Bloomfield Public Schools
Bloomfield, New Jersey 07003

Curriculum Guide

Honors Anatomy and Physiology
Grades 11-12

Prepared by:
Michael Doyle

Salvatore Goncalves, Superintendent of Schools
Sandra Searing, Assistant Superintendent of Curriculum and Instruction
Louis Cappello, Supervisor of Science, K-12

Conforms to the Next Generation Science Standards and NJSLS Standards

Board Approved: September 12, 2017

COURSE: Honors Anatomy and Physiology (Seton Hall University's Project Acceleration)
GRADE LEVEL: 11/12

Introduction:

The Project Acceleration Honors Anatomy and Physiology course is a joint effort between Bloomfield High School and Seton Hall University offering high school upperclassmen an opportunity to take a college level course; students may elect to receive 4 college credits for the course via Seton Hall University.

The course follows Seton Hall's guidelines for a first semester anatomy and physiology course and covers the topics as listed in the pacing guide. Project Acceleration Honors Anatomy and Physiology is, by design, a pre-professional course, with students expected to master the tremendous amount of content encountered in medical fields. While mastering content in anatomy and physiology traditionally falls under the didactic method, much of the course will revolve around applying the theme of form and function to this content, and exploring what happens when systems (in the broad sense of the term) fail.

Project Acceleration Honors Anatomy and Physiology has a mandatory laboratory component, where students study human tissue samples, explore life-size models of the skeletal and muscular systems, design and run experiments using available medical equipment, and dissect fetal pigs (and possibly other specimens) to explore relationships of organ systems.

Because this is a course constrained by the requirements of Seton Hall University, and because it is an accelerated course that falls under the NGSS "accelerated model course pathway" model, changes are expected. As per the NGSS:

> "As schools, districts, and/or local education agencies start developing accelerated pathways and evaluate how the models and considerations presented here fit into their local contexts, it is expected that a wider variety of accelerated pathways will be collaboratively developed and shared."

As such, this should be considered a living document, and is expected to evolve; the curriculum may also be adjusted as per recommendations/requirements of the Project Acceleration program.

It should be noted that the NGSS Accelerated NGSS Model Course Maps (ANMCM) do not add additional performance expectations (PEs) to the curriculum, and that specialized advanced courses such as this one do not meet all the PEs in the life science strands. Much of the course content is devoted to specialized knowledge and lies outside the parameters set by the *Next Generation Science Standards*.

Pacing [with approximate timing]:

Unit 1: *Introduction to Anatomy & Physiology, Orientation to Human Body [2 weeks]*
Unit 2: *Chemistry of Life [review] [2 weeks]*
Unit 3: *Tissues [and cell biology review] [3 weeks]*
Unit 4: *Integumentary System [2 weeks]*
Unit 5: *Bone tissue and skeletal system [5 weeks]*
Unit 6: *Muscle tissue and muscular system [5 weeks]*
Unit 7: *Blood [1 week]*
Unit 8: *Cardiovascular system [3 weeks]*
Unit 9: *Lymphatic and immune systems [2 weeks]*
Unit 10: *Respiratory system [3 weeks]*

Resources: Electronic and text resources are listed in each unit. Teachers will be able to access the curriculum document on the district website.

Textbooks:
Anatomy and Physiology, OpenStax College, 2017 [updated as needed, open source site]

Established Goals:
Course description as per Seton Hall University
Science: **http://www.nextgenscience.org/next-generation-science-standards**
New Jersey Student Learning Standards Math: **http://www.corestandards.org/Math/**
New Jersey Student Learning Standards English Language Arts: **http://www.corestandards.org/ELA-Literacy/**
New Jersey Student Learning Standards for Technology: **http://www.state.nj.us/education/cccs/2014/tech/**

Modifications:

- Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community.
- Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).
- Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tool such as SKYPE, experts from the community helping with a project, journal articles, and biographies).
- Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences).
- Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings.
- Use project-based science learning to connect science with observable phenomena.
- Structure the learning around explaining or solving a social or community-based issue.
- Provide ELL students with multiple literacy strategies.
- Collaborate with after-school programs or clubs to extend learning opportunities.
- Restructure lesson using UDL principles (http://www.cast.org/our-work/about-udl.html#.VXmoXcfD_UA).

Unit #1	**Unit Name:** *Introduction to Anatomy and Physiology, Anatomical Orientation*	**Unit Length:** *~2 weeks*

ESSENTIAL QUESTIONS:
How are form and function related in the human body?
How do we know which way is "up" in anatomy?
How do we stay alive?

#	STUDENT LEARNING OBJECTIVES (SLO)	Corresponding DCIs and PEs
1	Describe and be able to relate specific examples of the hierarchal relationships within the human body, from its sub-cellular components to the organism as a whole	**HS-LS1-2** Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
2	Directly experience and measure physiologic changes to external stressors to model a feedback system in the human body	**HS-LS1-3** Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.
3	Master anatomic position and orientation, and accurately apply directional terms.	**HS-LS1-2** Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.

The performance expectations above were developed using the following elements from the NRC document A Framework for K-12 Science Education:

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds.	**LS1.A: Structure and Function** • Systems of specialized cells within organisms help them perform the essential functions of life. (HS-LS1-1) • Multicellular organisms have a hierarchical structural organization, in which any one system is made up of	**Systems and System Models** • Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions—including energy, matter, and information flows—within

• Develop and use a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-LS1-2) • Use a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-LS1-4),(HS-LS1-5),(HS-LS1-7) **Planning and Carrying Out Investigations** Planning and carrying out in 9-12 builds on K-8 experiences and progresses to include investigations that provide evidence for and test conceptual, mathematical, physical, and empirical models. • Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly. (HS-LS1-3)	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)	and between systems at different scales. (HS-LS1-2),(HS-LS1-4)

Connections to other DCIs in this grade-band:
HS.PS1.B (HS-LS1-5),(HS-LS1-6),(HS-LS1-7); **HS.PS2.B** (HS-LS1-7); **HS.LS3.A** (HS-LS1-1); **HS.PS3.B** (HS-LS1-5),(HS-LS1-7) [insofar as anatomic relations discussed this unit; part of unit outside scope of NGSS].

New Jersey Student Learning Standards Connections:

ELA:

RST.11-12.1 Accurately cite strong and thorough evidence from the text to support analysis of science and technical texts, attending to precise details for explanations or descriptions. (HS-LS1-1, HS-LS1-6)

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. (HS-LS1-3)[focus on usefulness of using multiple images from multiple sources of same structure to build gestalt of structure]

WHST.11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. (HS-LS1-3) [focus on usefulness of using multiple images from multiple sources of same structure to build gestalt of structure]

WHST.9-12.9 Draw evidence from informational texts to support analysis, reflection, and research. (HS-LS1-1, HS-LS1-6)

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. (HS-LS1-2, HS-LS1-4, HS-LS1-5, HS-LS1-7)

MATH: n/a this unit

Technology & Career Standards:
8.1 Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.
Career Ready Practices: 1-12

Unit Plan		
Content Vocabulary	**Academic Vocabulary**	**Recommended Resources**
anatomy, physiology, structure, function, cell, tissue, organ system, organism, integumentary, skeletal, muscular, lymphatic, respiratory, nervous, endocrine, urinary, reproductive, digestive, responsiveness, irritability, excretion, metabolism, nutrients, homeostasis, feedback, homeostatic imbalance, anatomic position, axial, appendicular, sagittal, frontal, dorsal, coronal transverse, oblique, superior, inferior, anterior, posterior, medial, lateral, intermediate, proximal, distal, superficial, deep, ventral, pleura, mediastinum, pericardial, pelvic, visceral, serosal, umbilical, epigastric, hypogastric, synovial, lumbar, hypochondriac	relate, sequence, functional, diagram, compare and contrast, describe, define, assume, locate, complementary, construct, specify, interpret, decipher, depict, explain, decide, claim, evidence, reason, decipher, elucidate, explicate	• Text • Classroom models • Class prepared slides • Online ancillaries provided via OpenStax • Anatomy Zone • Bozeman Science Anatomy and Physiology • Biology Corner (anatomy and physiology section) In addition, various resources will be provided by class website on a week to week basis depending on the needs and abilities of the students.

THE 5 "E"s	Examples of Learning Activities for the specified "E"	SLO's and Engineering Practices
ENGAGE	**Examples of Engaging Activities:**	
	Explore form/function of everyday objects [falls under both Engage and Explore]: students will deconstruct form of various simple objects to analyze how form and function entwine	SLO 1 **S&E Practice(s):** • Constructing explanations (for science) and designing solutions (for engineering) • Engaging in argument from evidence
	"Anatomy Simon Says" game	SLO 3 **S&E Practice(s):** None

EXPLORE	**Examples of Exploring Activities:**	
	Introducing anatomic models: students compare and contrast available classroom models with themselves and their partners	SLO 1 **S&E Practice(s):** ● Asking questions (for science) and defining problems (for engineering) ● Developing and using models
	Comparative anatomy: students compare and contrast human anatomy with that of other mammals, then more broadly to animals, then even more broadly to eukarya.	SLO 1 **S&E Practice(s):** ● Developing and using models
EXPLAIN	**Examples of Explaining Activities:**	
	Explore form/function of everyday objects: students will deconstruct form of various simple objects to analyze how form and function entwine	SLO 1 **S&E Practice(s):** ● Constructing explanations (for science) and designing solutions (for engineering) ● Engaging in argument from evidence
ELABORATE	**Examples of Elaborating Activities:**	
	Homeostasis lab: student analyze physiologic changes under various stressors [various forms of this lab will be done throughout the year, tailored for specific units]	SLO 2 **S&E Practice(s):** ● Planning and carrying out investigations ● Analyzing and interpreting data ● Using mathematics and computational thinking Engaging in argument from evidence ● Obtaining, evaluating, and communicating information

EVALUATE	Examples of Evaluating Activities:	
	Homeostasis lab: student analyze physiologic changes under various stressors	SLO 2 **S&E Practice(s):** ● Planning and carrying out investigations ● Analyzing and interpreting data ● Using mathematics and computational thinking ● Engaging in argument from evidence ● Obtaining, evaluating, and communicating information
	"Traditional" unit exam: As this course is designed to prepare students for medical careers, each unit will include formal summative quizzes/exams that may use multiple choice (including K type questions), short answer, computation, and essay questions to assess content knowledge.	SLO 1, SLO 2, SLO 3 **S&E Practices** ● Analyzing and interpreting data ● Constructing explanations (for science) and designing solutions (for engineering ● Engaging in argument from evidence ● Obtaining, evaluating, and communicating information

Unit #2	Unit Name: *Chemistry of Life [REVIEW]*	Unit Length: ~2 weeks

ESSENTIAL QUESTIONS:
How are form and function related in the human body?
How do our microscopic structures keep us alive?
How are form and function related at the cellular level?

