Statewide Framework Document for: 260102

Principles of Biomedical Science

Standards may be added to this document prior to submission but may not be removed from the framework to meet state credit equivalency requirements. Performance assessments may be developed at the local level. In order to earn state approval, performance assessments must be submitted within this framework. **This course is eligible for 1.0 lab science.**

The Washington State Science Standards performance expectations for high school blend core ideas (Disciplinary Core Ideas, or DCIs) with scientific and engineering practices (SEPs) and crosscutting concepts (CCCs) to support students in developing usable knowledge that can be applied across the science disciplines. These courses are to be taught in a three-dimensional manner. The details about each performance expectation can be found at Next Generation Science Standards.

Industry Standards and/or Competencies are embedded throughout the course which includes alignment to 21st Century Skills.
The following levels of understanding and in-demand transportable skills are embedded throughout the lessons within each of the units and build upon each other: Knowledge and Skills, Objectives, Domains, and Competencies.

Knowledge and Skills: what students will know and be able to do after they've had the opportunity to learn the course content.
Objectives: skills that directly relate to the workplace or applied academic setting and are the application of the knowledge and skills
Domains: areas of in-demand expertise that an employer in a specific field may seek; key understandings and long-term takeaways that go beyond factual knowledge into broader, conceptual comprehension.

Competencies: general characteristics of the transportable skills that benefit students in various professional and academic pursuits

C1: Problem Solving and Process Thinking

D1 Experimental Design: An experimental design process is a systematic approach to investigate and gain knowledge.

O1.1 Design and carry out an experiment that investigates a research question.

KS 1.1.1 Conduct background research using credible sources to identify and investigate a relevant question.
KS 1.1.2 Develop a testable hypothesis and design an experimental protocol that evaluates its validity.
K.S 1.1.3 Distinguish between independent and dependent variables.
KS 1.1.4 Identify and explain the purpose and importance of experimental controls.
KS 1.1.5 Select and use equipment appropriately to conduct experiments.

KS 1.1.6 Maintain a detailed repeatable account of an experiment in a physical or digital laboratory notebook.

KS 1.1.7 Identify possible sources of errors, then redesign and repeat the experiment when appropriate.

O1.2 Collect and analyze experimental data to draw conclusions.

KS 1.2.1 Display experimental data appropriately and accurately in digital or written form (graphs, tables, diagrams).

KS 1.2.2 Perform necessary calculations to analyze experimental data.

KS 1.2.3 Draw logical conclusions from experimental data.

KS 1.2.4 Communicate experimental findings with appropriate audiences both orally and in writing.

D2 Critical and Analytical Thinking: Biomedical science professionals' approach complex problems systematically and logically by breaking them into manageable components. They work collaboratively and apply their knowledge and skills to draw well-reasoned conclusions and solutions.

O2.1 Devise and execute a plan to solve a problem.

KS 2.1.1 Synthesize information from multiple credible sources, such as literature, databases, policy documents, and diverse perspectives from multiple disciplines, to explore causes and solutions to problems.

KS 2.1.2 Devise and execute a plan to solve a problem while considering the impacts of the possible solutions.

O2.2 Use data and evidence to evaluate and justify decisions.

KS 2.2.1 Use mathematical computations to interpret data.

KS 2.2.2 Collect, display, analyze and interpret data (including diagrams, charts, graphs, and tables) to draw a conclusion.

KS 2.2.3 Conduct a research using credible resources to craft explanations and draw conclusions while acknowledging the limitations, opposing views, and biases.

O2.3 Apply an iterative design process to creatively address a need or solve a problem.

KS 2.3.1 Assess how design and innovation can help solve a problem in biomedical science.

KS 2.3.2 Identify and define visual, functional, and structural design requirements (criteria) and realistic constraints, against which solution alternatives can be evaluated and optimized.

KS 2.3.3 Compare competing solution ideas and justify the selection of a solution path with respect to design requirements and constraints.

