 11.33 Demonstrate use of file organization and information storage. 11.34 Identify uses of basic word processing, spreadsheet, and database applications. 11.35 Evaluate validity of web-based resources.

Next Generation Science Standards (NGSS)

From Molecules to Organisms: Structures and Processes

- 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.

Heredity: Inheritance and Variation of Traits

- 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.

Engineering Design

- HS.ETS1.1 Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.
- HS.ETS1.2 Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
- HS.ETS1.3 Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.
- HS.ETS1.4 Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.

Energy - Definitions of Energy

- DCI - PS3.A Energy is a quantitative property of a system that depends on the motion and interactions of matter and radiation within that system. That there is a single quantity called energy is due to the fact that a system's total energy is conserved, even as, within the system, energy is continually transferred from one object to another and between its various possible forms. (HSPS3-1), (HS-PS3-2)
- DCI - PS3.A At the macroscopic scale, energy manifests itself in multiple ways, such as in motion, sound, light, and thermal energy . (HSPS3-2), (HS-PS3-3)

Energy - Conservation of Energy and Energy Transfer

- DCI - PS3.B Energy cannot be created or destroyed, but it can be transported from one place to another and transferred between systems. (HS-PS3-1), (HS-PS3-4)

Engineering Design - Optimizing the Design Solution

- DCI - ETS1.C Criteria may need to be broken down into simpler ones that can be approached systematically, and decisions about the priority of certain criteria over others (trade-offs) may be needed. (secondary to HS-PS1-6)

From Molecules to Organisms: Structures and Processes - Structure and Function

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

• DCI - LS1.C 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. (HS-LS1-7)	
Ecosystems: Interactions, Energy, and Dynamics - Cycles of Matter and Energy Transfer in Ecosystems	
• DCI - LS2.B Photosynthesis and cellular respiration (including anaerobic processes) provide most of the energy for life processes. (HS-LS2-3)	
Heredity: Inheritance and Variation of Traits - Inheritance of Traits	
• DCI - LS3.A 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. (HS-LS3-1) • DCI - LS3.B 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. (HS-LS3-2)	
Asking questions and defining problems	
Science and Engineering Practices	• Ask questions o - that arise from careful observation of phenomena, or unexpected results, to clarify and/or seek additional information. o - that arise from examining models or a theory, to clarify and/or seek additional information and relationships. o - to determine relationships, including quantitative relationships, between independent and dependent variables. o - to clarify and refine a model, an explanation, or an engineering problem. • Evaluate a question to determine if it is testable and relevant. • Ask questions that can be investigated within the scope of the school laboratory, research facilities, or field (e.g., outdoor environment) with available resources and, when appropriate, frame a hypothesis based on a model or theory. • Ask and/or evaluate questions that challenge the premise(s) of an argument, the interpretation of a data set, or the suitability of a design. • Define a design problem that involves the development of a process or system with interacting components and criteria and constraints that may include social, technical, and/or environmental considerations.
Developing and Using Models	
Science and Engineering Practices	• Develop, revise, and/or use a model based on evidence to illustrate and/or predict the relationships between systems or between components of a system.

	• Develop and/or use a model (including mathematical and computational) to generate data to support explanations, predict phenomena, analyze systems, and/or solve problems. • Develop and/or use multiple types of models to provide mechanistic accounts and/or predict phenomena, and move flexibly between model types based on merits and limitations.
Planning and Carrying Out Investigations	
Science and Engineering Practices	• Plan an investigation or test a design individually and collaboratively to produce data to serve as the basis for evidence as part of building and revising models, supporting explanations for phenomena, or testing solutions to problems. Consider possible confounding variables or effects and evaluate the investigation's design to ensure variables are controlled. • Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly. • Plan and conduct an investigation or test a design solution in a safe and ethical manner including considerations of environmental, social, and personal impacts. • Select appropriate tools to collect, record, analyze, and evaluate data. Make directional hypotheses that specify what happens to a dependent variable when an independent variable is manipulated.
Analyzing and Interpreting Data	
Science and Engineering Practices	• Analyze data using tools, technologies, and/or models (e.g., computational, mathematical) in order to make valid and reliable scientific claims or determine an optimal design solution. • Apply concepts of statistics and probability (including determining function fits to data, slope, intercept, and correlation coefficient for linear fits) to scientific and engineering questions and problems, using digital tools when feasible.
Using Mathematics and Computational Thinking	
Science and Engineering Practices	• Create and/or revise a computational model or simulation of a phenomenon, designed device, process, or system. • Use mathematical, computational, and/or algorithmic representations of phenomena or design solutions to describe and/or support claims and/or explanations. • Apply techniques of algebra and functions to represent and solve scientific and engineering problems. • Apply ratios, rates, percentages, and unit conversions in the context of complicated measurement problems involving quantities with derived or compound units (such as mg/mL, kg/m^3, acre-feet, etc.)
Constructing Explanations and Designing Solutions	
Science and Engineering Practices	• Make a quantitative and/or qualitative claim regarding the relationship between dependent and independent variables. • Construct and revise an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own

	investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. • Apply scientific ideas, principles, and/or evidence to provide an explanation of phenomena and solve design problems, taking into account possible unanticipated effects. • Apply scientific reasoning, theory, and/or models to link evidence to the claims to assess the extent to which the reasoning and data support the explanation or conclusion. • Design, evaluate, and/or refine a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations.
Engaging in Argument from Evidence	
Science and Engineering Practices	• Evaluate the claims, evidence, and/or reasoning behind currently accepted explanations or solutions to determine the merits of arguments. • Construct, use, and/or present an oral and written argument or counterarguments based on data and evidence. • Make and defend a claim based on evidence about the natural world or the effectiveness of a design solution that reflects scientific knowledge and student-generated evidence.
Obtaining, Evaluating, and Communicating Information	
Science and Engineering Practices	• Compare, integrate and evaluate sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a scientific question or solve a problem. • Gather, read, and evaluate scientific and/or technical information from multiple authoritative sources, assessing the evidence and usefulness of each source. • Evaluate the validity and reliability of and/or synthesize multiple claims, methods, and/or designs that appear in scientific and technical texts or media reports, verifying the data when possible. • Communicate scientific and/or technical information or ideas (e.g., about phenomena and/or the process of development and the design and performance of a proposed process or system) in multiple formats (i.e., orally, graphically, textually, mathematically).
Patterns	
Crosscutting Concepts	• Different patterns may be observed at each of the scales at which a system is studied and can provide evidence for causality in explanations of phenomena. • Observed patterns in nature guide organization and classification and prompt questions about relationships and causes underlying them.
Cause and Effect: Mechanism and Prediction	
Crosscutting Concepts	• Cause and effect relationships can be suggested and predicted for complex natural and human designed systems by examining what is known about smaller scale mechanisms within the system. • Changes in systems may have various causes that may not have equal effects.
Energy and Matter: Flows, Cycles, and Conservation	

Crosscutting Concepts	• Tracking energy and matter flows, into, out of, and within systems helps one understand their system's behavior. • The total amount of energy and matter in closed systems is conserved. • Changes of energy and matter in a system can be described in terms of energy and matter flows into, out of, and within that system. • Energy cannot be created or destroyed- only moves between one place and another place, between objects and/or fields, or between systems. • Energy drives the cycling of matter within and between systems.
Systems and System Models	
Crosscutting Concepts	• A system is an organized group of related objects or components; models can be used for understanding and predicting the behavior of systems. • Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions—including energy, matter, and information flows—within and between systems at different scales.
Structure and Function	
Crosscutting Concepts	• The functions and properties of natural and designed objects and systems can be inferred from their overall structure, the way their components are shaped and used, and the molecular substructures of its various materials.
Stability and Change	
Crosscutting Concepts	• Much of science deals with constructing explanations of how things change and how they remain stable. • For both designed and natural systems, conditions that affect stability and factors that control rates of change are critical elements to consider and understand. • Feedback (negative or positive) can stabilize or destabilize a system.

Key Vocabulary:			
absorption	chromosome	meiosis	codon
Adenosine tri-phosphate (ATP)	metabolism	Deoxyribonucleic Acid (DNA)	mitosis
allele	amino acid	antibody	aseptic technique
bacteria	calories	carbohydrate	cell
cellular respiration	cholesterol	electrophoresis	experiment
filtration	gene	heredity	homeostasis
hormone	immunity	infection	lipid
model	molecule	mutation	nucleotide
nutrient	organ	protein	restriction enzyme
Restriction Fragment Length Polymorphisms (RFLPs)	secretion	tissue	virus

Topics/Content Outline- Units and Themes:

Unit 1: Identity

- Lesson 1.1 Human
- Lesson 1.2 Tissues
- Lesson 1.3 Molecules and Cells

Unit 2: Communication

- Lesson 2.1 The Brain
- Lesson 2.2 Electrical Communication
- Lesson 2.3 Chemical Communication
- Lesson 2.4 Communication with the Outside World

Unit 3: Power

- Lesson 3.1 Introduction to Power
- Lesson 3.2 Food
- Lesson 3.3 Oxygen
- Lesson 3.4 Water

Unit 4: Movement

- Lesson 4.1 Joints and Motion
- Lesson 4.2 Muscles
- Lesson 4.3 Blood Flow
- Lesson 4.4 Exercise and Motion/ Exercise Physiology

Unit 5: Protection

- Lesson 5.1 The Skin
- Lesson 5.2 Bones
- Lesson 5.3 Lymph and Blood Cells

Unit 6: Homeostasis

- Lesson 6.1 Health and Wellness
- Lesson[MN1] 6.2 Muscles
- Lesson 6.3 Blood Flow
- Lesson 6.4 Exercise and Motion/ Exercise Physiology

Primary Resource(s):
Project Lead The Way Biomedical Science Program