#	STUDENT LEARNING OBJECTIVES (SLO)	Corresponding DCIs and PEs
1	Explain the connection between the sequence and the subcomponents of a biomolecule and its properties.	**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.
2	Explain how the living organisms can create more complex structures from simpler parts.	**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.

The performance expectations above were developed using the following elements from the NRC document A Framework for K-12 Science Education:

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their	**LS1.A: Structure and Function:** 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	**Stability and Change** Feedback (negative or positive) can stabilize or destabilize a system.

components in the natural and designed worlds. • Develop and use a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-LS1-2) • Use a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-LS1-4),(HS-LS1-5),(HS-LS1-7)	mechanisms can encourage (through positive feedback) or discourage (negative feedback) what is going on inside the living system.	

Connections to other DCIs in this grade-band:
HS.PS1.B (HS-LS1-5),(HS-LS1-6),(HS-LS1-7); **HS.PS2.B** (HS-LS1-7); **HS.LS3.A** (HS-LS1-1); **HS.PS3.B** (HS-LS1-5),(HS-LS1-7)

New Jersey Student Learning Standards Connections:
ELA:

RST.11-12.1 Accurately cite strong and thorough evidence from the text to support analysis of science and technical texts, attending to precise details for explanations or descriptions. (HS-LS1-1, HS-LS1-6)

WHST.9-12.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. (HS-LS1-1, HS-LS1-6)

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. (HS-LS1-3)

WHST.11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and

	audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. (HS-LS1-3)
WHST.9-12.9	Draw evidence from informational texts to support analysis, reflection, and research. (HS-LS1-1, HS-LS1-6)
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. (HS-LS1-2, HS-LS1-4, HS-LS1-5, HS-LS1-7)
MATH:	
MP.4	Model with mathematics. (HS-LS1-4)
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. (HS-LS1-4) [most apt for cardiovascular and muscular systems, but may be applied to others under certain circumstances]
HSF-BF.A.1	Write a function that describes a relationship between two quantities. (HS-LS1-4)

Technology & Career Standards:
8.1 Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.
Career Ready Practices: 1-12

Unit Plan		
Content Vocabulary	**Academic Vocabulary**	**Required Resources**
matter, energy, adenosine triphosphate (ATP), kinetic energy, potential energy, elements, atoms, radioisotope, molecules, chemical bonds (ionic, covalent, hydrogen), polar and nonpolar, exergonic/endergonic	distinguish, relate, sequence, functional, diagram, compare and contrast, describe, define, assume, locate, complementary, construct, specify, interpret, decipher, depict, explain, decide, notice, elucidate	• Text • Classroom models • Class prepared slides • Online ancillaries provided via OpenStax • Anatomy Zone

reactions, organic, heat capacity, solvent, hydrolysis, dehydration synthesis, carbohydrate, (mono-, di-, poly-)saccharide, lipid, phospholipid, protein, amino acid, peptide bond, macromolecule, denaturation, enzyme, nucleic acids		● Bozeman Science Anatomy and Physiology In addition, various resources will be provided by class website on a week to week basis depending on the needs and abilities of the students.

THE 5 "E"s	Examples of Learning Activities for the specified "E"	SLO's and Engineering Practices
ENGAGE	**Examples of Engaging Activities:**	
	Burn a candle: Students will observe a burning candle as review of law on conservation of mass; the activity will focus on input/output of combustion reactions, and tie the reactants and products to respiration in humans.	SLO 1, SLO 2 **S&E Practice(s):** ● Asking questions (for science) and defining problems (for engineering) ● Developing and using models ● Analyzing and interpreting data ● Using mathematics and computational thinking ● Engaging in argument from evidence ● Obtaining, evaluating, and communicating information
EXPLORE	**Examples of Exploring Activities:**	
	Molecular modeling activity--structure: students use 3-D model to explore interactions between different components (atoms/functional groups) found in organic compounds	SLO 1, SLO 2 **S&E Practice(s):** ● Developing and using models ● Engaging in argument from evidence
EXPLAIN	**Examples of Explaining Activities:**	
	Molecular modeling activity--reactions: students use 3-D model to explain/model reactions between different organic compounds	SLO 1, SLO 2 **S&E Practice(s):** ● Developing and using models ● Engaging in argument from evidence

ELABORATE/ EVALUATE	Examples of Elaborating Activities:	
	"Traditional" unit exam: As this course is designed to prepare students for medical careers, each unit will include formal summative quizzes/exams that may use multiple choice (including K type questions), short answer, computation, and essay questions to assess content knowledge.	SLO 1, SLO 2, SLO 3 **S&E Practices** ● Analyzing and interpreting data ● Constructing explanations (for science) and designing solutions (for engineering ● Engaging in argument from evidence ● Obtaining, evaluating, and communicating information

Unit #3	**Unit Name:** *Tissues*	**Unit Length:** *~3 weeks*

ESSENTIAL QUESTIONS:
How does form correlate with function at the tissue level in the human body?
How do our various tissues help keep us alive (maintain homeostasis)?

#	STUDENT LEARNING OBJECTIVES (SLO)	Corresponding DCIs and PEs
1	Distinguish at macroscopic and microscopic level the major tissue types of the human body	**HS-LS1-2.** Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
2	Correlate forms of various tissues with their function, tying together form/function at both the microscopic and macroscopic levels, allowing the human organism to grow and reproduce successfully.	**LS1.A: Structure and Function** • Systems of specialized cells within organisms help them perform the essential functions of life. (HS-LS1-1) • Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level. (HS-LS1-2) • 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)

		4-LS1-1. Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.
3	Predict/infer the function of an unknown tissue by careful study of its form	**Engaging in Argument from Evidence** Construct an argument with evidence, data, and/or a model. (4-LS1-1)

The performance expectations above were developed using the following elements from the NRC document A Framework for K-12 Science Education:		
Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed world. • Develop and use a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-LS1-2) **Planning and Carrying Out Investigations**	**LS1.A : Structure and Function** • Systems of specialized cells within organisms help them perform the essential functions of life. (HS-LS1-1) • All cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the instructions that code for the formation of proteins, which carry out most of the work of cells. (HS -LS1-1) (Note: This Disciplinary Core Idea is also addressed by HS -LS3-1.) • Multicellular organisms have a hierarchical structural organization, in which any one	**Systems and System Models** • Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions—including energy, matter, and information flows—within and between systems at different scales. (HS-LS1-2),(HS-LS1-4) **Structure and Function** • Investigating or designing new systems or structures requires a detailed examination of the properties of different materials, the structures of different

Planning and carrying out in 9-12 builds on K-8 experiences and progresses to include investigations that provide evidence for and test conceptual, mathematical, physical, and empirical models. • Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly. (HS-LS1-3) **Constructing Explanations and Designing Solutions** Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student generated sources of evidence	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)	components, and connections of components to reveal its function and/or solve a problem. (HS-LS1-1) **Stability and Change** • Feedback (negative or positive) can stabilize or destabilize a system. (HS-LS1-3)

consistent with scientific ideas, principles, and theories. • Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (HS -LS1-1)		
Connections to other DCIs in this grade-band: **HS.PS1.B** (HS-LS1-5),(HS-LS1-6),(HS-LS1-7); **HS.PS2.B** (HS-LS1-7); **HS.LS3.A** (HS-LS1-1); **HS.PS3.B** (HS-LS1-5),(HS-LS1-7)		
Articulation of DCIs across grade-bands: **MS.PS1.A** (HS-LS1-6); **MS.PS1.B** (HS-LS1-5),(HS-LS1-6),(HS-LS1-7); **MS.PS3.D** (HS-LS1-5),(HS-LS1-6),(HS-LS1-7); **MS.LS1.A** (HS-LS1-1) ,(HS-LS1-2),(HS-LS1-3),(HS-LS1-4); **MS.LS1.B** (HS-LS1-4); **MS.LS1.C** (HS-LS1-5),(HS-LS1-6),(HS-LS1-7); **MS.LS2.B** (HS-LS1-5),(HS-LS1-7) ; **MS.ESS2.E** (HS-LS1-6); **MS.LS3.A** (HS-LS1-1),(HS-LS1-4); **MS.LS3.B** (HS-LS1-1)		
New Jersey Student Learning Standards Connections: **ELA:** **RST.11-12.1** Accurately cite strong and thorough evidence from the text to support analysis of science and technical texts, attending to precise details for explanations or descriptions. (HS-LS1-1, HS-LS1-6) **WHST.9-12.2** Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. (HS-LS1-1, HS-LS1-6)		