KS 2.3.4 Develop a solution and implement a plan to test and evaluate a potential solution to verify that it meets all constraints and complies with all design criteria.

C2: Professional Practices and Communications

D3 Career Awareness: Biomedical science solutions have global impacts in economic, environmental, and societal contexts.

O3.1 Describe the diverse set of careers in the biomedical sciences and the societal impacts of their work.

KS 3.1.1 Identify and describe the different careers of professionals who research, diagnose, and treat medical conditions.

KS 3.1.2 Describe the education requirements, salary ranges, professional licensure, skills, and/or responsibilities of biomedical science professionals.

KS 3.1.3 Describe the impact that biomedical science research and interventions have on society.

D4 Professionalism and Ethics: Successful biomedical scientists typically exhibit specific personal and professional characteristics that lend themselves to the creative, collaborative, and solution-driven nature of the profession.

O4.1 Apply professional standards, as they relate to the personal traits of a biomedical science professional.

KS 4.1.1 Demonstrate professional standards, such as creativity, perseverance, honesty, integrity, and accountability, which should be exhibited by biomedical professionals.

KS 4.1.2 Describe how failure, or unexpected results, can produce positive outcomes by improving understanding.

KS 4.1.3 Create and support an environment that fosters teamwork, emphasizes quality, and promotes learning.

KS 4.1.4 Weigh the ethical impressions of biomedical science decisions.

KS 4.1.5 Summarize and explain the larger ethical, moral, and legal issues related to scientific research, product development, and use in society (animal use/human research).

D5 Communication: Biomedical Science requires effective communication with a variety of audiences using multiple modalities.

O5.1 Communicate effectively with a specific audience.

KS 5.1.1 Follow acceptable formats for writing assignments and professional presentations.

KS 5.1.2 Modify communications to meet the needs of the audience or patient.

KS 5.1.3 Apply listening skills and interpret verbal and nonverbal behaviors to enhance communication with coworkers and patients.

KS 5.1.4 Properly cite references for all reports in an accepted format.

KS 5.1.5 Use proper elements of written and electronic communication (spelling, grammar, and formatting).

KS 5.1.6 Demonstrate technical reading and writing by reading scientific journal articles and demonstrating knowledge of databases (PubMed, NCBI), and writing scientific lab reports.

KS 5.1.7 Use appropriate scientific terminology and abbreviations.

D6 Collaboration: Being able to effectively and efficiently function on multidisciplinary teams is critical to success in the biomedical sciences.

O6.1 Create an effective team environment to promote successful goal attainment.

KS 6.1.1 Respect others' viewpoints.

KS 6.1.2 Demonstrate teamwork and describe the importance of each team member's contribution to the project.

KS 6.1.3 Identify basic conflict resolution strategies and employ those strategies as necessary and appropriate.

KS 6.1.4 Demonstrate appropriate peer review processes for asking questions and giving effective and constructive feedback.

KS 6.1.5 Develop a project schedule allocating tasks among team members, and track progress for successful completion of the project.

KS 6.1.6 Select and use collaborative tools, such as cloud-based tools, document sharing, and video and text functions, to successfully complete a project.

School District Name		
Course Title: Principles of Biomedical Science		**Total Framework Hours:** 180
CIP Code: 260102	☒ Exploratory ☐ Preparatory	**Date Last Modified:** April 1, 2022
Career Cluster: Health Science		**Cluster Pathway:** Biotechnology Research and Development

Course Summary:
This framework serves to provide foundational knowledge and skills in fields such as biology, anatomy & physiology, genetics, microbiology, and epidemiology through team activities problems, students will tackle real-world challenges faced by biomedical professionals in the field. This framework is based on the copyrighted curriculum through Project Lead the Way® (PLTW). Biomedical Science is a general program which focuses on the summary of biological issues related to science and medicine. It combines the study of human physiology, human pathology and pharmacology to draw conclusions and make advances to solving health problems.

