PASSAIC COUNTY TECHNICAL INSTITUTE
STEM Academy
45 Reinhardt Road
Wayne, NJ

Essentials of Biomedical Science

Course # S9100

November 2017

Essentials of Biomedical Sciences

Students explore the concepts of human medicine and are introduced to research processes and to bioinformatics. Hands-on projects enable students to investigate human body systems and various health conditions, including heart disease, diabetes, sickle-cell disease, hypercholesterolemia, and infectious diseases. Utilizing the activity-project-problem-based (APB) teaching and learning pedagogy, students will progress from completing structured activities to solving open-ended projects and problems that require them to develop planning, documentation, communication, and other professional skills. Over the length of the course, students work together to determine the factors that led to the death of a fictional person. After pinpointing those factors, the students investigate lifestyle choices and medical treatments that might have prolonged the person's life.

The course is designed to provide an overview of all the courses in the Biomedical Sciences Program and to lay the scientific foundation necessary for student success in the subsequent courses. The key biological concepts embedded in the curriculum include homeostasis, metabolism, inheritance of traits, feedback systems, and defense against disease. Where appropriate, engineering principles are also incorporated into the curriculum. These include the design process, feedback loops, fluid dynamics, and the relationship of structure to function. The curriculum is aligned with New Jersey Student Learning Standards in Math, English Language Arts and World History, NJSLS-Science, including Career Ready Practices and acceptable 21st Century, Career and Technical cluster standards. These cross-curricular connections to widely accepted standards will help students gain confidence and reinforce essential concepts and skills that build toward life-long success in the Biomedical Science pathway.

The course engages students in a logical decision-making practice and collaborative strategies, as well as industry-standard tools authentic to how biomedical science professionals work. This course builds enthusiasm for and a real understanding of role, impact, and practice of Biomedical Science as a primary goal of the course.

PASSAIC COUNTY TECHNICAL INSTITUTE
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Biomedical Science Curriculum Unit 1

Content Area:	**Essentials of Biomedical Science**	**Grade(s)**	**9**
Unit Plan Title:	**The Mystery; The Death of Anna Garcia**		

Learning Objectives

Lesson 1 The Mystery

This course provides an introduction to the biomedical sciences through exciting hands- on projects and problems. Students investigate concepts of biology and medicine as they explore health conditions including heart disease, diabetes, sickle-cell disease, hypercholesterolemia, and infectious diseases. They will determine the factors that led to the death of a fictional woman as they piece together evidence found in her medical history and autopsy report. Students will investigate lifestyle choices and medical treatments that might have prolonged the woman's life and demonstrate how the development of disease is related to changes in human body systems. The activities and projects introduce students to human physiology, basic biology, medicine, research processes, and allow students to design experiments to solve problems.

Lesson 1.1 Investigating the Scene

The goal of this lesson is to lay the foundation for the course and introduce students to the use of laboratory and career journals and Inspiration® software. Students also learn how to set up an experiment and how to properly document sources. The lesson opens with the mysterious death of Anna Garcia. Students play the role of crime scene investigators to examine key information gathered from interviews of friends, family members, and people of interest. In addition, students examine the scene for clues. Next they play the role of forensic scientists to analyze each piece of evidence collected from the crime scene, including hair, fingerprints, blood, and shoeprints in order to determine what happened at Anna's house and to identify potential suspects. Students will learn how to design an experiment while determining how ambient temperature affects the cooling rate of a dead body. Finally, they will design and perform an experiment to investigate how height affects bloodstain patterns. Students will use the results to identify the height that caused the bloodstain patterns found at Anna's house in order to determine whether she might have been struck standing up or as she was falling.

Lesson 1.2 DNA Analysis

In the last lesson, students processed and analyzed evidence found at Anna Garcia's house at the time of her death, including blood samples found near her body. In this lesson students will explore DNA in order to determine whose blood was found at the scene. Students will begin to explore the relationship between DNA, genes, and chromosomes. They will extract DNA from both plant and animal cells, investigate the structural composition of DNA by building a three-dimensional model of the molecule, explore the methods used to analyze DNA, and then work as a forensic DNA analyst to compare the DNA found at the crime scene with the DNA obtained from each of the suspects.

Lesson 1.3 The Findings

In the previous lessons, students were introduced to the case of the mysterious death of Anna Garcia. They investigated the crime scene, analyzed the evidence, and performed DNA pro ling. In this lesson students will investigate autopsy procedures and will be given the rst piece of Anna's autopsy report. They will put together all of the evidence collected and analyzed regarding Anna's mysterious death throughout the unit in order to draw conclusions and create a report detailing the suspected manner of death (natural, accidental, or homicide). They will learn how to properly cite sources and investigate the role that different biomedical professionals played in Anna's mysterious death investigation. Finally, students will discuss the bioethics of scientific research and explore the bounds of HIPAA legislation.

Science Standards & Practices	English & Language Arts Standards	Mathematics Standards
NJSLS - Science Standards NJSLS-S - LS1.A - From Molecules to Organisms: Structures and Processes - Structure and Function -	**NJSLS for ELA** NJSLSA.R.1 - Reading - Read closely to determine what the text says explicitly and to make logical inferences from it;	**NJSLS for Mathematics** NJSLS N.Q .1 - Quantities - Use units as a way to understand problems and to guide the solution of multistep

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) **Science & Engineering Practice** - Science and Engineering Practice - Asking questions and defining problems Ask questions - that arise from careful observation of phenomena, or unexpected results, to clarify and/or seek additional information. - that arise from examining models or a theory, to clarify and/or seek additional information and relationships. - to determine relationships, including quantitative relationships, between independent and dependent variables. - to clarify and refine a model, an explanation, or an engineering problem. Science and Engineering Practice - Asking questions and defining problems - Evaluate a question to determine if it is testable and relevant. Science and Engineering Practice - Asking questions and defining problems - Ask questions that can be investigated within the scope of the school laboratory, research facilities, or field (e.g., outdoor environment) with available resources and, when appropriate, frame a hypothesis based on a model or theory. Science and Engineering Practice - Developing and Using Models - Develop and/or use a model (including mathematical and computational) to generate data to support explanations, predict phenomena, analyze systems, and/or solve problems. Science and Engineering Practice - Planning and Carrying Out Investigations - Plan an investigation or test a design individually and collaboratively to produce data to serve as the basis for evidence as part of building and revising models, supporting explanations for phenomena, or testing solutions to problems. Consider possible confounding variables or effects and evaluate the investigation's design to ensure variables are controlled. Science and Engineering Practice - Planning and Carrying Out Investigations - Plan and conduct an investigation individually and collaboratively to produce data to serve as	cite specific textual evidence when writing or speaking to support conclusions drawn from the text. NJSLSA.R.7 - Reading - Integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, as well as in words. NJSLSA.R.10 - Reading - Read and comprehend complex literary and informational texts independently and proficiently with scaffolding as needed. NJSLSA.W.1 – Writing - Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence. NJSLSA.W.2 - Writing - Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content. NJSLSA.W.4 - Writing - Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. NJSLSA.W.5 - Writing - Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach. NJSLSA.W.6 - Writing - Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others. NJSLSA.W.8 - Writing - Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism. NJSLSA.W.9 - Writing - Draw evidence from literary or informational texts to support analysis, reflection, and research. NJSLSA.W.10 - Writing - Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.	problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. NJSLS A.SSE.1 - Seeing Structure in Expressions Interpret expressions that represent a quantity in terms of its context. NJSLS A.CED.1 - Creating Equations - Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions. NJSLS A.REI.3 - Reasoning with Equations and Inequalities - Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. NJSLS A.REI.10 - Reasoning with Equations and Inequalities - Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line). NJSLS S.IC.6 - Making Inferences and Justifying Conclusions Evaluate reports based on data.