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. (HS-LS1-3)
WHST.11-12.8	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. (HS-LS1-3)
WHST.9-12.9	Draw evidence from informational texts to support analysis, reflection, and research. (HS-LS1-1, HS-LS1-6)
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. (HS-LS1-2, HS-LS1-4, HS-LS1-5, HS-LS1-7)
MATH:	
MP.4	Model with mathematics. (HS-LS1-4)
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. (HS-LS1-4) [most apt for cardiovascular and muscular systems, but may be applied to others under certain circumstances]
HSF-BF.A.1	Write a function that describes a relationship between two quantities. (HS-LS1-4) [most apt for cardiovascular, respiratory, and muscular systems, but may be applied to others under certain circumstances]

Technology & Career Standards:
8.1 Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.
Career Ready Practices: 1-12

Unit Plan

Content Vocabulary	Academic Vocabulary	Recommended Resources
tissue, cellularity, specialized, contacts, polarity, epithelial tissue (epithelium), basal lamina, connective tissue, basement membrane, avascular, simple/stratified, endothelium, mesothelium, columnar, pseudostratified, goblet cell, cuboidal, squamous, transitional, gland, secretion, endocrine hormone, exocrine, uni- and multicellular, merocrine, holocrine, apocrine, substance, fiber, ground substance, extracellular matrix, collagen/elastic/reticular fibers, fibroblasts, Chondroblast, hematopoietic stem cell, white blood cell, red blood cell, plasma cell, mast cell, macrophage, mesenchyme, areolar, adipose, adipocytes, dense regular connective tissue, dense irregular CT, cartilage (hyaline, elastic, fibrocartilage), osteoblast, one, osteons, blood, cutaneous, mucous, serous, nervous, muscle, cardiac/smooth/cardiac muscle, inflammation, ecto-/endo-/mesoderm	predict, infer, model, relate, sequence, functional, diagram, compare and contrast, describe, define, assume, locate, complementary, construct, specify, interpret, decipher, depict, explain, decide	• Text • Classroom models • Class prepared slides • Online ancillaries provided via OpenStax • Anatomy Zone • Bozeman Science Anatomy and Physiology In addition, various resources will be provided by class website on a week to week basis depending on the needs and abilities of the students.

THE 5 "E"s	Examples of Learning Activities for the specified "E"	SLO's and Engineering Practices
ENGAGE	**Examples of Engaging Activities:**	
	Introduction to histology lab I: students are introduced to the microscopes (including proper use) and initially observe multiple unidentified types of tissue to develop sense of color, patterns, and scale	SLO 1 • Analyzing and interpreting data
EXPLORE	**Examples of Exploring Activities:**	
	Introduction to histology lab II: students apply didactic knowledge of specific tissue types to select histology slides, tying together form/function as they analyze specific tissues	SLO 1, SLO 2 • Analyzing and interpreting data • Constructing explanations (for science) and designing solutions (for engineering • Engaging in argument from evidence

		● Obtaining, evaluating, and communicating information
EXPLAIN/ ELABORATE	**Example of Explaining/Elaborating Activity:**	
	Introduction to histology lab III: students are given unknown samples of tissue and asked to delineate specific cell types within the tissue slide, applying both content knowledge as well as inferring from various clues.	SLO 1, SLO 2 ● Analyzing and interpreting data ● Constructing explanations (for science) and designing solutions (for engineering ● Engaging in argument from evidence ● Obtaining, evaluating, and communicating information
EVALUATE	**Examples of Evaluating Activities:**	
	Histology practical: students examine various pieces of unknown tissue at the microscopic level, then by applying their previous knowledge determine the likely tissue type as well as its function.	SLO 1, SLO 2, SLO 3 ● Analyzing and interpreting data ● Constructing explanations (for science) and designing solutions (for engineering ● Engaging in argument from evidence ● Obtaining, evaluating, and communicating information
	"Traditional" unit exam: As this course is designed to prepare students for medical careers, each unit will include formal summative quizzes/exams that may use multiple choice (including K type questions), short answer, computation, and essay questions to assess content knowledge.	SLO 1, SLO 2, SLO 3 ● Analyzing and interpreting data ● Constructing explanations (for science) and designing solutions (for engineering ● Engaging in argument from evidence ● Obtaining, evaluating, and communicating information

Unit #4	**Unit Name:** *Integumentary System*	**Unit Length:** *~2 weeks*

ESSENTIAL QUESTIONS:
How do form and function correlate at the microscopic and gross levels of the Integumentary system?
How does the integumentary system help keep us alive (maintain homeostasis?

#	STUDENT LEARNING OBJECTIVES (SLO)	Corresponding DCIs and PEs
1	Master the spatial relationships and hierarchical organization of various components of the integumentary system	**HS-LS1-2.** Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
2	Grasp how form interrelates with function within the integumentary system as well as the human organism as a whole.	**LS1.A: Structure and Function** • Systems of specialized cells within organisms help them perform the essential functions of life. (HS-LS1-1) • Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level. (HS-LS1-2) **4-LS1-1.** Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.
3	Predict what happens when homeostatic mechanisms within the integumentary system fail.	**Engaging in Argument from Evidence** Construct an argument with evidence, data, and/or a model. (4-LS1-1)

The performance expectations above were developed using the following elements from the NRC document A Framework for K-12 Science Education:

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed world. • Develop and use a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-LS1-2) **Planning and Carrying Out Investigations** Planning and carrying out in 9-12 builds on K-8 experiences and progresses to include investigations that provide evidence for and test conceptual, mathematical, physical, and empirical models. • Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and	**LS1.A: Structure and Function** • Systems of specialized cells within organisms help them perform the essential functions of life. (HS-LS1-1) • All cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the instructions that code for the formation of proteins, which carry out most of the work of cells. (HS-LS1-1) (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	**Systems and System Models** • Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions—including energy, matter, and information flows—within and between systems at different scales. (HS-LS1-2),(HS-LS1-4) **Structure and Function** • Investigating or designing new systems or structures requires a detailed examination of the properties of different materials, the structures of different components, and connections of components to reveal its function and/or solve a problem. (HS-LS1-1) **Stability and Change** • Feedback (negative or positive) can stabilize or destabilize a system. (HS-LS1-3)

accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly. (HS-LS1-3) **Constructing Explanations and Designing Solutions** Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student generated sources of evidence consistent with scientific ideas, principles, and theories. • Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (HS -LS1-1)	(through positive feedback) or discourage (negative feedback) what is going on inside the living system. (HS-LS1-3) **LS1.C: Organization for Matter and Energy Flow in Organisms** • 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. (HS-LS1-7)	

Connections to other DCIs in this grade-band:
HS.PS1.B (HS-LS1-5),(HS-LS1-6),(HS-LS1-7); **HS.PS2.B** (HS-LS1-7); **HS.LS3.A** (HS-LS1-1); **HS.PS3.B** (HS-LS1-5),(HS-LS1-7)

Articulation of DCIs across grade-bands:
MS.PS1.A (HS-LS1-6); **MS.PS1.B** (HS-LS1-5),(HS-LS1-6),(HS-LS1-7); **MS.PS3.D** (HS-LS1-5),(HS-LS1-6),(HS-LS1-7); **MS.LS1.A** (HS-LS1-1),(HS-LS1-2),(HS-LS1-3),(HS-LS1-4); **MS.LS1.B** (HS-LS1-4); **MS.LS1.C** (HS-LS1-5),(HS-LS1-6),(HS-LS1-7); **MS.LS2.B** (HS-LS1-5),(HS-LS1-7); **MS.ESS2.E** (HS-LS1-6); **MS.LS3.A** (HS-LS1-1),(HS-LS1-4); **MS.LS3.B** (HS-LS1-1)

New Jersey Student Learning Standards Connections:

ELA:

RST.11-12.1 Accurately cite strong and thorough evidence from the text to support analysis of science and technical texts, attending to precise details for explanations or descriptions. (HS-LS1-1, HS-LS1-6)

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. (HS-LS1-3)

WHST.11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. (HS-LS1-3)

WHST.9-12.9 Draw evidence from informational texts to support analysis, reflection, and research. (HS-LS1-1, HS-LS1-6)

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. (HS-LS1-2, HS-LS1-4, HS-LS1-5, HS-LS1-7)

MATH:

MP.4 Model with mathematics. (HS-LS1-4)

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. (HS-LS1-4) [most apt for cardiovascular and muscular systems, but may be applied to others under certain circumstances]
HSF-BF.A.1	Write a function that describes a relationship between two quantities. (HS-LS1-4)

Technology & Career Standards:
8.1 Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.
Career Ready Practices: 1-12

Unit Plan		
Content Vocabulary	**Academic Vocabulary**	**Recommended Resources**
integument, hypodermis, superficial fascia, keratin, keratinocyte, melanocyte, melanin, Langerhans' cell, dendritic cell, Merkel cell, thick/thin skin, stratum basale/germinativum/ spinosum/granulosum/lucidum/corneum, dermis, papillary layer, reticular layer, carotene, cyanosis, sudiferous gland merocrine gland, apocrine gland, sebaceous, pili, seborrhea, hair follicle/sheath/bulb/plexus, epithelial root sheath, arrector pili, velus, nail matrix, eponychium, cuticle, acid mantle, lanugo, vernix caseosa	elaborate, predict, infer, model, relate, sequence, functional, diagram, compare and contrast, describe, define, assume, locate, complementary, construct, specify, interpret, decipher, depict, explain, decide, arrange, categorize	• Text • Classroom models • Class prepared slides • Online ancillaries provided via OpenStax • Anatomy Zone • Bozeman Science Anatomy and Physiology In addition, various resources will be provided by class website on a week to week basis depending on the needs and abilities of the students.