Analyze the evidence found at a crime scene and help the medical examiner uncover clues left on a body to solve a mystery. Question, diagnose, and propose treatment and care for patients in a family medical practice. Track down the source of a mysterious outbreak at a local hospital. Access and stabilize a patient during an emergency and prepare for medical surge and mobile medical care. Collaborate with professionals in other fields to innovate and design solutions to local and global medical problems. Whether seeking a career in medicine or healthcare or simply looking to for the challenge of real-world problems, students in Principles of Biomedical Science will practice how to think creatively and critically to innovate in science and will gain practical experience with experimental design and the design process.

Through both individual and collaborative team activities, projects, and problems, students will tackle real-world challenges faced by biomedical professionals in the field. They will work with the same tools and equipment used in hospitals and labs as they engage in relevant hands-on work. Students will develop skill in technical documentation to represent and communicate experimental findings and solutions to problems. In addition, students will explore how connections to other disciplines such as computer science and engineering shape the future of medicine and practice collaboration techniques that will help them connect with professionals across any field.

Eligible for Equivalent Credit in: Lab Science	**Total Number of Units:** 4

Course Resources: PLTW framework overview, PLTW Principles of Biomedical Resume, PLTW PBS Curriculum Guide (goals for each lesson). Note, for example: PLTW 1.1 references a lesson in the curriculum.

Unit 1: Medical Investigations	**Total Learning Hours for Unit:** 45

Unit Summary:
Students engage in forensic science and medical examination investigations to explore biological and forensic science careers and gain experience in experimental design and data analysis. Through the investigation of a mysterious death, students learn about:

- Biomolecules and their role in determining identity
- Human anatomy and physiology
- Interconnectedness of systems

Students:

- Practice synthesizing multiple forms of data to draw conclusions and have opportunities to develop professional communication skills.
- Identify different forms of evidence to evaluate for meaning and to resolve potential criminal cases. (PLTW 1.1)
- Utilize technology to bring resolution to forensic cases. (PLTW 1.1)

- Apply the concepts of cause, mechanism, and manner to establish causes of death. (PLTW 1.2)
- Analyze information collected during an autopsy leading to the understanding of disease and/or case of death. (PLTW 1.2)
- Understand how the careful evaluation of evidence and accurate recording of data is critical to establishing a legitimate testimony. (PLTW 1.3)

Performance Assessments: (Districts to complete for each unit)
Example assessments for this unit include:
Unit problem plus embedded assessments (i.e., Projects and Informative assessments) within the curriculum or alternatives which the instructor designs. District will need to describe the performance assessments where students demonstrate their understanding and competency related to the academic and industry standards and competencies specific to each unit of instruction.

Problem 1.3.1 Crack the Case (PLTW)
Scenario: Student recently graduated from training and, acting as a *Professional Forensic Scientist*, is now tasked to solve a new case.
Examine a virtual crime scene, *gather* evidence from the scene and witnesses, *analyze* evidence to *deduce* what happened, and *complete an autopsy report* using test and examination results. In preparation for court testimony, *create an evidence board* that illustrates the case to a judge or jury. *Present.*

Leadership Alignment: (Districts to complete for each unit)
Leadership alignment must include a unit specific project/activity that aligns with the 21st Century Leadership Skills.
Example:

- Plan a systematic course of action to answer a question. Problem Solving, Systems Thinking
- Analyze and interpret evidence to draw logical conclusions. Problem Solving, Systems Thinking, Judgements and Decisions
- Communicate information in a professional and organized manner. Communication and Collaboration, Communicate Clearly
- Demonstrate perseverance, honesty, and integrity while accomplishing a goal. Self-Directed Learners, Manage Goals and Time

Industry Standards and/or Competencies:
Competencies (C), Domains (D), Enduring Understanding (EU), Objectives (O), Knowledge and Skills (KS)

C3 Technical Knowledge and Skills

D7 General Laboratory Practices: The practice of biomedical sciences requires the application of common tools, techniques, and technologies to solve problems.