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. Science and Engineering Practice - Planning and Carrying Out Investigations - Plan and conduct an investigation or test a design solution in a safe and ethical manner including considerations of environmental, social, and personal impacts. Science and Engineering Practice - Planning and Carrying Out Investigations - Select appropriate tools to collect, record, analyze, and evaluate data. Make directional hypotheses that specify what happens to a dependent variable when an independent variable is manipulated. Science and Engineering Practice - Analyzing and Interpreting Data - Analyze data using tools, technologies, and/or models (e.g., computational, mathematical) in order to make valid and reliable scientific claims or determine an optimal design solution. Science and Engineering Practice - Constructing Explanations and Designing Solutions - Make a quantitative and/or qualitative claim regarding the relationship between dependent and independent variables. Science and Engineering Practice - Constructing Explanations and Designing Solutions - Construct and revise an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. Science and Engineering Practice - Constructing Explanations and Designing Solutions - Apply scientific ideas, principles, and/or evidence to provide an explanation of phenomena and solve design problems, taking into account possible unanticipated effects.	NJSLSA.SL.1 - Speaking and Listening - Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with peers on *grades 9–10 topics, texts, and issues,* building on others' ideas and expressing their own clearly and persuasively. Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas. Collaborate with peers to set rules for discussions (e.g. informal consensus, taking votes on key issues, presentation of alternate views); develop clear goals and assessment criteria (e.g. student developed rubric) and assign individual roles as needed. Propel conversations by posing and responding to questions that relate the current discussion to broader themes or larger ideas; actively incorporate others into the discussion; and clarify, verify, or challenge ideas and conclusions. Respond thoughtfully to various perspectives, summarize points of agreement and disagreement, and justify own views. Make new connections in light of the evidence and reasoning presented. NJSLSA.SL.2 - Speaking and Listening - Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, qualitatively, orally) evaluating the credibility and accuracy of each source. NJSLSA.SL.4 - Speaking and Listening - Present information, findings, and supporting evidence clearly, concisely, and logically. The content, organization, development, and style are appropriate to task, purpose, and audience. NJSLSA.SL.5 - Speaking and Listening Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to	

Science and Engineering Practice - Constructing Explanations and Designing Solutions - Apply scientific reasoning, theory, and/or models to link evidence to the claims to assess the extent to which the reasoning and data support the explanation or conclusion. Science and Engineering Practice - Engaging in Argument from Evidence - Construct, use, and/or present an oral and written argument or counterarguments based on data and evidence.	enhance findings, reasoning, and evidence and to add interest. NJSLSA.L.1 - Language - Demonstrate command of the conventions of standard English grammar and usage when writing or speaking. Use parallel structure. Use various types of phrases (noun, verb, adjectival, adverbial, participial, prepositional, absolute) and clauses (independent, dependent; noun, relative, adverbial) to convey specific meanings and add variety and interest to writing or presentations. NJSLSA.L.2 - Language - Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing. Use a semicolon (and perhaps a conjunctive adverb) to link two or more closely related independent clauses. Use a colon to introduce a list or quotation. Spell correctly. NJSLSA.L.4 - Language - Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on *grades 9–10 reading and content*, choosing flexibly from a range of strategies. Use context (e.g., the overall meaning of a sentence, paragraph, or text; a word's position or function in a sentence) as a clue to the meaning of a word or phrase. Identify and correctly use patterns of word changes that indicate different meanings or parts of speech (e.g., *analyze, analysis, analytical; advocate, advocacy*). Consult general and specialized reference materials (e.g., dictionaries, glossaries, thesauruses), both print and digital, to find the pronunciation of a word or determine or clarify its precise meaning, its part of speech, or its etymology. Verify the preliminary determination of the meaning of a word or phrase (e.g., by checking the inferred meaning in context or in a dictionary).	

	NJSLSA.L.5 - Language - Demonstrate understanding of figurative language, word relationships, and nuances in word meanings. Interpret figures of speech (e.g., euphemism, oxymoron) in context and analyze their role in the text. Analyze nuances in the meaning of words with similar denotations. NJSLSA.L.6 - Language - Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.	

NJSLS CTE & Career Readiness Practices(s) Addressed in this unit

NJSLS Career & Technical Education Standards – See Addendum

NJSLS CTE 9.3.HL-BRD.4 - Demonstrate the principles of solution preparation, sterile techniques, contamination control, and measurement and calibration of instruments used in biotechnology research.

NJSLS CTE 9.3.ST.2 - Use technology to acquire, manipulate, analyze and report data.

NJSLS CTE 9.3.ST-ET.2 - Display and communicate STEM information.

NJSLS CTE 9.3.ST-ET.3 - Apply processes and concepts for the use of technological tools in STEM.

NJSLS Career Ready Practices – See Addendum

Act as a responsible and contributing citizen and employee.
Apply appropriate academic and technical skills.
Communicate clearly and effectively and with reason.
Consider the environmental, social and economic impacts of decisions.
Demonstrate creativity and innovation.
Employ valid and reliable research strategies.
Utilize critical thinking to make sense of problems and persevere in solving them.
Model integrity, ethical leadership and effective management.
Use technology to enhance productivity.
Work productively in teams while using cultural global competence.

Essential Questions 3-5)

1.The human body is composed of multiple body systems; how do these systems contribute to homeostasis?

2. Each human body system is composed of specific organs that interact to complete specialized functions, explain the physiological function of these organs. 3. What laws and ethical standards are Healthcare professionals bound by to maintain the confidentiality of patients? 4. Why is it important to evaluate a source of information to insure the information is accurate and unbiased in presentations and reports? 5.Determining the cause of death involves the investigation of many aspects of the medical condition of a victim, the internal and external examination of the body, the chemical and microscopic analysis of tissues and body fluids, identify the specialized areas of the biomedical profession.
Anchor Text
Principles of Biomedical Science © 2016 Project Lead The Way, Inc. Provided through Inkling.com
Informational Texts (3-5)
See Inkling.com
Short Texts (1-3)
AMA and Forensic Science Journals
Formative & Summative Assessments
Formative: Kahoot, Plickers, Exit tickets, etc. Summative: PLTW Computer Based Assessments, Project Scoring Rubrics
Resources (websites, Canvas, LMS, Google Classroom, documents, etc.)
Inkling.com, Canvas
Labs
1.1 Investigating the Scene 1.2 DNA Analysis 1.3 The Findings

Suggested Time Frame:	**4 weeks**

Biomedical Sciences Curriculum Unit 2

Content Area:	**Essentials of Biomedical Sciences**	**Grade(s)**	**9**
Unit Plan Title:	**Diabetes**		

Learning Objectives

Lesson 2 Diabetes
The goal of this unit is for students to walk through Anna Garcia's diagnosis of diabetes by completing simulated laboratory tests. Given results of the tests, students can deduce the basic biology of both Type 1 and Type 2 diabetes. Students investigate the connection between insulin and glucose and discuss how feedback systems in the body regulate the function of key hormones. Students investigate the biochemical makeup of food and complete experiments to demonstrate the relationship between energy and food. As students explore diabetes, they are introduced to basic chemistry, the structure and function of macromolecules, and the relationship of these molecules to metabolic function. The causes, symptoms, treatments, and side effects of diabetes are studied as well as the lifestyle implications associated with this disease. Students examine complications related to diabetes and finally brainstorm and develop an innovation to help with the management or treatment of the disease.

Lesson 2.1 What Is Diabetes?
In this lesson, the goal is for students to investigate what it means to have diabetes. Students will explore how doctors make an initial diagnosis of diabetes and characterize the disease. They will complete simulated glucose tolerance testing as well as insulin analysis on three patients, including Anna, and draw conclusions about their disease status based on your findings. By analyzing test results, they will deduce what is happening inside the body when a person has Type 1 or Type 2 diabetes. Students will further investigate the relationship between insulin and glucose and learn how to find credible sources. Students will use the design process to create a 3-D working model demonstrating how insulin works to move glucose into cells. Students will use the model to explain this process to a target audience of newly diagnosed diabetics. Students will then investigate feedback and feedback loops. Using knowledge of the insulin/glucose connection, students will diagram the speci c steps in the body that function to keep blood sugar in balance.

Lesson 2.2 The Science of Food
The goal of this lesson is for students to investigate the science of food and look in detail at the biochemistry of macromolecules. Students will use chemical indicators to test for the presence of sugar, starch, protein, and lipids in three common food items as well as in the stomach contents of the ill-fated Anna Garcia. Students will de ne various terms commonly used on food labels and then analyze food labels to determine the nutritional content of the respective food items. Students will analyze Anna's diet and assess how well she was meeting her nutritional requirements. Students will then complete a series of molecular puzzles to build macromolecules and explore the biochemistry of food. They will begin to see how the body works to harness the power of what we eat through the assembly and disassembly of macromolecules. Students further explore the energy content of various foods by completing calorimetry experiments using Vernier software and a temperature probe. Students will continue to explore how food choices are vital to the health of a diabetic in the next lesson.