THE 5 "E"s	Examples of Learning Activities for the specified "E"	SLO's and Engineering Practices
ENGAGE	**Examples of Engaging Activities:**	
	Self-exploration I: students use themselves (and their partners) as "models" to observe and record anatomical features of their integumentary systems; observations are recorded in class notebook.	SLO 1, SLO 2 **S&E Practice(s):** ● Planning and carrying out investigations ● Obtaining, evaluating, and communicating information

EXPLORE	**Examples of Exploring Activities:**	
	Self-exploration II: students use themselves (and their partners) as "models" to observe and record anatomical features of their integumentary systems as above, but then hypothesize the function of specific forms before delving into the didactic sessions for the unit	SLO 1, SLO 2 **S&E Practice(s):** ● Planning and carrying out investigations ● Obtaining, evaluating, and communicating information
EXPLAIN/ ELABORATE	**Examples of Explaining/Elaborating Activities:**	
	Histology sessions: students study histology specimens and form hypotheses about the function of novel microscopic structures within the integumentary system before formal didactic discussion of the histology specimens.	SLO 1, SLO 2 **S&E Practice(s):** ● Planning and carrying out investigations ● Analyzing and interpreting data ● Engaging in argument from evidence ● Obtaining, evaluating, and communicating information
EVALUATE	**Examples of Evaluating Activities:**	
	Homeostasis activity—when things go wrong: students analyze physiologic changes/diseases under various stressors [various forms of this lab will be done throughout the year, tailored	SLO 1, SLO 2, SLO 3 **S&E Practices** ● Analyzing and interpreting data

	for specific units]; in this unit, students will evaluate several pathology cases using both case history as well as prepared slides to diagnose various diseases	● Constructing explanations (for science) and designing solutions (for engineering ● Engaging in argument from evidence ● Obtaining, evaluating, and communicating information
	"Traditional" unit exam: As this course is designed to prepare students for medical careers, each unit will include formal summative quizzes/exams that may use multiple choice (including K type questions), short answer, computation, and essay questions to assess content knowledge.	SLO 1, SLO 2, SLO 3 **S&E Practices** ● Analyzing and interpreting data ● Constructing explanations (for science) and designing solutions (for engineering ● Engaging in argument from evidence ● Obtaining, evaluating, and communicating information

Unit #5	**Unit Name:** *Bone tissue and skeletal system*	**Unit Length:** *~5 weeks*

ESSENTIAL QUESTIONS:
How do form and function correlate at the microscopic and gross levels of the skeletal system?
How do bone tissue, bones, and the skeletal system help keep us alive (maintain homeostasis)?

#	STUDENT LEARNING OBJECTIVES (SLO)	Corresponding DCIs and PEs
1	Master the spatial relationships and hierarchical organization of various components of the skeletal system.	**HS-LS1-2.** Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
2	Grasp how form interrelates with function within the skeletal system as well as the human organism as a whole.	**LS1.A: Structure and Function** • Systems of specialized cells within organisms help them perform the essential functions of life. (HS-LS1-1) • Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level. (HS-LS1-2) **4-LS1-1.** Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.
3	Predict what happens when homeostatic mechanisms within the skeletal system fail.	**Engaging in Argument from Evidence** Construct an argument with evidence, data, and/or a model. (4-LS1-1)

The performance expectations above were developed using the following elements from the NRC document A Framework for K-12 Science Education:

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds. • Develop and use a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-LS1-2) • Use a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-LS1-4),(HS-LS1-5),(HS-LS1-7)	**LS1.A : Structure and Function** • Systems of specialized cells within organisms help them perform the essential functions of life. (HS-LS1-1) • All cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the instructions that code for the formation of proteins, which carry out most of the work of cells. (HS -LS1-1) (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	**Systems and System Models** • Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions—including energy, matter, and information flows—within and between systems at different scales. (HS-LS1-2),(HS-LS1-4) **Structure and Function** • Investigating or designing new systems or structures requires a detailed examination of the properties of different materials, the structures of different components, and connections of components to reveal its function and/or solve a problem. (HS-LS1-1) **Stability and Change** • Feedback (negative or positive) can stabilize or destabilize a system. (HS-LS1-3)

	(through positive feedback) or discourage (negative feedback) what is going on inside the living system. (HS-LS1-3)	

Connections to other DCIs in this grade-band:
HS.PS1.B (HS-LS1-5),(HS-LS1-6),(HS-LS1-7); **HS.PS2.B** (HS-LS1-7); **HS.LS3.A** (HS-LS1-1); **HS.PS3.B** (HS-LS1-5),(HS-LS1-7)

Articulation of DCIs across grade-bands:
MS.PS1.A (HS-LS1-6); **MS.PS1.B** (HS-LS1-5),(HS-LS1-6),(HS-LS1-7); **MS.PS3.D** (HS-LS1-5),(HS-LS1-6),(HS-LS1-7); **MS.LS1.A** (HS-LS1-1),(HS-LS1-2),(HS-LS1-3),(HS-LS1-4); **MS.LS1.B** (HS-LS1-4); **MS.LS1.C** (HS-LS1-5),(HS-LS1-6),(HS-LS1-7); **MS.LS2.B** (HS-LS1-5),(HS-LS1-7); **MS.ESS2.E** (HS-LS1-6); **MS.LS3.A** (HS-LS1-1),(HS-LS1-4); **MS.LS3.B** (HS-LS1-1)

New Jersey Student Learning Standards Connections:

ELA:

RST.11-12.1 Accurately cite strong and thorough evidence from the text to support analysis of science and technical texts, attending to precise details for explanations or descriptions. (HS-LS1-1, HS-LS1-6)

WHST.9-12.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. (HS-LS1-1, HS-LS1-6)

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. (HS-LS1-3)

WHST.11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. (HS-LS1-3)

WHST.9-12.9 Draw evidence from informational texts to support analysis, reflection, and research. (HS-LS1-1, HS-LS1-6)

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. (HS-LS1-2, HS-LS1-4. HS-LS1-5. HS-LS1-7)
MATH:	
MP.4	Model with mathematics. (HS-LS1-4)
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. (HS-LS1-4) [most apt for cardiovascular and muscular systems, but may be applied to others under certain circumstances]
HSF-BF.A.1	Write a function that describes a relationship between two quantities. (HS-LS1-4)

Technology & Career Standards:
8.1 Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.
Career Ready Practices: 1-12

Unit Plan		
Content Vocabulary	**Academic Vocabulary**	**Recommended Resources**
appositional growth, interstitial growth, axial, appendicular, sesamoid, long/short/flat/irregular bone, diaphysis, epiphysis, marrow, periosteum, Sharpey's fibers, nutrient foramen, compact/spongy bone, osteons, Haversian system, Volkmann's canal, osteocytes, lacunae, lamellar bone, circumferential, tuberosity, crest, trochanter, tubercle, epicondyle, spine, condyle, fossa, fissure, groove, osteogenesis, endochondral, remodeling, alkaline phosphatase, resorption, parathyroid hormone, Wolff's law, fracture, open/closed reduction, osteomalacia,	predict, infer, model, relate, sequence, functional, diagram, compare and contrast, describe, define, assume, locate, complementary, construct, specify, interpret, decipher, depict, explain, decide	• Text • Classroom models • Class prepared slides • Online ancillaries provided via OpenStax • Anatomy Zone • Bozeman Science Anatomy and Physiology In addition, various resources will be provided by class website on a week to

rickets, callus, osteoporosis [individual bones and their markings in text]		week basis depending on the needs and abilities of the students.

THE 5 "E"s	Examples of Learning Activities for the specified "E"	SLO's and Engineering Practices
ENGAGE	**Examples of Engaging Activities:**	
	Self-exploration: students use themselves (and their partners) as "models" to observe and record anatomical features of their skeletal systems; observations are recorded in class notebook	SLO 1 **S&E Practice(s):** ● Asking questions (for science) and defining problems (for engineering) ● Developing and using models
EXPLORE	**Examples of Exploring Activities:**	
	Introducing anatomic models: students compare and contrast available classroom bone and skeletal models with themselves and their partners	SLO 1 **S&E Practice(s):** ● Asking questions (for science) and defining problems (for engineering) Developing and using models
EXPLAIN/ ELABORATE	**Examples of Explaining/Elaborating Activities:**	
	Histology sessions: students study histology specimens and form hypotheses about the function of novel microscopic structures within the skeletal system before formal didactic discussion of the histology specimens.	SLO 1, SLO 2 **S&E Practice(s):** ● Analyzing and interpreting data ● Constructing explanations (for science) and designing solutions (for engineering ● Engaging in argument from evidence ● Obtaining, evaluating, and communicating information

EVALUATE	**Examples of Evaluating Activities:**	
	Homeostasis activity—when things go wrong: students analyze physiologic changes/diseases	SLO 1, SLO 2, SLO 3 **S&E Practices**

	under various stressors [various forms of this lab will be done throughout the year, tailored for specific units]; in this unit, students will develop patient information brochures for distribution within their "practices"; student will defend their brochures orally.	● Analyzing and interpreting data ● Constructing explanations (for science) and designing solutions (for engineering ● Engaging in argument from evidence ● Obtaining, evaluating, and communicating information
	"Traditional" unit exam: As this course is designed to prepare students for medical careers, each unit will include formal summative quizzes/exams that may use multiple choice (including K type questions), short answer, computation, and essay questions to assess content knowledge.	SLO 1, SLO 2, SLO 3 **S&E Practices** ● Analyzing and interpreting data ● Constructing explanations (for science) and designing solutions (for engineering ● Engaging in argument from evidence ● Obtaining, evaluating, and communicating information

Unit #6	**Unit Name:** *Muscle tissue and muscular system*	**Unit Length:** *~5 weeks*

ESSENTIAL QUESTIONS:
How do form and function correlate at the microscopic and gross levels of the muscular system?
How do muscle tissues, muscles, and the muscle system help keep us alive (maintain homeostasis)?

