School District of Marshfield Course Syllabus

Course Name: Anatomy and Physiology Honors
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:

This course examines the structure and function of the various systems of the human body, as well as examining the causes and cures of human disease. Animal dissections will be used to help us better understand how the human body works.

Wisconsin Standards for Science (SCI)	
Crosscutting Concepts (CC)	
CC2: Students use science and engineering practices, disciplinary core ideas, and ***cause and effect*** relationships to make sense of phenomena and solve problems.	
Cause and Effect	CC2.h: Students understand empirical evidence is required to differentiate between cause and correlation and to make claims about specific causes and effects. They suggest cause and effect relationships to explain and predict behaviors in complex natural and designed systems. They also propose causal relationships by examining what is known about smaller scale mechanisms within the system. They recognize changes in systems may have various causes that may not have equal effects.
CC4: Students use science and engineering practices, disciplinary core ideas, and an understanding of ***systems and models*** to make sense of phenomena and solve problems.	
Systems and System Models	CC4.h: Students investigate or analyze a system by defining its boundaries and initial conditions, as well as its inputs and outputs. They use models (e.g., physical, mathematical, computer models) to simulate the flow of energy, matter, and interactions within and between systems at different scales. They also use models and simulations to predict the behavior of a system, and recognize that these predictions have limited precision and reliability due to the assumptions and approximations inherent in the models. They also design systems to do specific tasks.
CC5: Students use science and engineering practices, disciplinary core ideas, and an understanding of ***energy and matter*** to make sense of phenomena and solve problems.	
Energy and Matter	CC5.h: Students understand that the total amount of energy and matter in closed systems is conserved. They describe changes of energy and matter in a system in terms of energy and matter flows into, out of, and within that system. They also learn that energy cannot be created or destroyed. It 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. In nuclear processes, atoms are not conserved, but the total number of protons plus neutrons is conserved.
CC6: Students use science and engineering practices, disciplinary core ideas, and an understanding of ***structure and function*** to make sense of phenomena and solve problems.	

Structure and Function	CC6.h: Students investigate systems by examining the properties of different materials, the structures of different components, and their interconnections to reveal the systems' function and solve a problem. They infer the functions and properties of natural and designed objects and systems from their overall structure, the way their components are shaped and used, and the molecular substructures of their various materials.
CC7: Students use science and engineering practices, disciplinary core ideas, and an understanding of ***stability and change*** to make sense of phenomena and solve problems.	
Stability and Change	CC7.h: Students understand much of science deals with constructing explanations of how things change and how they remain stable. They quantify and model changes in systems over very short or very long periods of time. They see some changes are irreversible, and negative feedback can stabilize a system, while positive feedback can destabilize it. They recognize systems can be designed for greater or lesser stability.
Science and Engineering Practices (SEP)	
SEP1: Students ***ask questions and define problems***, in conjunction with using crosscutting concepts and disciplinary core ideas, to make sense of phenomena and solve problems.	
Asking Questions SEP1.A	SEP1.A.h: Students ask questions to formulate, refine, and evaluate empirically testable questions. This includes the following: Ask questions that arise from careful observation of phenomena, or unexpected results, to clarify and seek additional information. Ask questions that arise from examining models or theories to clarify and seek additional information and relationships. Ask questions to determine relationships, including quantitative relationships, between independent and dependent variables. Ask questions to clarify and refine a model or an explanation. 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 evaluate questions that challenge the premise(s) of an argument, the interpretation of a data set, or the suitability of the design.
SEP2: Students ***develop and use models***, in conjunction with using crosscutting concepts and disciplinary core ideas, to make sense of phenomena and solve problems.	
Developing Models SEP2.A	SEP2.A.h: Students use, synthesize, and develop models to predict and show relationships among variables and between systems and their components in the natural and designed world. This includes the following: Evaluate merits and limitations of two different models of the same proposed tool, process, mechanism, or system in order to select or revise a model that best fits the evidence or design criteria. Design a test of a model to ascertain its reliability. Develop, revise, and use models based on evidence to illustrate and predict the relationships between systems of between components of a system. Develop and use multiple types of models to provide mechanistic accounts and predict phenomena. Move flexibly between these model types based on merits and limitations. Develop a complex model that allows for manipulation and testing of a proposed process or system. Develop and use a model (including mathematical and computational) to generate data to support explanations, predict phenomena, analyze systems, and solve problems.
SEP4: Students ***analyze and interpret data***, in conjunction with using crosscutting concepts and disciplinary core ideas, to make sense of phenomena and solve problems.	
Analyze and Interpret Data SEP4.A	SEP4.A.h: Students engage in more detailed statistical analysis, the comparison of data sets for consistency, and the use of models to generate and analyze data. This includes the following: Analyze data using tools, technologies, and 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 to scientific and engineering questions and problems, using digital tools when feasible. Concepts should include determining the fit of functions, slope, and intercepts to data, along with correlation coefficients when the data is linear. Consider and address more sophisticated limitations of data analysis (e.g., sample selection) when analyzing and interpreting data. Compare and contrast various types of data sets (e.g., self-generated, archival) to examine consistency of measurements and observations. Evaluate the impact of new data on a working explanation or model of a proposed process or system. Analyze data to optimize design features or characteristics of system components relative to criteria for success.
SEP6: Students ***construct explanations and design solutions***, in conjunction with using crosscutting concepts and disciplinary core ideas, to make sense of phenomena and solve problems.	
Construct an Explanation SEP6.A	SEP6.A.h: Students create explanations that are supported by multiple and independent student-generated sources of evidence consistent with scientific ideas, principles, and theories. This includes the following: Make quantitative and qualitative claims 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, and peer review. Explanations should reflect 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 evidence to provide an explanation of phenomena taking into account possible, unanticipated effects.
SEP7: Students ***engage in argument from evidence***, in conjunction with using crosscutting concepts and disciplinary core ideas, to make sense of phenomena and solve problems.	