Lesson 2.3 Life with Diabetes
The goal of this lesson is for students to explore the personal side of life with diabetes. The lesson begins with students designing a "What to Expect" guide for patients confronted with a new diagnosis. The guide should offer insight into a typical day in the life of a diabetic and should highlight daily routines, restrictions, lifestyle choices and modi cations, as well as tips for coping and acceptance. Students will further examine what happens inside the body of a diabetic as they simulate how the body reacts to varying blood glucose concentrations. Students design an experiment to simulate osmosis in body cells and attempt to match details about diabetic emergencies in Anna Garcia's life with simulated blood serum from the time of these incidents. Students relate the movement of water in model cells to the symptoms that Anna experienced in each emergency situation. Students begin to understand how rapid shifts in blood sugar can have severe consequences. While most of these complications are short term if addressed quickly, there are many long- term consequences of diabetes, especially if the disease is not well-controlled. Students will explore the impact that Type 1 and Type 2 diabetes can have on human body systems and visualize this impact on a graphic organizer. They will read additional information from Anna's autopsy report and analyze findings to brainstorm possible causes of death. Students will then design an innovation that helps diabetics treat, manage, or even cure their disease and present their idea to a panel offering a research grant.

Science Standards & Practices	English & Language Arts Standards	Mathematics Standards
NJSLS - Science Standards NJSLS-S - LS1.A - From Molecules to Organisms: Structures and Processes - Structure and Function - 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) HS.LS1.2 - From Molecules to Organisms: Structures and Processes	**NJSLS for ELA** NJSLSA.R.1 - Reading - Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text. NJSLSA.R.4 - Reading - Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.	**NJSLS for Mathematics** NJSLS N.Q .1 - Quantities Use units as a way to understand problems and to guide the solution of multistep problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. NJSLS N.Q .3 - Quantities Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. DCI - PS3.B - Energy - Conservation of Energy and Energy Transfer The availability of energy limits that can occur in any system. (HS-PS3-1) DCI - LS1.A - From Molecules to Organisms: Structures and Processes - Structure and Function Systems of specialized cells within organisms help them perform the essential functions of life. (HS-LS1-1) DCI - LS1.A - From Molecules to Organisms: Structures and Processes - Structure and Function Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level. (HS-LS1-2) DCI - LS1.A - From Molecules to Organisms: Structures and Processes - 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) **Science & Engineering Practice** - Asking questions and defining problems - Ask questions - that arise from careful observation of phenomena, or unexpected results, to clarify and/or seek additional information. - that arise from examining models or a theory, to clarify and/or seek additional information and relationships. - to determine relationships, including quantitative relationships, between independent and dependent variables. - to clarify and refine a model, an explanation, or an engineering problem. Science and Engineering Practice - Developing and Using Models - Develop and/or use a model (including	NJSLSA.R.7 – Reading - Integrate and evaluate content presented in diverse formats and media, including visually and quantitatively, as well as in words. NJSLSA.R.10 - Reading - Read and comprehend complex literary and informational texts independently and proficiently. NJSLSA.W.1 – Writing - Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence. NJSLSA.W.2 - Writing - Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content. NJSLSA.W.4 - Writing - Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. NJSLSA.W.6 - Writing - Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others. NJSLSA.W.7 - Writing - Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation. NJSLSA.W.8 - Writing - Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism. NJSLSA.W.9 - Writing - Draw evidence from literary or informational texts to support analysis, reflection, and research. NJSLSA.W.10 - Writing - Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences. NJSLSA.SL.1 - Speaking and Listening - Prepare for and participate effectively in a range of conversations and	NJSLS S.ID.1 - Interpreting Categorical and Quantitative Data Represent data with plots on the real number line (dot plots, histograms, and box plots). NJSLS S.IC.6 - Making Inferences and Justifying Conclusions Evaluate reports based on data.

mathematical and computational) to generate data to support explanations, predict phenomena, analyze systems, and/or solve problems. Science and Engineering Practice - Planning and Carrying Out Investigations - Plan an investigation or test a design individually and collaboratively to produce data to serve as the basis for evidence as part of building and revising models, supporting explanations for phenomena, or testing solutions to problems. Consider possible confounding variables or effects and evaluate the investigation's design to ensure variables are controlled. Science and Engineering Practice - Planning and Carrying Out Investigations - Select appropriate tools to collect, record, analyze, and evaluate data. Make directional hypotheses that specify what happens to a dependent variable when an independent variable is manipulated. Science and Engineering Practice - Analyzing and Interpreting Data - Analyze data using tools, technologies, and/or models (e.g., computational, mathematical) in order to make valid and reliable scientific claims or determine an optimal design solution. Science and Engineering Practice - Constructing Explanations and Designing Solutions - Construct and revise an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. Science and Engineering Practice - Constructing Explanations and Designing Solutions - Apply scientific ideas, principles, and/or evidence to provide an explanation of phenomena and solve design problems, taking into account possible unanticipated effects. Science and Engineering Practice - Constructing Explanations and Designing Solutions - Apply scientific reasoning, theory, and/or models to link evidence to the	collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively. NJSLSA.SL.2 - Speaking and Listening - Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally. NJSLSA.SL.4 - Speaking and Listening - Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience. NJSLSA.L.1 - Language - Demonstrate command of the conventions of standard English grammar and usage when writing or speaking. NJSLSA.L.2 - Language - Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing. NJSLSA.L.4 - Language - Determine or clarify the meaning of unknown and multiple-meaning words and phrases by using context clues, analyzing meaningful word parts, and consulting general and specialized reference materials, as appropriate. NJSLSA.L.6 - Language - Acquire and use accurately a range of general academic and domain-specific words and phrases sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.	

claims to assess the extent to which the reasoning and data support the explanation or conclusion. Science and Engineering Practice - Engaging in Argument from Evidence - Construct, use, and/or present an oral and written argument or counterarguments based on data and evidence. Science and Engineering Practice - Engaging in Argument from Evidence - Make and defend a claim based on evidence about the natural world or the effectiveness of a design solution that reflects scientific knowledge and student- generated evidence. Science and Engineering Practice - Obtaining, Evaluating, and Communicating Information - Compare, integrate and evaluate sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a scientific question or solve a problem. Science and Engineering Practice - Obtaining, Evaluating, and Communicating Information - Gather, read, and evaluate scientific and/or technical information from multiple authoritative sources, assessing the evidence and usefulness of each source. Science and Engineering Practice - Obtaining, Evaluating, and Communicating Information - Evaluate the validity and reliability of and/or synthesize multiple claims, methods, and/or designs that appear in scientific and technical texts or media reports, verifying the data when possible. Communicate scientific and/or technical information or ideas (e.g., about phenomena and/or the process of development and the design and performance of a proposed process or system) in multiple formats (i.e., orally, graphically, textually, mathematically). **Crosscutting Concept** - Patterns - Different patterns may be observed at each of the scales at which a system is studied and can provide evidence for causality in explanations of phenomena. Crosscutting Concepts - Cause and Effect: Mechanism and Prediction - Cause and effect relationships can be suggested and predicted for complex natural and human		

designed systems by examining what is known about smaller scale mechanisms within the system. Crosscutting Concept - Cause and Effect: Mechanism and Prediction Changes in systems may have various causes that may not have equal effects. Crosscutting Concept - Scale, Proportion, and Quantity - Algebraic thinking is used to examine scientific data and predict the effect of a change in one variable on another (e.g., linear growth vs. exponential growth). Crosscutting Concept - Systems and System Models - A system is an organized group of related objects or components; models can be used for understanding and predicting the behavior of systems. Crosscutting Concept - 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. Crosscutting Concept - Systems and System Models - Models can be used to predict the behavior of a system, but these predictions have limited precision and reliability due to the assumptions and approximations inherent in models. Crosscutting Concept - Structure and Function - The way an object is shaped or structured determines many of its properties and functions. Crosscutting Concept - Structure and Function - The functions and properties of natural and designed objects and systems can be inferred from their overall structure, the way their components are shaped and used, and the molecular substructures of its various materials. Crosscutting Concepts - Stability and Change - Much of science deals with constructing explanations of how things change and how they remain stable. Crosscutting Concept - Stability and Change - Feedback (negative or positive) can stabilize or destabilize a system.		

NJSLS CTE & Career Readiness Practices(s) Addressed in this unit

NJSLS Career & Technical Education Standards – See Addendum

NJSLS CTE 9.3.HL-BRD.2 Apply the fundamentals of biochemistry, cell biology, genetics, mathematical concepts, microbiology, molecular biology, organic chemistry and statistics to conduct effective biotechnology research and development of products.

NJSLS CTE 9.3.ST.2 - Use technology to acquire, manipulate, analyze and report data.

NJSLS CTE 9.3.ST-ET.2 - Display and communicate STEM information.

NJSLS CTE 9.3.ST-ET.3 - Apply processes and concepts for the use of technological tools in STEM.