#	STUDENT LEARNING OBJECTIVES (SLO)	Corresponding DCIs and PEs
1	Master the spatial relationships and hierarchical organization of various components of the muscular system at both the microscopic and macroscopic levels.	HS-LS1-2. Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
2	Grasp how form interrelates with function within the muscular system as well as the human organism as a whole.	**LS1.A: Structure and Function** • Systems of specialized cells within organisms help them perform the essential functions of life. (HS-LS1-1) • Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level. (HS-LS1-2) **4-LS1-1.** Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.
3	Predict what happens when homeostatic mechanisms within the muscular system fail.	**Engaging in Argument from Evidence** Construct an argument with evidence, data, and/or a model. (4-LS1-1)

The performance expectations above were developed using the following elements from the NRC document A Framework for K-12 Science Education:

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds. • Develop and use a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-LS1-2) • Use a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-LS1-4),(HS-LS1-5),(HS-LS1-7)	**LS1.A : Structure and Function** • Systems of specialized cells within organisms help them perform the essential functions of life. (HS-LS1-1) • All cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the instructions that code for the formation of proteins, which carry out most of the work of cells. (HS -LS1-1) (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	**Systems and System Models** • Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions—including energy, matter, and information flows—within and between systems at different scales. (HS-LS1-2),(HS-LS1-4) **Structure and Function** • Investigating or designing new systems or structures requires a detailed examination of the properties of different materials, the structures of different components, and connections of components to reveal its function and/or solve a problem. (HS-LS1-1) **Stability and Change** • Feedback (negative or positive) can stabilize or destabilize a system. (HS-LS1-3)

	(through positive feedback) or discourage (negative feedback) what is going on inside the living system. (HS-LS1-3)	

Connections to other DCIs in this grade-band:
HS.PS1.B (HS-LS1-5),(HS-LS1-6),(HS-LS1-7); **HS.PS2.B** (HS-LS1-7); **HS.LS3.A** (HS-LS1-1); **HS.PS3.B** (HS-LS1-5),(HS-LS1-7)

Articulation of DCIs across grade-bands:
MS.PS1.A (HS-LS1-6); **MS.PS1.B** (HS-LS1-5),(HS-LS1-6),(HS-LS1-7); **MS.PS3.D** (HS-LS1-5),(HS-LS1-6),(HS-LS1-7); **MS.LS1.A** (HS-LS1-1),(HS-LS1-2),(HS-LS1-3),(HS-LS1-4); **MS.LS1.B** (HS-LS1-4); **MS.LS1.C** (HS-LS1-5),(HS-LS1-6),(HS-LS1-7); **MS.LS2.B** (HS-LS1-5),(HS-LS1-7); **MS.ESS2.E** (HS-LS1-6); **MS.LS3.A** (HS-LS1-1),(HS-LS1-4); **MS.LS3.B** (HS-LS1-1)

New Jersey Student Learning Standards Connections:
ELA:

RST.11-12.1 Accurately cite strong and thorough evidence from the text to support analysis of science and technical texts, attending to precise details for explanations or descriptions. (HS-LS1-1, HS-LS1-6)

WHST.9-12.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. (HS-LS1-1, HS-LS1-6)

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. (HS-LS1-3)

WHST.11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. (HS-LS1-3)

WHST.9-12.9	Draw evidence from informational texts to support analysis, reflection, and research. (HS-LS1-1, HS-LS1-6)
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. (HS-LS1-2, HS-LS1-4, HS-LS1-5, HS-LS1-7)
MATH:	
MP.4	Model with mathematics. (HS-LS1-4)
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. (HS-LS1-4) [most apt for cardiovascular and muscular systems, but may be applied to others under certain circumstances]
HSF-BF.A.1	Write a function that describes a relationship between two quantities. (HS-LS1-4)

Technology & Career Standards:
8.1 Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.
Career Ready Practices: 1-12

Unit Plan		
Content Vocabulary	**Academic Vocabulary**	**Recommended Resources**
muscle, muscle fiber, myofilament, voluntary/smooth/cardiac muscle, striation, irritability, contractility, extensibility, elasticity, epimysium, perimysium, fascicle, endomysium, insertion, origin, aponeurosis, sarcolemma, sarcoplasm, myoglobin, myofibril, sarcomere, , A band, I band, H zone, M line, Z disc, thick/thin filament, myosin, actin, tropomyosin, troponin, cross bridge, sarcoplasmic reticulum, terminal cisternae, T	predict, infer, model, relate, sequence, functional, diagram, compare and contrast, describe, define, assume, locate, complementary, construct, specify, interpret, decipher, depict, explain, decide	• Text • Classroom models • Class prepared slides • Online ancillaries provided via OpenStax • Anatomy Zone • Bozeman Science Anatomy and Physiology

tubule, triad, sliding filament model, neuromuscular junction, action potential, refractory period, repolarization, tension, load, motor unit, wave/temporal summation, tetanus, isotonic vs isometric contraction, treppe, anaerobic, aerobic, creatine phosphate, fast glycolytic fiber, slow oxidative fiber, fast oxidative fiber, series-elastic elements, myoblast, muscular dystrophy		In addition, various resources will be provided by class website on a week to week basis depending on the needs and abilities of the students.

THE 5 "E"s	**Examples of Learning Activities for the specified "E"**	**SLO's and Engineering Practices**
ENGAGE	**Examples of Engaging Activities:**	
	Self-exploration I: students use themselves (and their partners) as "models" to observe and record anatomical features of their muscular systems; observations are recorded in class notebook	SLO 1 **S&E Practice(s):** ● Asking questions (for science) and defining problems (for engineering) ● Developing and using models
EXPLORE	**Examples of Exploring Activities:**	
	Introducing anatomic models: students compare and contrast available classroom muscle models with themselves and their partners	SLO 1 **S&E Practice(s):** ● Asking questions (for science) and defining problems (for engineering) ● Developing and using models
	Introducing the goniometer: Using crude goniometer, students devise ways to measure how far they can extend and flex certain muscle groups; they then compare data with other groups and hypothesize why there are limits (and why these limits appear to vary among different students).	SLO 1. SLO 2 **S&E Practice(s):** ● Planning and carrying out investigations ● Analyzing and interpreting data ● Using mathematics and computational thinking Engaging in argument from evidence ● Obtaining, evaluating, and communicating information

EXPLAIN	**Examples of Explaining Activities:**	
	Muscle fatigue lab: Students are provided with various implements that may be used for exercising the hand muscles and are asked to design an experiment to test what happens as muscles are over-worked.	SLO 1. SLO 2, SLO 3 **S&E Practice(s):** ● Planning and carrying out investigations ● Analyzing and interpreting data ● Using mathematics and computational thinking ● Engaging in argument from evidence ● Obtaining, evaluating, and communicating information
ELABORATE	**Examples of Elaborating Activities:**	
	Histology sessions: students study histology specimens and form hypotheses about the function of novel microscopic structures within the muscular system before formal didactic discussion of the histology specimens.	SLO 1, SLO 2 ● Analyzing and interpreting data ● Constructing explanations (for science) and designing solutions (for engineering ● Engaging in argument from evidence ● Obtaining, evaluating, and communicating information
EVALUATE	**Examples of Evaluating Activities:**	
	Homeostasis activity—when things go wrong: students analyze physiologic changes/diseases under various stressors [various forms of this lab will be done throughout the year, tailored for specific units]; in this unit, students will predict the loss of function for specific muscle injuries.	SLO 1, SLO 2, SLO 3 **S&E Practices** ● Analyzing and interpreting data ● Constructing explanations (for science) and designing solutions (for engineering ● Engaging in argument from evidence ● Obtaining, evaluating, and communicating information
	"Traditional" unit exam: As this course is designed to prepare students for medical careers, each unit will include formal summative quizzes/exams that may use multiple choice (including K type questions), short answer, computation, and essay questions to assess content knowledge.	SLO 1, SLO 2, SLO 3 **S&E Practices** ● Analyzing and interpreting data ● Constructing explanations (for science) and designing solutions (for engineering ● Engaging in argument from evidence ● Obtaining, evaluating, and communicating information

Unit #7	Unit Name: *Blood*	Unit Length: *~1 week*

ESSENTIAL QUESTIONS:
How do form and function correlate at the microscopic and gross levels of the hematopoietic system?
How does blood and the circulatory system help keep us alive (maintain homeostasis)?

#	STUDENT LEARNING OBJECTIVES (SLO)	Corresponding DCIs and PEs
1	Master the spatial relationships and hierarchical organization of various components of the hematopoietic system at both the microscopic and gross level.	HS-LS1-2. Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
2	Grasp how form interrelates with function within the hematopoietic system as well as the human organism as a whole.	**LS1.A: Structure and Function** • Systems of specialized cells within organisms help them perform the essential functions of life. (HS-LS1-1) • Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level. (HS-LS1-2) **4-LS1-1.** Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.
3	Predict what happens when homeostatic mechanisms within the hematopoietic system fail.	**Engaging in Argument from Evidence** Construct an argument with evidence, data, and/or a model. (4-LS1-1)

The performance expectations above were developed using the following elements from the NRC document A Framework for K-12 Science Education:

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
(Developing and Using Models Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds. • Develop and use a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-LS1-2) • Use a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-LS1-4),(HS-LS1-5),(HS-LS1-7)	**LS1.A : Structure and Function** • Systems of specialized cells within organisms help them perform the essential functions of life. (HS-LS1-1) • All cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the instructions that code for the formation of proteins, which carry out most of the work of cells. (HS -LS1-1) (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	**Systems and System Models** • Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions—including energy, matter, and information flows—within and between systems at different scales. (HS-LS1-2),(HS-LS1-4) **Structure and Function** • Investigating or designing new systems or structures requires a detailed examination of the properties of different materials, the structures of different components, and connections of components to reveal its function and/or solve a problem. (HS-LS1-1) **Stability and Change** • Feedback (negative or positive) can stabilize or destabilize a system. (HS-LS1-3)