O7.1 Demonstrate mastery of general laboratory practice common to many biomedical science fields.

KS 7.1.1 Use and apply principles of measurement.
KS 7.1.3 Develop and utilize a standard curve.
KS 7.1.4 Practice precise and accurate micro pipetting.
KS 7.1.5 Demonstrate proper use of a microscope to view biological samples.
KS 7.1.6 Demonstrate aseptic technique.
KS 7.1.7 Practice culturing techniques.
KS 7.1.8 Demonstrates an ability to accurately follow a lab protocol.

D8 Clinical Medicine: Patient records and other pieces of medical evidence can be used to assess a person's health and identify disease.

O8.1 Document patient information.

KS 8.1.1 Use medical terminology to transcribe and communicate information, data, and observation.

KS 8.1.2 Maintain accurate patient records and demonstrate why this is important.

O8.2 Synthesize complex medical information to diagnose a disease, disorder, or injury or to determine cause of death.

KS 8.2.1 Collect, assess and interpret patient vital signs.

KS 8.2.2 Select and use appropriate diagnostic tools and tests to evaluate a patient's condition.

KS 8.2.3 Interpret medical information and/or laboratory test results to draw conclusions.

KS 8.2.4 Identify causes (environmental, genetic, lifestyle, and the like) of health conditions.

KS 8.2.5 Describe how a condition or disorder impacts body systems.

O8.3 Respond to patient and/or community needs and propose treatment strategies for disease, disorder, injury, or the prevention thereof.

KS 8.3.1 Prescribe a viable course of action to treat or manage a condition.

KS 8.3.3 Describe the impact of lifestyle habits on human health and disease risk.

D9 Molecular Biology and Genetics: Analyzing DNA offers insight into human identity and the causes of genetic diseases.

O9.1 Explain the role of DNA, RNA, and proteins in the inheritance of traits and the development of diseases or disorders.

KS 9.1.1 Describe the structure and function of nucleic acids and the relationship among genes, alleles, chromosomes, proteins, and traits.

O9.4 Select and use appropriate tools, techniques, and/or technologies to analyze genetic information and diagnose disease.

KS 9.4.1 Explain and demonstrate techniques in molecular biology (DNA extraction, restriction digestion, gel electrophoresis) and interpret results.

D10 Microbiology: Biomedical scientists' study and manipulate microorganisms to understand their properties (i.e., growth and behavior) and their role in infectious disease.

O10.2 Describe how the components of the human immune system fight disease and can be used in prevention and diagnosis.

KS 10.2.3 Employ immunological techniques for identification and diagnosis.

D11 Cell Biology: Understanding the proper function of cells can help determine when something goes wrong.

O11.1 Explain how the composition, structure, and activities of cells build functional systems in the human body.

KS 11.1.1 Differentiate between prokaryotic and eukaryotic cells.

KS 11.1.2 Describe the relationship of cells, tissues, organs, and systems in the human body.

KS 11.1.3 Identify the structure and function of macromolecules that are used in the body.

KS 11.1.5 Interpret the interaction between cells, and between cells and their environment.

D12 Anatomy and Physiology: Biomedical scientists need to understand how the body functions in order to support patient health.

O12.1 Explain the connection between structure and function in biology.

KS 12.1.1 Describe the anatomy and physiology of key human body systems as well as the organization and interaction of these systems.

KS 12.1.2 Understand that interactions between internal and external sources can affect body systems and cell functions.

KS 12.1.3 Explain how organ anatomy (such as that of the heart or brain) is related to function.

KS 12.1.4 Demonstrate how a change in structure in the body impacts function.

O12.2 Describe how the systems of the body work together to maintain homeostasis.

KS 12.2.1 Cite examples of how body systems collaboratively function to maintain homeostasis and health.