NJSLS Career Ready Practices – See Addendum

Act as a responsible and contributing citizen and employee.
Apply appropriate academic and technical skills.
Attend to personal health and financial well-being.
Communicate clearly and effectively and with reason.
Consider the environmental, social and economic impacts of decisions.
Demonstrate creativity and innovation.
Employ valid and reliable research strategies.
Utilize critical thinking to make sense of problems and persevere in solving them.
Model integrity, ethical leadership and effective management.
Plan education and career path aligned to personal goals.
Use technology to enhance productivity.
Work productively in teams while using cultural global competence.

Essential Questions (3-5)

1. Why are food labels a useful way to determine which nutrients and what percentages of their daily values are present in a food?
2. What is the importance of understanding foods at the molecular and macromolecular level and the importance of atoms that make up these molecules?
3. Why is it important to identify the chemical bonds formed between atoms which are sources of energy, and the energy that is released when the bonds are broken?
4. Is Homeostasis dependent upon chemical reactions? Explain?
5. Why is water an essential component of human body?
6. What are its unique properties that allow it to dissolve molecules and compounds?

Anchor Text

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Informational Texts (3-5)

See Inkling.com

Short Texts (1-3)

AMA and Forensic Science Journals
Formative & Summative Assessments
Formative: Kahoot, Plickers, Exit tickets, etc. Summative: PLTW Computer Based Assessments, Project Scoring Rubrics
Resources (websites, Canvas, LMS, Google Classroom, documents, etc.)
Inkling.com, Canvas
Labs
2.1 What is Diabetes? 2.2 The Science of Food 2.3 Life with Diabetes

Suggested Time Frame:	**4 weeks**

Biomedical Sciences Curriculum Unit 3

Content Area:	**Essentials of Biomedical Sciences**	**Grade(s)**	**9**
Unit Plan Title:	**Sickle Cell Disease**		

Learning Objectives

Lesson 3 Sickle Cell Disease

The goal of this unit is for students to learn basic concepts of genetics and inheritance as they explore Anna Garcia's struggle with sickle cell disease. Students examine sickled red blood cells under a microscope and learn what life is like with the disease by reading and writing patient diary entries. They simulate the process of protein synthesis, examine the assembly of the protein hemoglobin, and demonstrate how sickle cell disease results from a mutation that alters a protein product. Students examine the structure of chromosomes and show how traits are passed through generations on the chromosomes in our cells.

from a mutation that alters a protein product. Students examine the structure of chromosomes and show how traits are passed through generations on the chromosomes in our cells.

Lesson 3.1 The Disease

The goal of this lesson is to introduce the students to what it means to have sickle cell disease. Students will learn about the components and function of blood in order to better understand how sickle cell disease affects the body. They will examine Anna Garcia's blood with a microscope and complete a simulated hematocrit in order to determine whether Anna's sickle cell disease was causing her other related health problems. They will learn about what it is like for a person dealing with this serious disease by reading her diary entries. Finally, they will write diary entries for a fictitious sickle cell patient. The entries will detail how the patient is feeling, describe the treatment being given, and include a narrative of all of the biomedical professionals the patient encounters during their treatment journey.

Lesson 3.2 It's in the Genes

The goal of this lesson is for students to investigate how DNA codes for proteins and how mutations can lead to diseases such as sickle cell anemia. Students will explore how the body uses DNA to produce proteins. They will apply their knowledge of protein synthesis to decode a secret message, investigate the e ects that various mutations have on protein production, and look specifically at the genetic mutation that causes sickle cell disease. Students will use computer simulations to visualize the interactions between amino acids and how these relate to protein structure. They will recognize how changes in the b-globin protein are due to the mutation associated with sickle cell disease.

Lesson 3.3 Chromosomes

The goal of this lesson is for students to further explore the relationship between DNA, genes, and chromosomes. Students will investigate the role that chromosomes play in transferring genetic material from cell to cell as well as from generation to generation. Students will also explore how the genes encoding dominant and recessive traits are passed through the generations via our chromosomes.

Lesson 3.4 Inheritance The goal of this lesson is for students to further study how inherited diseases are passed from parent to child, with a focus on sickle cell disease. They will analyze the gel electrophoresis results obtained from the Restriction Fragment Length Polymorphisms (RFLPs) of Anna Garcia's family members to create a family pedigree. Next they will calculate the theoretical probability of a child inheriting sickle cell disease using Punnett squares and compare the results to experimental results. Finally, they will put it all together to analyze pedigrees. As an optional extension activity, students will simulate the effects of a high frequency of malaria on the allele frequencies of a population.

Science Standards & Practices	English & Language Arts Standards	Mathematics Standards
NJSLS - Science Standards NJSLS-S - HS.LS1.2 - From Molecules to Organisms: Structures and Processes - Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. NJSLS-S - DCI - LS1.A - From Molecules to Organisms: Structures and Processes - Structure and Function - Systems of specialized cells within organisms help them perform the essential functions of life. (HS-LS1-1) NJSLS-S - DCI - LS1.A - From Molecules to Organisms: Structures and Processes - Structure and Function - 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) **Science and Engineering Practice -** Asking questions and defining problems Ask questions - that arise from careful observation of phenomena, or unexpected results, to clarify and/or seek additional information. - that arise from examining models or a theory, to clarify and/or seek additional information and relationships. - to determine relationships, including quantitative relationships, between independent and dependent variables. - to clarify and refine a model, an explanation, or an engineering problem. Science and Engineering Practice - Developing and Using Models - Develop and/or use a model (including mathematical and computational) to generate data to	**NJSLS for ELA** NJSLSA.R.1 - Reading - Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text. NJSLSA.R.4 - Reading - Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone. NJSLSA.R.6 – Reading - Assess how point of view or purpose shapes the content and style of a text. NJSLSA.R.7 - Reading - Integrate and evaluate content presented in diverse formats and media, including visually and quantitatively, as well as in words. NJSLSA.R.10 - Reading - Read and comprehend complex literary and informational texts independently and proficiently. NJSLSA.W.1 – Writing - Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence. NJSLSA.W.2 - Writing - Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.	**NJSLS for Mathematics** NJSLS A.SSE.1 - Seeing Structure in Expressions Interpret expressions that represent a quantity in terms of its context. NJSLS S.IC.6 - Making Inferences and Justifying Conclusions Evaluate reports based on data.

support explanations, predict phenomena, analyze systems, and/or solve problems. Science and Engineering Practice - Planning and Carrying Out Investigations - Select appropriate tools to collect, record, analyze, and evaluate data. Make directional hypotheses that specify what happens to a dependent variable when an independent variable is manipulated. Science and Engineering Practice - Analyzing and Interpreting Data - Analyze data using tools, technologies, and/or models (e.g., computational, mathematical) in order to make valid and reliable scientific claims or determine an optimal design solution. Science and Engineering Practice - Using Mathematics and Computational Thinking - Apply ratios, rates, percentages, and unit conversions in the context of complicated measurement problems involving quantities with derived or compound units (such as mg/mL, kg/m3 , acre-feet, etc.) Science and Engineering Practice - Constructing Explanations and Designing Solutions - Construct and revise an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. Science and Engineering Practice - Constructing Explanations and Designing Solutions - Apply scientific ideas, principles, and/or evidence to provide an explanation of phenomena and solve design problems, taking into account possible unanticipated effects. Science and Engineering Practice - Constructing Explanations and Designing Solutions - Apply scientific reasoning, theory, and/or models to link evidence to the claims to assess the extent to which the reasoning and data support the explanation or conclusion. Science and Engineering Practice - Engaging in Argument from Evidence - Construct, use, and/or present an oral and	NJSLSA.W.3 - Writing - Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details, and well-structured event sequences. NJSLSA.W.4 - Writing - Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. NJSLSA.W.5 - Writing - Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach. NJSLSA.W.6 - Writing - Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others. NJSLSA.W.7 - Writing - Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation. NJSLSA.W.8 - Writing - Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism. NJSLSA.W.9 - Writing - Draw evidence from literary or informational texts to support analysis, reflection, and research. NJSLSA.W.10 - Writing - Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences. NJSLSA.SL.1 - Speaking and Listening - Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively. NJSLSA.SL.2 - Speaking and Listening - Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally.	

written argument or counterarguments based on data and evidence. Science and Engineering Practice - Engaging in Argument from Evidence - Make and defend a claim based on evidence about the natural world or the effectiveness of a design solution that reflects scientific knowledge and student- generated evidence. Science and Engineering Practice - Obtaining, Evaluating, and Communicating Information - Compare, integrate and evaluate sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a scientific question or solve a problem. Science and Engineering Practice - Obtaining, Evaluating, and Communicating Information - Gather, read, and evaluate scientific and/or technical information from multiple authoritative sources, assessing the evidence and usefulness of each source. Science and Engineering Practice - Obtaining, Evaluating, and Communicating Information - Evaluate the validity and reliability of and/or synthesize multiple claims, methods, and/or designs that appear in scientific and technical texts or media reports, verifying the data when possible. Communicate scientific and/or technical information or ideas (e.g., about phenomena and/or the process of development and the design and performance of a proposed process or system) in multiple formats (i.e., orally, graphically, textually, mathematically). **Crosscutting Concepts -** Patterns - Different patterns may be observed at each of the scales at which a system is studied and can provide evidence for causality in explanations of phenomena. Crosscutting Concepts - Cause and Effect: Mechanism and Prediction - Cause and effect relationships can be suggested and predicted for complex natural and human designed systems by examining what is known about smaller scale mechanisms within the system.	NJSLSA.SL.3 - Speaking and Listening - Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric. NJSLSA.L.1 - Language - Demonstrate command of the conventions of standard English grammar and usage when writing or speaking. NJSLSA.L.2 - Language - Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing. NJSLSA.L.4 - Language - Determine or clarify the meaning of unknown and multiple-meaning words and phrases by using context clues, analyzing meaningful word parts, and consulting general and specialized reference materials, as appropriate. NJSLSA.L.6 - Language - Acquire and use accurately a range of general academic and domain-specific words and phrases sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.	