	(through positive feedback) or discourage (negative feedback) what is going on inside the living system. (HS-LS1-3)	

Connections to other DCIs in this grade-band:
HS.PS1.B (HS-LS1-5),(HS-LS1-6),(HS-LS1-7); **HS.PS2.B** (HS-LS1-7); **HS.LS3.A** (HS-LS1-1); **HS.PS3.B** (HS-LS1-5),(HS-LS1-7)

Articulation of DCIs across grade-bands:
MS.PS1.A (HS-LS1-6); **MS.PS1.B** (HS-LS1-5),(HS-LS1-6),(HS-LS1-7); **MS.PS3.D** (HS-LS1-5),(HS-LS1-6),(HS-LS1-7); **MS.LS1.A** (HS-LS1-1),(HS-LS1-2),(HS-LS1-3),(HS-LS1-4); **MS.LS1.B** (HS-LS1-4); **MS.LS1.C** (HS-LS1-5),(HS-LS1-6),(HS-LS1-7); **MS.LS2.B** (HS-LS1-5),(HS-LS1-7); **MS.ESS2.E** (HS-LS1-6); **MS.LS3.A** (HS-LS1-1),(HS-LS1-4); **MS.LS3.B** (HS-LS1-1)

New Jersey Student Learning Standards Connections:

ELA:

RST.11-12.1 Accurately cite strong and thorough evidence from the text to support analysis of science and technical texts, attending to precise details for explanations or descriptions. (HS-LS1-1, HS-LS1-6)

WHST.9-12.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. (HS-LS1-1, HS-LS1-6)

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. (HS-LS1-3)

WHST.11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. (HS-LS1-3)

WHST.9-12.9	Draw evidence from informational texts to support analysis, reflection, and research. (HS-LS1-1, HS-LS1-6)
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. (HS-LS1-2, HS-LS1-4, HS-LS1-5, HS-LS1-7)
MATH:	
MP.4	Model with mathematics. (HS-LS1-4)
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. (HS-LS1-4) [most apt for cardiovascular and muscular systems, but may be applied to others under certain circumstances]
HSF-BF.A.1	Write a function that describes a relationship between two quantities. (HS-LS1-4)

Technology & Career Standards:
8.1 Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.
Career Ready Practices: 1-12

Unit Plan		
Content Vocabulary	**Academic Vocabulary**	**Recommended Resources**
formed elements, plasma, buffy coat, hematocrit, albumin, erythrocyte (red blood cell), hemoglobin, hematopoiesis, erythropoietin, bilirubin, anemia, thalassemia, sickle cell anemia, polycythemia, leukocyte (white blood cell), leukocytosis, granulocyte, neutrophil, polymorphonuclear leukocyte (PMN), eosinophil, basophil, lymphocyte, monocyte, interleukin, leukemia, hemostasis, platelet, coagulation,	predict, infer, model, relate, sequence, functional, diagram, compare and contrast, describe, define, assume, locate, complementary, construct, specify, interpret, decipher, depict, explain, decide	• Text • Classroom models • Class prepared slides • Online ancillaries provided via OpenStax • Anatomy Zone • Bozeman Science Anatomy and Physiology

prothrombin, thrombin, fibrinolysis, plasminogen, heparin, thrombus, embolus, thrombocytopenia, factor VIII, ABO blood groups, Rh factor, transfusion		In addition, various resources will be provided by class website on a week to week basis depending on the needs and abilities of the students.

THE 5 "E"s	Examples of Learning Activities for the specified "E"	SLO's and Engineering Practices
ENGAGE	**Examples of Engaging Activities:**	
	KWL/misconceptions discussion: Open unit with discussion of what we can see/feel using our bodies as models ("blue" vessels, pulse, etc.), then delve into what students know about blood. [Consider opening with spoof video of horror movie if appropriate one can be found]	SLO 2 **S&E Practices** ● Engaging in argument from evidence
EXPLAIN	**Examples of Explaining Activities:**	
	Laying out the clotting cascade: Students team up and draw out for each other the steps of the clotting cascade	SLO 1, SLO 2 **S&E Practices** ● Constructing explanations (for science) and designing solutions (for engineering ● Obtaining, evaluating, and communicating information
EXPLORE/ ELABORATE	**Examples of Explore/Elaborating Activities:**	
	Histology sessions: students study histology specimens and form hypotheses about the function of novel microscopic structures within the hematopoietic system before formal didactic discussion of the histology specimens.	SLO 1, SLO 2 **S&E Practices** ● Analyzing and interpreting data ● Constructing explanations (for science) and designing solutions (for engineering ● Engaging in argument from evidence ● Obtaining, evaluating, and communicating information

EVALUATE	Examples of Evaluating Activities:	
	Homeostasis activity—when things go wrong: students analyze physiologic changes/diseases under various stressors [various forms of this lab will be done throughout the year, tailored for specific units]; in this unit, students will predict the short term and long term consequence to the hematopoietic system with extreme environmental pressures.	SLO 1, SLO 2, SLO 3 **S&E Practices** ● Analyzing and interpreting data ● Constructing explanations (for science) and designing solutions (for engineering ● Engaging in argument from evidence ● Obtaining, evaluating, and communicating information
	"Traditional" unit exam: As this course is designed to prepare students for medical careers, each unit will include formal summative quizzes/exams that may use multiple choice (including K type questions), short answer, computation, and essay questions to assess content knowledge.	SLO 1, SLO 2, SLO 3 **S&E Practices** ● Analyzing and interpreting data ● Constructing explanations (for science) and designing solutions (for engineering ● Engaging in argument from evidence ● Obtaining, evaluating, and communicating information

Unit #8	**Unit Name:** *Cardiovascular system*	**Unit Length:** *~3 weeks*

ESSENTIAL QUESTIONS:
How do form and function correlate at the microscopic and gross levels of the cardiovascular system?
How does the heart and the cardiovascular system help keep us alive (maintain homeostasis)?

#	STUDENT LEARNING OBJECTIVES (SLO)	Corresponding DCIs and PEs
1	Master the spatial relationships and hierarchical organization of various components of the cardiovascular system at both the microscopic and macroscopic level.	**HS-LS1-2.** Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
2	Grasp how form interrelates with function within the cardiovascular system as well as the human organism as a whole.	**LS1.A: Structure and Function** • Systems of specialized cells within organisms help them perform the essential functions of life. (HS-LS1-1) • Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level. (HS-LS1-2) **4-LS1-1.** Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.
3	Predict what happens when homeostatic mechanisms within the cardiovascular system fail.	**Engaging in Argument from Evidence** Construct an argument with evidence, data, and/or a model. (4-LS1-1)

The performance expectations above were developed using the following elements from the NRC document A Framework for K-12 Science Education:

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds. • Develop and use a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-LS1-2) • Use a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-LS1-4),(HS-LS1-5),(HS-LS1-7)	**LS1.A: Structure and Function** • Systems of specialized cells within organisms help them perform the essential functions of life. (HS-LS1-1) • Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level. (HS-LS1-2) • Feedback mechanisms maintain a living system's internal conditions within certain limits and mediate behaviors, allowing it to remain alive and functional even as external conditions change within some range. Feedback mechanisms can encourage (through positive feedback) or discourage (negative feedback) what is going on inside the living system. (HS-LS1-3)	**Systems and System Models** • Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions—including energy, matter, and information flows—within and between systems at different scales. (HS-LS1-2),(HS-LS1-4) **Structure and Function** • Investigating or designing new systems or structures requires a detailed examination of the properties of different materials, the structures of different components, and connections of components to reveal its function and/or solve a problem. (HS-LS1-1) **Stability and Change** • Feedback (negative or positive) can stabilize or destabilize a system. (HS-LS1-3)

Connections to other DCIs in this grade-band:
HS.PS1.B (HS-LS1-5),(HS-LS1-6),(HS-LS1-7); **HS.PS2.B** (HS-LS1-7); **HS.LS3.A** (HS-LS1-1); **HS.PS3.B** (HS-LS1-5),(HS-LS1-7)

Articulation of DCIs across grade-bands:
MS.PS1.A (HS-LS1-6); **MS.PS1.B** (HS-LS1-5),(HS-LS1-6),(HS-LS1-7); **MS.PS3.D** (HS-LS1-5),(HS-LS1-6),(HS-LS1-7); **MS.LS1.A** (HS-LS1-1),(HS-LS1-2),(HS-LS1-3),(HS-LS1-4); **MS.LS1.B** (HS-LS1-4); **MS.LS1.C** (HS-LS1-5),(HS-LS1-6),(HS-LS1-7); **MS.LS2.B** (HS-LS1-5),(HS-LS1-7); **MS.ESS2.E** (HS-LS1-6); **MS.LS3.A** (HS-LS1-1),(HS-LS1-4); **MS.LS3.B** (HS-LS1-1)

New Jersey Student Learning Standards Connections:

ELA:

RST.11-12.1 Accurately cite strong and thorough evidence from the text to support analysis of science and technical texts, attending to precise details for explanations or descriptions. (HS-LS1-1, HS-LS1-6)

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. (HS-LS1-3) [focus on usefulness of using multiple images from multiple sources of same structure to build gestalt of structure]

WHST.11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. (HS-LS1-3) [focus on usefulness of using multiple images from multiple sources of same structure to build gestalt of structure]

WHST.9-12.9 Draw evidence from informational texts to support analysis, reflection, and research. (HS-LS1-1, HS-LS1-6)

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. (HS-LS1-2, HS-LS1-4, HS-LS1-5, HS-LS1-7)

MATH:

MP.4	Model with mathematics. (HS-LS1-4)
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. (HS-LS1-4) [most apt for cardiovascular and muscular systems, but may be applied to others under certain circumstances]
HSF-BF.A.1	Write a function that describes a relationship between two quantities. (HS-LS1-4)

Technology & Career Standards:
8.1 Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.
Career Ready Practices: 1-12

Unit Plan		
Content Vocabulary	**Academic Vocabulary**	**Recommended Resources**
heart, mediastinum, PMI, pericardium, epi-/endo-/myocardium, ventricle, coronary sulcus, auricle, atrium, vena cava, vein, artery, coronary sinus, trabeculae carnae, papillary muscle, circuit, myocardial infarction (MI), atrioventricular, tricuspid, mitral, chordae tendinae, aortic valve, pulmonary semilunar valve, automaticity, refractory period, intercalated disc, syncytium, sinoatrial node, atrioventricular node, bundle branch, Purkinjie	predict, infer, model, relate, sequence, functional, diagram, compare and contrast, describe, define, assume, locate, complementary, construct, specify, interpret, decipher, depict, explain, decide	• Text • Classroom models • Class prepared slides • Online ancillaries provided via OpenStax • Anatomy Zone • Bozeman Science Anatomy and Physiology

fiber, bundle of His, ectopic, arrhythmia, QRS complex, T wave, S-T segment, systole, diastole, isovolumetric, ejection, contractility, atrial (Bainbridge) reflex, atherosclerosis		In addition, various resources will be provided by class website on a week to week basis depending on the needs and abilities of the students.