Argue from Evidence SEP7.A	SEP7.A.h: Students use appropriate and sufficient evidence and scientific reasoning to defend and critique claims and explanations about the natural and designed world. Arguments may also come from current scientific or historical episodes in science. This includes the following: Compare and evaluate competing arguments or design solutions in light of currently accepted explanations, new evidence, limitations (e.g., trade-offs), constraints, and ethical issues. Evaluate the claims, evidence, and reasoning behind currently accepted explanations or solutions to determine the merits of arguments. Respectfully provide and receive critiques on scientific arguments by probing reasoning and evidence, by challenging ideas and conclusions, by responding thoughtfully to diverse perspectives, and by determining what additional information is required to resolve contradictions. Construct, use, and present oral and written arguments 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 solutions that reflects scientific knowledge and student-generated evidence. Evaluate competing design solutions to a real-world problem based on scientific ideas and principles, empirical evidence, and logical arguments. Consider relevant factors (e.g. economic, societal, environmental, and ethical considerations).
SEP8: Students will ***obtain, evaluate and communicate information***, in conjunction with using crosscutting concepts and disciplinary core ideas, to make sense of phenomena and solve problems.	
Obtain, Evaluate, and Communicate Information SEP8.A	SEP8.A.h: Students evaluate the validity and reliability of claims, methods, and designs. This includes the following: Critically read scientific literature adapted for classroom use to determine the central ideas or conclusions, and to obtain scientific and technical information. Summarize complex evidence, concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.

	Compare, integrate, and evaluate sources of information presented in different media or formats (e.g., visually, quantitatively, or text-based) in order to address a scientific question or solve a problem. Gather, read, and evaluate scientific and technical information from multiple authoritative sources, assessing the evidence and usefulness of each source. Synthesize and evaluate the validity and reliability of multiple claims, methods, or designs that appear in scientific and technical texts or media reports. Verify the data when possible. Communicate scientific and technical information in multiple formats, including orally, graphically, textually, and mathematically. Examples of information could include ideas about phenomena or the design and performance of a proposed process or system.
Life Science (LS)	
LS1: Students use science and engineering practices, crosscutting concepts, and an understanding of ***structures and processes*** **(on a scale from molecules to organisms)** to make sense of phenomena and solve problems.	
Example Three-Dimensional Performance Indicators	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-LS1-5: Use a model to illustrate how photosynthesis transforms light energy into stored chemical 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 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.

Key Vocabulary:			
Anatomy	Physiology	Epithelial tissue	Intercalated disc
Neuroglia	Melanin	Axial skeleton	Appendicular skeleton
Osteoblast	Carpals	Tarsals	Synergist
Antagonist	Hypertrophy	Atrophy	Myofibril
Axon	Dendrite	Ganglion	Meninges
Motor neuron	Sensory neuron	Central nervous system	Peripheral nervous system
Plexus	Synapse	Ventricle	Hormone
Agglutination	Embolism	Erythrocyte	Bradycardia
Tachycardia	Diastolic pressure	Systolic pressure	Immunity
Inflammation	Alimentary canal	Villi	

Topics/Content Outline- Units and Themes:

Semester 1:

- Cell specialization
- Skeletal system
- Muscular system
- Integumentary system
- Nervous system

Semester 2:

- Digestive system
- Respiratory system
- Circulatory system
- Endocrine system
- Reproductive system
- Heredity

Primary Resource(s):

Hole's Essentials of Human Anatomy and Physiology
McGraw-Hill Education
ISBN: 978-0-07-903972-9