Crosscutting Concepts - Cause and Effect: Mechanism and Prediction Changes in systems may have various causes that may not have equal effects. Crosscutting Concepts - Scale, Proportion, and Quantity - Algebraic thinking is used to examine scientific data and predict the effect of a change in one variable on another (e.g., linear growth vs. exponential growth). Crosscutting Concepts - Systems and System Models - A system is an organized group of related objects or components; models can be used for understanding and predicting the behavior of systems. Crosscutting Concepts - Structure and Function - The way an object is shaped or structured determines many of its properties and functions. Crosscutting Concepts - Structure and Function - The functions and properties of natural and designed objects and systems can be inferred from their overall structure, the way their components are shaped and used, and the molecular substructures of its various materials. Crosscutting Concepts - Stability and Change - Much of science deals with constructing explanations of how things change and how they remain stable.		

NJSLS CTE & Career Readiness Practices(s) Addressed in this unit

NJSLS Career & Technical Education Standards – See Addendum

NJSLS CTE 9.3.HL-BRD.3 Demonstrate basic knowledge of recombinant DNA, genetic engineering, bioprocessing, monoclonal antibody production, nanotechnology, bioinformatics, genomics, proteomics and transcriptomics to conduct biotechnology research and development.

NJSLS CTE 9.3.HL-BRD.6 Summarize and explain the larger ethical, moral and legal issues related to biotechnology research, product development and use in society.

NJSLS CTE 9.3.ST-ET.2 - Display and communicate STEM information.

NJSLS CTE 9.3.ST-ET.3 - Apply processes and concepts for the use of technological tools in STEM.

NJSLS CTE 9.3.ST.2 - Use technology to acquire, manipulate, analyze and report data.

NJSLS CTE 9.3.ST.4 Understand the nature and scope of the Science, Technology, Engineering & Mathematics Career Cluster and the role of STEM in society and the economy.

NJSLS Career Ready Practices – See Addendum

Act as a responsible and contributing citizen and employee.
Apply appropriate academic and technical skills.
Communicate clearly and effectively and with reason.
Consider the environmental, social and economic impacts of decisions.
Demonstrate creativity and innovation.
Employ valid and reliable research strategies.
Utilize critical thinking to make sense of problems and persevere in solving them.
Model integrity, ethical leadership and effective management.
Use technology to enhance productivity.
Work productively in teams while using cultural global competence.

Essential Questions (3-5)

1. How does karyotyping detect chromosomal abnormalities which cause multiple, often morbid complications?
2. What can the change a single amino acid in a protein do to the properties of that protein and its 3-dimensional shape?
3. How does the sequences of the nucleotides effect DNA from all living organisms?
4. How does the hemoglobin protein in red blood cells effect the transport of oxygen to the cells allowing them to function properly?
5. Can the incidence of a particular disease vary between different countries?

Anchor Text

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Informational Texts (3-5)

See Inkling.com

Short Texts (1-3)

AMA and Forensic Science Journals

Formative & Summative Assessments

Formative: Kahoot, Plickers, Exit tickets, etc.
Summative: PLTW Computer Based Assessments, Project Scoring Rubrics

Resources (websites, Canvas, LMS, Google Classroom, documents, etc.)

Inkling.com, Canvas

Labs

3.1 The Disease
3.2 It's in the Genes
3.3 Karyotyping for Chromosomal Abnormalities
3.4 Inheritance

Suggested Time Frame:	4 weeks

PASSAIC COUNTY TECHNICAL INSTITUTE
STEM Academy
45 Reinhardt Road
Wayne, NJ

Biomedical Sciences Curriculum Unit 4

Content Area:	**Essentials of Biomedical Sciences**	**Grade(s)**	**9**
Unit Plan Title:	**Heart Disease**		

Learning Objectives

Lesson 4 Heart Disease
The goal of this unit is for students to examine the normal function of the human heart and investigate malfunctions in the cardiovascular system that can lead to heart disease. Students complete a dissection to tour heart anatomy and study heart function using probes and data acquisition software. They collect and analyze heart data, including heart rate, blood pressure, and EKG readings and analyze cardiac test results of Anna Garcia. Students explore the role cholesterol plays in the body. Students further their knowledge of molecular biology as they run gel electrophoresis and complete RFLP analysis to diagnose familial hypercholesterolemia. Students design models to simulate the function of a pump and design visuals to show interventions for blocked coronary vessels.

Lesson 4.1 Heart Structure
The goal of this lesson is for students to explore the structure and organization of the heart. In the first activity of the lesson, students will investigate the basic structure of the heart and identify the major blood vessels that bring blood in and out of the heart's main chambers. They will create a graphic organizer to help them remember the basic blood ow pattern to and from the heart and lungs. The diagrams they draw in this activity will help them identify the actual structures of the heart when they dissect a four-chambered sheep's heart in the next activity. Students will observe key structures and discuss how structure relates to function. They will also use a microscope to observe the structure of arteries and veins. At the conclusion of the lesson, students will review Anna's autopsy report and begin to postulate how problems in the cardiovascular system may have contributed to her death.

Lesson 4.2 The Heart at Work
The goal of this lesson is for students to learn how the hearts works in order to understand how and why heart disease occurs. Students learn that because of a few episodes of chest pain, Anna Garcia was sent for a full cardiac workup. Students will learn about the tests used to monitor heart function and use data acquisition software and probes to study heart rate, blood pressure, and electrical activity of the heart. Students will design and conduct experiments on variables affecting heart rate and blood pressure and document their work in a formal laboratory report. At the conclusion of the lesson, students will analyze Anna's cardiac workup and investigate how the function (or dysfunction) of her heart may have played a role in her death

Lesson 4.3 Heart Dysfunction
The goal of this lesson is for students to explore what happens inside the body when the heart is unable to function properly. Students will investigate the function of cholesterol in the body and research how this lipid can impact health. They will present the information they learn about cholesterol, LDL, and HDL. They will analyze Anna Garcia's cholesterol test results and make recommendations about her cardiac care. Students will then use DNA electrophoresis to separate and analyze DNA fragments to determine if Anna and members of her family have familial hypercholesterolemia. In the final problem of the lesson, students will explore the human heart as a pump and investigate what happens to overall health when factors such as cholesterol plaque impede ow. Students will design and build a simple pump to simulate the heart on the most basic level. Finally, students will design an experiment to simulate the e ects of decreased vessel diameter on blood ow rate.

Lesson 4.4 Heart Intervention
The goal of this lesson is for students to explore what happens to the body when blood vessels fail to deliver oxygen to the tissues. Students will investigate medical procedures used to treat blocked blood vessels and prevent events such as heart attack and stroke and build a model to demonstrate one of these techniques. Students will return to both Anna's medical history documents as well as her autopsy report and brainstorm how issues of the heart may have played a role in Anna's final demise. In the final project of the lesson, students will assess risk of heart disease. They will use an online risk calculator to explore factors that increase or decrease the risk of heart attack or associated coronary disease. They will calculate risk for both Anna Garcia and a patient they have been assigned. As they design a heart disease intervention plan for their assigned patient, students will think about all they have learned in this unit and how lifestyle and the choices we make impact overall health.