THE 5 "E"s	**Examples of Learning Activities for the specified "E"**	**SLO's and Engineering Practices**
ENGAGE	**Examples of Engaging Activities:**	
	Stethoscope activity: Students pair up and with little assistance explore each other's heart sounds; student will also be asked to analyze the stethoscope as a tool to determine how it works. [Students will be encouraged to take them apart.]	SLO 3 **S&E Practice(s):** ● Constructing explanations (for science) and designing solutions (for engineering ● Engaging in argument from evidence ● Obtaining, evaluating, and communicating information
EXPLORE	**Examples of Exploring Activities:**	
	Introducing anatomic models: students compare and contrast available classroom heart models with themselves and their partners	SLO 1 **S&E Practice(s):** ● Asking questions (for science) and defining problems (for engineering) ● Developing and using models
EXPLAIN/ ELABORATE	**Examples of Explaining/Elaborating Activities:**	
	Histology sessions: students study histology specimens and form hypotheses about the function of novel microscopic structures within the cardiovascular system before formal didactic discussion of the histology specimens. *Homeostasis: Blood pressure, pulse, and position* Students will explore the changes in	SLO 1, SLO 2 ● Analyzing and interpreting data ● Constructing explanations (for science) and designing solutions (for engineering ● Engaging in argument from evidence ● Obtaining, evaluating, and communicating information

	blood pressure and pulse associated with changes in body position. Multiple sources available--sample: http://people.fmarion.edu/tbarbeau/236%20Lab%20-%20Cardiology%20EKG%20&%20Posture.pdf	
EVALUATE	**Examples of Evaluating Activities:**	
	Homeostasis activity—when things go wrong: students analyze physiologic changes/diseases under various stressors [various forms of this lab will be done throughout the year, tailored for specific units]; in this unit, students will predict the clinical consequences of specific insults to the cardiovascular system.	SLO 1, SLO 2, SLO 3 **S&E Practices** ● Analyzing and interpreting data ● Constructing explanations (for science) and designing solutions (for engineering ● Engaging in argument from evidence ● Obtaining, evaluating, and communicating information
	"Traditional" unit exam: As this course is designed to prepare students for medical careers, each unit will include formal summative quizzes/exams that may use multiple choice (including K type questions), short answer, computation, and essay questions to assess content knowledge.	SLO 1, SLO 2, SLO 3 **S&E Practices** ● Analyzing and interpreting data ● Constructing explanations (for science) and designing solutions (for engineering ● Engaging in argument from evidence ● Obtaining, evaluating, and communicating information

Unit #9	**Unit Name:** *Lymphatic and immune system*	**Unit Length:** *~2 weeks*

ESSENTIAL QUESTIONS:
How do form and function correlate at the microscopic and gross levels of the immune system?
How does the immune system help keep us alive (maintain homeostasis)?

#	STUDENT LEARNING OBJECTIVES (SLO)	Corresponding DCIs and PEs
1	Master the spatial relationships and hierarchical organization of various components of the immune system.	**LS1.A: Structure and Function** • Systems of specialized cells within organisms help them perform the essential functions of life. (HS-LS1-1) • Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level. (HS-LS1-2)
2	Grasp how form interrelates with function within the immune system as well as the human organism as a whole.	**LS1.A: Structure and Function** • Systems of specialized cells within organisms help them perform the essential functions of life. (HS-LS1-1) • Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level. (HS-LS1-2) **4-LS1-1.** Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.
3	Predict what happens when homeostatic mechanisms within the immune system fail.	**Engaging in Argument from Evidence** ● Construct an argument with evidence, data, and/or a model. (4-LS1-1) **LS1.A: Structure and Function** ● 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 performance expectations above were developed using the following elements from the NRC document A Framework for K-12 Science Education:

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds. • Develop and use a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-LS1-2) • Use a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-LS1-4),(HS-LS1-5),(HS-LS1-7)	**LS1.A: Structure and Function** • Systems of specialized cells within organisms help them perform the essential functions of life. (HS-LS1-1) • Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level. (HS-LS1-2) • Feedback mechanisms maintain a living system's internal conditions within certain limits and mediate behaviors, allowing it to remain alive and functional even as external conditions change within some range. Feedback mechanisms can encourage (through positive feedback) or discourage (negative feedback) what is going on inside the living system. (HS-LS1-3)	**Systems and System Models** • Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions—including energy, matter, and information flows—within and between systems at different scales. (HS-LS1-2),(HS-LS1-4) **Structure and Function** • Investigating or designing new systems or structures requires a detailed examination of the properties of different materials, the structures of different components, and connections of components to reveal its function and/or solve a problem. (HS-LS1-1)

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

Connections to other DCIs in this grade-band:
HS.PS1.B (HS-LS1-5),(HS-LS1-6),(HS-LS1-7); **HS.PS2.B** (HS-LS1-7); **HS.LS3.A** (HS-LS1-1); **HS.PS3.B** (HS-LS1-5),(HS-LS1-7)

Articulation of DCIs across grade-bands:
MS.PS1.A (HS-LS1-6); **MS.PS1.B** (HS-LS1-5),(HS-LS1-6),(HS-LS1-7); **MS.PS3.D** (HS-LS1-5),(HS-LS1-6),(HS-LS1-7); **MS.LS1.A** (HS-LS1-1),(HS-LS1-2),(HS-LS1-3),(HS-LS1-4); **MS.LS1.B** (HS-LS1-4); **MS.LS1.C** (HS-LS1-5),(HS-LS1-6),(HS-LS1-7); **MS.LS2.B** (HS-LS1-5),(HS-LS1-7); **MS.ESS2.E** (HS-LS1-6); **MS.LS3.A** (HS-LS1-1),(HS-LS1-4); **MS.LS3.B** (HS-LS1-1)

New Jersey Student Learning Standards Connections:
ELA:

RST.11-12.1 Accurately cite strong and thorough evidence from the text to support analysis of science and technical texts, attending to precise details for explanations or descriptions. (HS-LS1-1, HS-LS1-6)

WHST.9-12.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. (HS-LS1-1, HS-LS1-6)

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. (HS-LS1-3). (HS-LS1-3)

WHST.11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. (HS-LS1-3)

WHST.9-12.9 Draw evidence from informational texts to support analysis, reflection, and research. (HS-LS1-1, HS-LS1-6)

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. (HS-LS1-2, HS-LS1-4, HS-LS1-5, HS-LS1-7)
MATH:	
MP.4	Model with mathematics. (HS-LS1-4)
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. (HS-LS1-4) [most apt for cardiovascular and muscular systems, but may be applied to others under certain circumstances]
HSF-BF.A.1	Write a function that describes a relationship between two quantities. (HS-LS1-4)

Technology & Career Standards:
8.1 Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.
Career Ready Practices: 1-12

Unit Plan		
Content Vocabulary	**Academic Vocabulary**	**Recommended Resources**
lymph, lacteal, chyle, thoracic duct, lymphocyte, T cell, B cell, macrophage, dendritic cell, follicle, germinal center, lymph node, cortex, medullary, afferent/efferent lymphatic vessel, spleen, red/white pulp, thymus, Hassall's corpuscle, tonsil, appendix, splenomegaly, immunity, innate, adaptive defense system, pathogen, phagocyte, adherence, natural killer cell, inflammatory response, exudate, hyperemia, complement, cytokine, prostaglandin, leukocytosis, diapedesis, chemotaxis, interferon, humoral, cell-mediated	predict, infer, model, relate, sequence, functional, diagram, compare and contrast, describe, define, assume, locate, complementary, construct, specify, interpret, decipher, depict, explain, decide	• Text • Classroom models • Class prepared slides • Online ancillaries provided via OpenStax • Anatomy Zone • Bozeman Science Anatomy and Physiology In addition, various resources will be provided by class website on a week to

immunity, antigen, MHC protein, antibody, immunoglobulin, monoclonal, helper T cell, SCID, AIDS, HIV, autoimmune, anaphylaxis		week basis depending on the needs and abilities of the students.

THE 5 "E"s	Examples of Learning Activities for the specified "E"	SLO's and Engineering Practices
ENGAGE	**Examples of Engaging Activities:**	
	"What happens when you get sick?" KWL/misconceptions discussion: students discuss signs and symptoms of various illnesses; teacher will present list of misconceptions for discussion as well	SLO 3 **S&E Practices** ● Constructing explanations (for science) and designing solutions (for engineering ● Engaging in argument from evidence
EXPLORE	**Examples of Exploring Activities:**	
	Case studies: Student analyze the effects of specific immune deficits (acquired and genetic) on the body's ability to defend itself from infection.	SLO 1, SLO 2, SLO 3 **S&E Practices** ● Analyzing and interpreting data ● Obtaining, evaluating, and communicating information
EXPLAIN/ ELABORATE	**Examples of Explaining/Elaborating Activities:**	
	Histology sessions: students study histology specimens and form hypotheses about the function of novel microscopic structures within the lymphatic system before formal didactic discussion of the histology specimens.	SLO 1, SLO 2 **S&E Practices** ● Analyzing and interpreting data ● Constructing explanations (for science) and designing solutions (for engineering ● Engaging in argument from evidence ● Obtaining, evaluating, and communicating information
EVALUATE	**Examples of Evaluating Activities:**	
	Homeostasis activity—when things go wrong: students analyze physiologic changes/diseases under various stressors	SLO 1, SLO 2, SLO 3 **S&E Practices** ● Analyzing and interpreting data

	[various forms of this lab will be done throughout the year, tailored for specific units]; in this unit, students will evaluate how various bacteria and viruses have evolved to evade the immune system.	● Constructing explanations (for science) and designing solutions (for engineering ● Engaging in argument from evidence ● Obtaining, evaluating, and communicating information
	"Traditional" unit exam: As this course is designed to prepare students for medical careers, each unit will include formal summative quizzes/exams that may use multiple choice (including K type questions), short answer, computation, and essay questions to assess content knowledge.	SLO 1, SLO 2, SLO 3 **S&E Practices** ● Analyzing and interpreting data ● Constructing explanations (for science) and designing solutions (for engineering ● Engaging in argument from evidence ● Obtaining, evaluating, and communicating information

Unit #10	Unit Name: *Respiratory system*	Unit Length: ~ *3 weeks*

ESSENTIAL QUESTIONS:
How do form and function correlate at the microscopic and gross levels of the respiratory system?
How does the respiratory system help keep us alive (maintain homeostasis)?

#	STUDENT LEARNING OBJECTIVES (SLO)	Corresponding DCIs and PEs
1	Master the spatial relationships and hierarchical organization of various components of the respiratory system at both the microscopic and macroscopic level.	**LS1.A: Structure and Function** • Systems of specialized cells within organisms help them perform the essential functions of life. (HS-LS1-1) • Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level. (HS-LS1-2)
2	Grasp how form interrelates with function within the respiratory system as well as the human organism as a whole.	**LS1.A: Structure and Function** • Systems of specialized cells within organisms help them perform the essential functions of life. (HS-LS1-1) • Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level. (HS-LS1-2) **4-LS1-1.** Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.
3	Predict what happens when homeostatic mechanisms within the respiratory system fail.	**Engaging in Argument from Evidence** Construct an argument with evidence, data, and/or a model. (4-LS1-1)

The performance expectations above were developed using the following elements from the NRC document A Framework for K-12 Science Education:

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds. • Develop and use a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-LS1-2) • Use a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-LS1-4),(HS-LS1-5),(HS-LS1-7)	**LS1.A: Structure and Function** • Systems of specialized cells within organisms help them perform the essential functions of life. (HS-LS1-1) • Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level. (HS-LS1-2) • Feedback mechanisms maintain a living system's internal conditions within certain limits and mediate behaviors, allowing it to remain alive and functional even as external conditions change within some range. Feedback mechanisms can encourage (through positive feedback) or discourage (negative feedback) what is going on inside the living system. (HS-LS1-3)	**Systems and System Models** • Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions—including energy, matter, and information flows—within and between systems at different scales. (HS-LS1-2),(HS-LS1-4) **Structure and Function** • Investigating or designing new systems or structures requires a detailed examination of the properties of different materials, the structures of different components, and connections of components to reveal its function and/or solve a problem. (HS-LS1-1) **Stability and Change** • Feedback (negative or positive) can stabilize or destabilize a system. (HS-LS1-3)

Connections to other DCIs in this grade-band:
HS.PS1.B (HS-LS1-5),(HS-LS1-6),(HS-LS1-7); **HS.PS2.B** (HS-LS1-7); **HS.LS3.A** (HS-LS1-1); **HS.PS3.B** (HS-LS1-5),(HS-LS1-7)

Articulation of DCIs across grade-bands:
MS.PS1.A (HS-LS1-6); **MS.PS1.B** (HS-LS1-5),(HS-LS1-6),(HS-LS1-7); **MS.PS3.D** (HS-LS1-5),(HS-LS1-6),(HS-LS1-7); **MS.LS1.A** (HS-LS1-1),(HS-LS1-2),(HS-LS1-3),(HS-LS1-4); **MS.LS1.B** (HS-LS1-4); **MS.LS1.C** (HS-LS1-5),(HS-LS1-6),(HS-LS1-7); **MS.LS2.B** (HS-LS1-5),(HS-LS1-7); **MS.ESS2.E** (HS-LS1-6); **MS.LS3.A** (HS-LS1-1),(HS-LS1-4); **MS.LS3.B** (HS-LS1-1)

New Jersey Student Learning Standards Connections:

ELA:

RST.11-12.1 Accurately cite strong and thorough evidence from the text to support analysis of science and technical texts, attending to precise details for explanations or descriptions. (HS-LS1-1, HS-LS1-6)

WHST.9-12.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. (HS-LS1-1, HS-LS1-6)

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. (HS-LS1-3)

WHST.11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. (HS-LS1-3)

WHST.9-12.9 Draw evidence from informational texts to support analysis, reflection, and research. (HS-LS1-1, HS-LS1-6)

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. (HS-LS1-2, HS-LS1-4, HS-LS1-5, HS-LS1-7)

MATH:	
MP.4	Model with mathematics. (HS-LS1-4)
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. (HS-LS1-4) [most apt for cardiovascular and muscular systems, but may be applied to others under certain circumstances]
HSF-BF.A.1	Write a function that describes a relationship between two quantities. (HS-LS1-4)

Technology & Career Standards:
8.1 Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.
Career Ready Practices: 1-12

Unit Plan		
Content Vocabulary	**Academic Vocabulary**	**Recommended Resources**
respiration, ventilation, conducting zone, nasal cavity, philtrum, external nares, alae, nasal septum, palate (hard and soft), vestibule, olfactory mucosa, vibrissae, paranasal sinuses, pharynx, nasopharynx, pharyngotympanic tube, oropharynx, palatine tonsil, lingual, larynx, arytenoid, cuneiform, corniculate, glottis, adventitia, bronchus, alveolar, lung, apex, hilum, bronchopulmonary, lobule, stroma, plexus, pleura, pressure, atelectasis, pneumothorax, compliance, IRDS, capacity, surface tension, dead space, FEV, partial pressure, Henry's law, ventilation-perfusion coupling, Haldane effect, carotid bodies, apnea, COPD, tuberculosis, asthma, cystic fibrosis	predict, infer, model, relate, sequence, functional, diagram, compare and contrast, describe, define, assume, locate, complementary, construct, specify, interpret, decipher, depict, explain, decide	• Text • Classroom models • Class prepared slides • Online ancillaries provided via OpenStax • Anatomy Zone • Bozeman Science Anatomy and Physiology In addition, various resources will be provided by class website on a week to week basis depending on the needs and abilities of the students.

THE 5 "E"s	Examples of Learning Activities for the specified "E"	SLO's and Engineering Practices
ENGAGE	**Examples of Engaging Activities:**	
	A&P Aerobic Exercise Activity: Students will perform exercises (if able), then evaluate what happens to their breathing and pulse rates.	SLO 1 **S&E Practice(s):** ● Asking questions (for science) and defining problems (for engineering)
EXPLORE	**Examples of Exploring Activities:**	
	Introducing anatomic models: students compare and contrast available classroom respiratory models with themselves and their partners	SLO 1 **S&E Practice(s):** ● Asking questions (for science) and defining problems (for engineering) ● Developing and using models
EXPLAIN/ ELABORATE	**Examples of Explaining Activities:**	
	CO_2 Detection activity: Students will learn how bromothymol blue solution can be used as a carbon dioxide detector, then use this knowledge to measure rates of CO_2 production by students under various circumstances	SLO 1 **S&E Practice(s):** ● Asking questions (for science) and defining problems (for engineering) ● Developing and using models
	Pulse oximetry exercise: Students will learn how to use pulse oximeter and interpret the results; students will then design an experiment to deliberately produce erroneous results after researching the technology behind pulse oximetry. (See https://windward.hawaii.edu/facstaff/miliefsky-m/ZOOL142L/aboutPulseOximetry.pdf)	SLO 1 **S&E Practice(s):** ● Asking questions (for science) and defining problems (for engineering) ● Developing and using models

EVALUATE	Examples of Evaluating Activities:	
	Homeostasis activity—when things go wrong: students analyze physiologic changes/diseases under various stressors [various forms of this lab will be done throughout the year, tailored for specific units]; in this unit, students will evaluate arterial blood gasses and assess simulated patients for possible causes of abnormal blood gas measurements.	SLO 1, SLO 2, SLO 3 **S&E Practices** ● Analyzing and interpreting data ● Constructing explanations (for science) and designing solutions (for engineering ● Engaging in argument from evidence ● Obtaining, evaluating, and communicating information
	"Traditional" unit exam: As this course is designed to prepare students for medical careers, each unit will include formal summative quizzes/exams that may use multiple choice (including K type questions), short answer, computation, and essay questions to assess content knowledge.	SLO 1, SLO 2, SLO 3 **S&E Practices** ● Analyzing and interpreting data ● Constructing explanations (for science) and designing solutions (for engineering ● Engaging in argument from evidence ● Obtaining, evaluating, and communicating information