Science Standards & Practices	English & Language Arts Standards	Mathematics Standards

NJSLS - Science Standards	NJSLS for ELA	NJSLS for Mathematics
NJSLS-S - HS.LS1.2 - From Molecules to Organisms: Structures and Processes - Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. NJSLS-S DCI - LS1.A - From Molecules to Organisms: Structures and Processes - Structure and Function - Systems of specialized cells within organisms help them perform the essential functions of life. (HS-LS1-1) NJSLS-S DCI - LS1.A - From Molecules to Organisms: Structures and Processes - Structure and Function - 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) **Science & Engineering Practice** - Asking questions and defining problems Ask questions - that arise from careful observation of phenomena, or unexpected results, to clarify and/or seek additional information. - that arise from examining models or a theory, to clarify and/or seek additional information and relationships. - to determine relationships, including quantitative relationships, between independent and dependent variables. - to clarify and refine a model, an explanation, or an engineering problem. Science and Engineering Practice - Developing and Using Models - Develop and/or use a model (including mathematical and computational) to generate data to support explanations, predict phenomena, analyze systems, and/or solve problems. Science and Engineering Practice - Constructing Explanations and Designing Solutions - Construct and revise an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.	NJSLSA.R.1 - Reading - Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text. NJSLSA.R.4 - Reading - Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone. NJSLSA.R.7 - Reading - Integrate and evaluate content presented in diverse formats and media, including visually and quantitatively, as well as in words. NJSLSA.R.10 - Reading - Read and comprehend complex literary and informational texts independently and proficiently. NJSLSA.W.2 - Writing - Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content. NJSLSA.W.4 - Writing - Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. NJSLSA.W.6 - Writing - Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others. NJSLSA.W.8 - Writing - Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism. NJSLSA.W.10 - Writing - Write routinely over extended time frames (time for research, reflection, and revision) and	NJSLS S.IC.6 - Making Inferences and Justifying Conclusions - Evaluate reports based on data.

Science and Engineering Practice - Constructing Explanations and Designing Solutions - Apply scientific ideas, principles, and/or evidence to provide an explanation of phenomena and solve design problems, taking into account possible unanticipated effects. Science and Engineering Practice - Constructing Explanations and Designing Solutions - Apply scientific reasoning, theory, and/or models to link evidence to the claims to assess the extent to which the reasoning and data support the explanation or conclusion. Science and Engineering Practice - Engaging in Argument from Evidence - Construct, use, and/or present an oral and written argument or counterarguments based on data and evidence. Science and Engineering Practice - Engaging in Argument from Evidence - Make and defend a claim based on evidence about the natural world or the effectiveness of a design solution that reflects scientific knowledge and student- generated evidence. Science and Engineering Practice - Obtaining, Evaluating, and Communicating Information - Compare, integrate and evaluate sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a scientific question or solve a problem. Science and Engineering Practice - Obtaining, Evaluating, and Communicating Information - Gather, read, and evaluate scientific and/or technical information from multiple authoritative sources, assessing the evidence and usefulness of each source. Science and Engineering Practice - Obtaining, Evaluating, and Communicating Information - Evaluate the validity and reliability of and/or synthesize multiple claims, methods, and/or designs that appear in scientific and technical texts or media reports, verifying the data when possible. Communicate scientific and/or technical information or ideas (e.g., about phenomena and/or the process of development and the design and performance of a proposed process or	shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences. NJSLSA.SL.1 - Speaking and Listening - Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively. NJSLSA.SL.2 - Speaking and Listening - Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally. NJSLSA.L.1 - Language - Demonstrate command of the conventions of standard English grammar and usage when writing or speaking. NJSLSA.L.2 - Language - Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing. NJSLSA.L.4 - Language - Determine or clarify the meaning of unknown and multiple-meaning words and phrases by using context clues, analyzing meaningful word parts, and consulting general and specialized reference materials, as appropriate. NJSLSA.L.6 - Language - Acquire and use accurately a range of general academic and domain-specific words and phrases sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.	

system) in multiple formats (i.e., orally, graphically, textually, mathematically). **Crosscutting Concepts** - Patterns - Different patterns may be observed at each of the scales at which a system is studied and can provide evidence for causality in explanations of phenomena. Crosscutting Concepts - Cause and Effect: Mechanism and Prediction - Cause and effect relationships can be suggested and predicted for complex natural and human designed systems by examining what is known about smaller scale mechanisms within the system. Crosscutting Concepts - Cause and Effect: Mechanism and Prediction Changes in systems may have various causes that may not have equal effects. Crosscutting Concepts - Systems and System Models - A system is an organized group of related objects or components; models can be used for understanding and predicting the behavior of systems. Crosscutting Concepts - Systems and System Models - Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions—including energy, matter, and information flows— within and between systems at different scales. Crosscutting Concepts - Systems and System Models - Models can be used to predict the behavior of a system, but these predictions have limited precision and reliability due to the assumptions and approximations inherent in models. Crosscutting Concepts - Structure and Function - The way an object is shaped or structured determines many of its properties and functions. Crosscutting Concepts - Structure and Function - The functions and properties of natural and designed objects and systems can be inferred from their overall structure, the way their components are shaped and used, and the molecular substructures of its various materials.		

Crosscutting Concepts - Stability and Change - Much of science deals with constructing explanations of how things change and how they remain stable.		

NJSLS CTE & Career Readiness Practices(s) Addressed in this unit

NJSLS Career & Technical Education Standards – See Addendum

NJSLS CTE 9.3.HL-BRD.4 - Demonstrate the principles of solution preparation, sterile techniques, contamination control, and measurement and calibration of instruments used in biotechnology research.

NJSLS CTE 9.3.HL-BRD.2 Apply the fundamentals of biochemistry, cell biology, genetics, mathematical concepts, microbiology, molecular biology, organic chemistry and statistics to conduct effective biotechnology research and development of products.

NJSLS CTE 9.3.HL-BRD.3 Demonstrate basic knowledge of recombinant DNA, genetic engineering, bioprocessing, monoclonal antibody production, nanotechnology, bioinformatics, genomics, proteomics and transcriptomics to conduct biotechnology research and development.

NJSLS CTE 9.3.ST.2 - Use technology to acquire, manipulate, analyze and report data.

NJSLS CTE 9.3.ST-ET.2 - Display and communicate STEM information.

NJSLS Career Ready Practices – See Addendum

Apply appropriate academic and technical skills.
Communicate clearly and effectively and with reason.
Consider the environmental, social and economic impacts of decisions.
Employ valid and reliable research strategies.
Utilize critical thinking to make sense of problems and persevere in solving them.
Plan education and career path aligned to personal goals.
Model integrity, ethical leadership and effective management.
Use technology to enhance productivity.
Work productively in teams while using cultural global competence.

Essential Questions (3-5)

1. What are types of fat or lipid molecules, their physical properties and functions in the body?
2. How does the type of bond between the carbon atoms in a fatty acid determine whether it is saturated or unsaturated with hydrogen atoms?
3. Is cholesterol necessary for the proper functioning of cells and for maintaining a healthy body?
4. How does high density lipoprotein (HDL) and low density lipoprotein (LDL) presence in the body indicate a person's risk for heart disease?
5. What sources can DNA be amplified and analyzed from in the body?
6. How does Restriction Fragment Length Polymorphism allow for genetic disease and disorders to be diagnosed?

Anchor Text

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Provided through Inkling.com
Informational Texts (3-5)
See Inkling.com
Short Texts (1-3)
AMA and Forensic Science Journals
Formative & Summative Assessments
Formative: Kahoot, Plickers, Exit tickets, etc. Summative: PLTW Computer Based Assessments, Project Scoring Rubrics
Resources (websites, Canvas, LMS, Google Classroom, documents, etc.)
Inkling.com, Canvas
Labs
4.1 Heart Structure 4.2 The Heart at Work 4.3 Heart Dysfunction 4.4 Heart Intervention

Suggested Time Frame:	**4 weeks**

Biomedical Sciences Curriculum Unit 5

Content Area:	**Essentials of Biomedical Sciences**	**Grade(s)**	**9**
Unit Plan Title:	**Infectious Disease**		

Learning Objectives

Lesson 5 Infectious Disease

The goal of this unit is to introduce students to microbiology and infection. Students follow the spread of a simulated epidemic in order to conduct a thorough examination of the agents of disease. Students use clues from their investigation of Anna Garcia's medical history to deduce that she was suffering from a bacterial infection. Through a series of laboratory investigations, students learn the fundamentals of aseptic technique, complete visual identification of bacterial morphology, use the Gram stain to examine bacterial cell structure, and analyze the results of metabolic tests to pinpoint the particular bacterium at the heart of the illness. Students explain the functioning of the human immune system in a visual project and explore how this system is designed to protect against invaders.

Lesson 5.1 Infection

The goal of this lesson is for students to play the role of medical detectives in order to investigate Anna's mystery infection. Ultimately, they will need to identify the exact pathogen responsible for Anna's illness. Students will demonstrate the transmission of an unknown infectious agent from person to person and use deductive reasoning to determine "patient zero." They will investigate a variety of diseases caused by infectious agents and use this information to determine the tests needed to fill in missing pieces from Anna's medical history. They will use aseptic technique to isolate bacterial colonies from four samples and then complete a gross examination of the colonies from Anna's sample. They will create bacterial smears on microscope slides and perform a Gram stain on three types of bacteria, including the bacteria isolated from Anna's sample. They will look at the stained samples under the microscope, identify the morphology of the bacteria, and determine whether the bacteria are Gram positive or Gram negative. They will use biochemical test results and bacteria identification flowcharts to identify the unknown bacterial species infecting Anna. Finally, students will design a board game or a children's book that showcases how the immune system works to fight infection.

Science Standards & Practices	English & Language Arts Standards	Mathematics Standards
NJSLS - Science Standards NJSLS-S - HS.LS1.2 - From Molecules to Organisms: Structures and Processes - Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. NJSLS-S DCI - LS1.A - From Molecules to Organisms: Structures and Processes - Structure and Function - Systems of specialized cells within organisms help them perform the essential functions of life. (HS-LS1-1) NJSLS-S DCI - LS1.A - From Molecules to Organisms: Structures and Processes - Structure and Function – 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) **Science & Engineering Practice** - Asking questions and defining problems Ask questions - that arise from careful observation of phenomena, or unexpected results, to clarify	**NJSLS for ELA** NJSLSA.R.1 - Reading - Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text. NJSLSA.R.4 - Reading - Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone. NJSLSA.R.7 - Reading - Integrate and evaluate content presented in diverse formats and media, including visually and quantitatively, as well as in words. NJSLSA.R.10 - Reading - Read and comprehend complex literary and informational texts independently and proficiently.	**NJSLS for Mathematics** NJSLS S.IC.6 - Making Inferences and Justifying Conclusions- Evaluate reports based on data.

and/or seek additional information. - that arise from examining models or a theory, to clarify and/or seek additional information and relationships. - to determine relationships, including quantitative relationships, between independent and dependent variables. - to clarify and refine a model, an explanation, or an engineering problem. Science and Engineering Practice - Developing and Using Models - Develop a complex model that allows for manipulation and testing of a proposed process or system. Science and Engineering Practice - Developing and Using Models - Develop and/or use a model (including mathematical and computational) to generate data to support explanations, predict phenomena, analyze systems, and/or solve problems. Science and Engineering Practice - Planning and Carrying Out Investigations - Select appropriate tools to collect, record, analyze, and evaluate data. Make directional hypotheses that specify what happens to a dependent variable when an independent variable is manipulated. Science and Engineering Practice - Analyzing and Interpreting Data - Analyze data using tools, technologies, and/or models (e.g., computational, mathematical) in order to make valid and reliable scientific claims or determine an optimal design solution. Science and Engineering Practice - Constructing Explanations and Designing Solutions - Construct and revise an explanation based on valid and reliable evidence obtained through a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that	NJSLSA.W.1 - Writing - Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence. NJSLSA.W.2 - Writing - Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content. NJSLSA.W.4 - Writing - Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. NJSLSA.W.6 - Writing - Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others. NJSLSA.W.8 - Writing - Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism. NJSLSA.W.10 - Writing - Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences. NJSLSA.SL.1 - Speaking and Listening - Prepare for and participate effectively in a range of conversations and	

describe the natural world operate today as they did in the past and will continue to do so in the future. Science and Engineering Practice - Constructing Explanations and Designing Solutions - Apply scientific ideas, principles, and/or evidence to provide an explanation of phenomena and solve design problems, taking into account possible unanticipated effects. Science and Engineering Practice - Constructing Explanations and Designing Solutions - Apply scientific reasoning, theory, and/or models to link evidence to the claims to assess the extent to which the reasoning and data support the explanation or conclusion. Science and Engineering Practice - Engaging in Argument from Evidence - Construct, use, and/or present an oral and written argument or counterarguments based on data and evidence. Science and Engineering Practice - Engaging in Argument from Evidence - Make and defend a claim based on evidence about the natural world or the effectiveness of a design solution that reflects scientific knowledge and student- generated evidence. Science and Engineering Practice - Obtaining, Evaluating, and Communicating Information - Compare, integrate and evaluate sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a scientific question or solve a problem. Science and Engineering Practice - Obtaining, Evaluating, and Communicating Information - Gather, read, and evaluate scientific and/or technical information from multiple	collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively. NJSLSA.SL.2 - Speaking and Listening - Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally. NJSLSA.L.1 - Language - Demonstrate command of the conventions of standard English grammar and usage when writing or speaking. NJSLSA.L.2 - Language - Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing. NJSLSA.L.4 - Language - Determine or clarify the meaning of unknown and multiple-meaning words and phrases by using context clues, analyzing meaningful word parts, and consulting general and specialized reference materials, as appropriate. NJSLSA.L.6 - Language - Acquire and use accurately a range of general academic and domain-specific words and phrases sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.	

authoritative sources, assessing the evidence and usefulness of each source. Science and Engineering Practice - Obtaining, Evaluating, and Communicating Information - Evaluate the validity and reliability of and/or synthesize multiple claims, methods, and/or designs that appear in scientific and technical texts or media reports, verifying the data when possible. Communicate scientific and/or technical information or ideas (e.g., about phenomena and/or the process of development and the design and performance of a proposed process or system) in multiple formats (i.e., orally, graphically, textually, mathematically). **Crosscutting Concepts** - Patterns - Different patterns may be observed at each of the scales at which a system is studied and can provide evidence for causality in explanations of phenomena. Crosscutting Concepts - Cause and Effect: Mechanism and Prediction - Cause and effect relationships can be suggested and predicted for complex natural and human designed systems by examining what is known about smaller scale mechanisms within the system. Crosscutting Concepts - Cause and Effect: Mechanism and Prediction Changes in systems may have various causes that may not have equal effects. Crosscutting Concepts - Systems and System Models - A system is an organized group of related objects or		

components; models can be used for understanding and predicting the behavior of systems. Crosscutting Concepts - Systems and System Models - Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions—including energy, matter, and information flows— within and between systems at different scales. Crosscutting Concepts - Systems and System Models - Models can be used to predict the behavior of a system, but these predictions have limited precision and reliability due to the assumptions and approximations inherent in models. Crosscutting Concepts - Structure and Function - The way an object is shaped or structured determines many of its properties and functions. Crosscutting Concepts - Structure and Function - The functions and properties of natural and designed objects and systems can be inferred from their overall structure, the way their components are shaped and used, and the molecular substructures of its various materials. Crosscutting Concepts - Stability and Change - Much of science deals with constructing explanations of how things change and how they remain stable.		

NJSLS CTE & Career Readiness Practices(s) Addressed in this unit
NJSLS Career & Technical Education Standards – See Addendum

NJSLS CTE 9.3.HL-BRD.4 - Demonstrate the principles of solution preparation, sterile techniques, contamination control, and measurement and calibration of instruments used in biotechnology research.

NJSLS CTE 9.3.HL-BRD.3 Demonstrate basic knowledge of recombinant DNA, genetic engineering, bioprocessing, monoclonal antibody production, nanotechnology, bioinformatics, genomics, proteomics and transcriptomics to conduct biotechnology research and development.

NJSLS CTE 9.3.HL-BRD.4 Demonstrate the principles of solution preparation, sterile techniques, contamination control, and measurement and calibration of instruments used in biotechnology research.

NJSLS CTE 9.3.ST.2 - Use technology to acquire, manipulate, analyze and report data.

NJSLS CTE 9.3.ST-ET.2 - Display and communicate STEM information.

NJSLS CTE 9.3.ST-ET.3 - Apply processes and concepts for the use of technological tools in STEM.

NJSLS Career Ready Practices – See Addendum

Apply appropriate academic and technical skills.

Communicate clearly and effectively and with reason.

Consider the environmental, social and economic impacts of decisions.

Demonstrate creativity and innovation.

Employ valid and reliable research strategies.

Utilize critical thinking to make sense of problems and persevere in solving them.

Model integrity, ethical leadership and effective management.

Use technology to enhance productivity.

Work productively in teams while using cultural global competence.

Essential Questions (3-5)

1. Many different types of bacteria exist, why do only a few cause diseases?
2. How does Gram stain allow the classification of Bacteria?
3. How does the use of an antibiotic control bacterial infections? What are the implications of antibiotic use as a preventative in controlling bacterial infections?

4. What are effective ways the health sciences community can do to aid in the prevention and the spread of disease?
5. What are the Basic personal preventive measures that can prevent the spread of many diseases?

Anchor Text

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Informational Texts (3-5)

See Inkling.com

Short Texts (1-3)

AMA and Forensic Science Journals

Formative & Summative Assessments

Formative: Kahoot, Plickers, Exit tickets, etc.

Summative: PLTW Computer Based Assessments, Project Scoring Rubrics

Resources (websites, Canvas, LMS, Google Classroom, documents, etc.)

Inkling.com, Canvas

Labs

5.1 Infection

5.2 Design a Public Health Awareness Campaign on an Infectious Disease	
Suggested Time Frame:	**4 weeks**

Biomedical Sciences Curriculum Unit 6

Content Area:	**Essentials of Biomedical Sciences**	**Grade(s)**	**9**
Unit Plan Title:	**Post Mortem**		

Learning Objectives

Lesson 6 Post Mortem
The goal of this unit is for students to put together all they have learned throughout the course to determine Anna Garcia's cause of death. Students will investigate the structure and function of key human body systems and relate the illnesses in the course to a breakdown in these systems. Students will begin to recognize the coordination and interconnections of the body systems required to maintain homeostasis, a precursor to the theme of the Human Body Systems (HBS) course.

Lesson 6.1 Analyzing Anna
This lesson is the culminating unit of the course. Students will put together all they have learned throughout the course to determine Anna Garcia's cause of death. Throughout the course, they have been compiling an Anna Garcia le with any information they have learned about her and her case. In this final lesson, students will investigate the structure and function of key human body systems and relate all of the ways Anna's various illnesses affected each body system, potentially resulting in her premature death. In the nal activity of the course, students will receive one final autopsy report and put together all they know to determine Anna's cause of death. They will think about the interventions or innovations that may have saved Anna that day and reflect on the power of prevention in keeping the body well and safe from harm.

Science Standards & Practices	English & Language Arts Standards	Mathematics Standards
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system is made up of numerous parts and is itself a component of the next level. (HS-LS1-2) **Science & Engineering Practice** - Asking questions and defining problems Ask questions - that arise from careful observation of phenomena, or unexpected results, to clarify and/or seek additional information. - that arise from examining models or a theory, to clarify and/or seek additional information and relationships. - to determine relationships, including quantitative relationships, between independent and dependent variables. - to clarify and refine a model, an explanation, or an engineering problem. Science and Engineering Practice - Planning and Carrying Out Investigations - Select appropriate tools to collect, record, analyze, and evaluate data. Make directional hypotheses that specify what happens to a dependent variable when an independent variable is manipulated. Science and Engineering Practice - Analyzing and Interpreting Data - Analyze data using tools, technologies, and/or models (e.g., computational, mathematical) in order to make valid and reliable scientific claims or determine an optimal design solution. Science and Engineering Practice - Constructing Explanations and Designing Solutions - Construct and revise an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. Science and Engineering Practice - Constructing Explanations and Designing Solutions - Apply scientific ideas, principles, and/or evidence to provide an explanation of phenomena and solve design problems, taking into account possible unanticipated effects. Science and Engineering Practice - Constructing Explanations and Designing Solutions - Apply scientific reasoning, theory, and/or models to link evidence to the	NJSLSA.R.8 - Reading - Delineate and evaluate the argument and specific claims in a text, including the validity of the reasoning as well as the relevance and sufficiency of the evidence. NJSLSA.R.10 - Reading - Read and comprehend complex literary and informational texts independently and proficiently. NJSLSA.W.1 - Writing - Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence. NJSLSA.W.2 - Writing - Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content. NJSLSA.W.4 - Writing - Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. NJSLSA.W.5 - Writing - Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach. NJSLSA.W.6 - Writing - Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others. NJSLSA.W.7 - Writing - Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation. NJSLSA.W.8 - Writing - Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism. NJSLSA.W.9 - Writing - Draw evidence from literary or informational texts to support analysis, reflection, and research. NJSLSA.W.10 - Writing - Write routinely over extended time frames (time for research, reflection, and revision) and	

claims to assess the extent to which the reasoning and data support the explanation or conclusion. Science and Engineering Practice - Engaging in Argument from Evidence - Construct, use, and/or present an oral and written argument or counterarguments based on data and evidence. Science and Engineering Practice - Engaging in Argument from Evidence - Make and defend a claim based on evidence about the natural world or the effectiveness of a design solution that reflects scientific knowledge and student- generated evidence. Science and Engineering Practice - Obtaining, Evaluating, and Communicating Information - Compare, integrate and evaluate sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a scientific question or solve a problem. Science and Engineering Practice - Obtaining, Evaluating, and Communicating Information - Gather, read, and evaluate scientific and/or technical information from multiple authoritative sources, assessing the evidence and usefulness of each source. Science and Engineering Practice - Obtaining, Evaluating, and Communicating Information - Evaluate the validity and reliability of and/or synthesize multiple claims, methods, and/or designs that appear in scientific and technical texts or media reports, verifying the data when possible. Communicate scientific and/or technical information or ideas (e.g., about phenomena and/or the process of development and the design and performance of a proposed process or system) in multiple formats (i.e., orally, graphically, textually, mathematically). **Crosscutting Concepts** - Patterns - Different patterns may be observed at each of the scales at which a system is studied and can provide evidence for causality in explanations of phenomena. Crosscutting Concepts - Cause and Effect: Mechanism and Prediction - Cause and effect relationships can be suggested and predicted for complex natural and human	shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences. NJSLSA.SL.1 - Speaking and Listening - Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively. NJSLSA.SL.2 - Speaking and Listening - Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally. NJSLSA.SL.4 - Speaking and Listening - Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience. NJSLSA.SL.5 - Speaking and Listening - Make strategic use of digital media and visual displays of data to express information and enhance understanding of presentations. NJSLSA.L.1 - Language - Demonstrate command of the conventions of standard English grammar and usage when writing or speaking. NJSLSA.L.2 - Language - Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing. NJSLSA.L.4 - Language - Determine or clarify the meaning of unknown and multiple-meaning words and phrases by using context clues, analyzing meaningful word parts, and consulting general and specialized reference materials, as appropriate. NJSLSA.L.6 - Language - Acquire and use accurately a range of general academic and domain-specific words and phrases sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.	

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NJSLS CTE & Career Readiness Practices(s) Addressed in this unit

NJSLS Career & Technical Education Standards – See Addendum

NJSLS CTE 9.3.HL-BRD.1 Summarize the goals of biotechnology research and development within legal and ethical protocols.

NJSLS CTE 9.3.HL-BRD.3 Demonstrate basic knowledge of recombinant DNA, genetic engineering, bioprocessing, monoclonal antibody production, nanotechnology, bioinformatics, genomics, proteomics and transcriptomics to conduct biotechnology research and development.

NJSLS CTE 9.3.HL-BRD.6 Summarize and explain the larger ethical, moral and legal issues related to biotechnology research, product development and use in society.

NJSLS CTE 9.3.ST.2 - Use technology to acquire, manipulate, analyze and report data.

NJSLS CTE 9.3.ST-SM.2 Apply science and mathematics concepts to the development of plans, processes and projects that address real world problems.

NJSLS CTE 9.3.ST-SM.4 Apply critical thinking skills to review information, explain statistical analysis, and to translate, interpret and summarize research and statistical data.

NJSLS Career Ready Practices – See Addendum

Act as a responsible and contributing citizen and employee.
Apply appropriate academic and technical skills.
Communicate clearly and effectively and with reason.
Consider the environmental, social and economic impacts of decisions.
Demonstrate creativity and innovation.

Employ valid and reliable research strategies. Utilize critical thinking to make sense of problems and persevere in solving them. Model integrity, ethical leadership and effective management. Use technology to enhance productivity. Work productively in teams while using cultural global competence.
Essential Questions (3-5)
1. Do all patients respond the same way to a medical intervention, what is the physicians' responsibility in determining the best treatment for each patient? 2. How is the development of treatment and prevention methods directly related to engineering principles and technology development? 3. Determining the cause of death involves the investigation of many aspects of the medical condition of a victim, the internal and external examination of the body, the chemical and microscopic analysis of tissues and body fluids, identify the specialized areas of the biomedical profession, how has this provided a determination of what killed Anna Garcia? 4. What is the role of medical research in the quest to increase longevity and improve quality of life? 5. Why is it important to evaluate a source of information to insure the information is accurate and unbiased in presentations and reports?
Anchor Text
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Resources (websites, Canvas, LMS, Google Classroom, documents, etc.)
Inkling.com, Canvas
Labs
6.1 Analyzing Anna

Suggested Time Frame:	**4 weeks**