KS 12.2.3 Create, describe, and analyze models of biological processes to explain proper and improper functioning.

Aligned National Standards

National Health Science Standards

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

1.1 Human Anatomy and Physiology

1.1.1 Describe the organization of the human body and directional terms.

a. Identify Levels of Organization:

- Chemical
- Cellular
- Tissue
- Organ
- System
- Organism

d. Use directional terms:

- Anterior / Posterior
- Medial / Lateral
- Proximal / Distal
- Superficial / Deep
- Superior / Inferior
- Ventral / Dorsal

1.1.2 Identify basic structures and describe functions of human body systems.

a. Skeletal:

- Structures of the skeletal system:
  - o Distinguish between axial and appendicular skeletons
  - o Describe long bone anatomy
  - o Identify joint types and movement
  - o Name and classify all bones (206)
- Functions of the skeletal system:
  - o Structure and support
  - o Muscle attachment and movement
  - o Mineral storage
  - o Hematopoiesis

b. Muscular:

- Structures of the muscular system:

	o Identify types of muscle tissue o Identify major muscle groups of neck, shoulder, chest, abdomen, back, arms, and legs • Functions of the muscular system: o Body movement o Posture o Protection c. Integumentary: • Structures of the integumentary system: o Identify integumentary components o Label the layers of skin • Functions of the integumentary system: o Vitamin D production o Sensory organ o Infection protection o Temperature regulation o UV light protection d. Cardiovascular: • Structures of the cardiovascular system: o Identify cardiovascular organs o Label the parts of the heart o Distinguish blood components • Functions of the cardiovascular system: o Blood flow through the heart and body o Transports nutrients, waste, antibodies, hormones, and gases o Cardiac conduction system e. Lymphatic / Immune: • Structures of the lymphatic system: o Identify lymphatic organs • Functions of the lymphatic system: o Provide protection against disease o Movement of lymph fluid f. Respiratory: • Structures of the respiratory system: o Identify respiratory organs • Functions of the respiratory system:

	o Gas exchange g. Nervous: • Structures of the nervous system: o Identify organs of the nervous system o Identify structures of the special sense organs • Functions of the nervous system: o Sensation o Movement o Processing h. Endocrine: • Structures of the endocrine system: o Identify endocrine glands • Functions of the endocrine system: o Production of hormones o Regulation of body processes o Controls metabolism o Regulates growth, development, and maturation i. Digestive: • Structures of the digestive system: o Identify digestive organs in sequence o Differentiate between alimentary and accessory organs • Functions of the digestive system: o Chemical and mechanical digestion o Absorption of nutrients o Excretion of waste j. Urinary: • Structures of the urinary system: o Identify urinary organs o Identify gross and microscopic anatomy of the kidney • Functions of the urinary system: o Process of urine formation o Urine composition o Homeostatic balance k. Reproductive: • Structures of the reproductive system: o Identify female reproductive organs

	o Identify male reproductive organs • Functions of the reproductive system: o Formation of gametes o Production of hormones 1.2 Diseases and Disorders 1.2.1 Describe etiology, pathology, diagnosis, treatment, and prevention of common diseases and disorders, including, but not limited to the following: • Arthritis • Asthma • Cancer • Cataracts • Concussion / Traumatic Brain Injury (TBI) • Cystic fibrosis • Diabetes mellitus • Dementia • Gastric ulcer • Hepatitis • Hypertension • Melanoma • Muscular Dystrophy • Myocardial Infarction • Sexually Transmitted Infection (STI) • Stroke / Cerebrovascular Accident (CVA) • Tuberculosis • Urinary Tract Infection (UTI) 1.2.2 Describe biomedical therapies as they relate to the prevention, pathology, and treatment of disease: • Gene testing • Gene therapy • Cloning • Stem cell research 1.3 Medical Mathematics 1.3.1 Demonstrate competency using basic math skills and mathematical conversions as they relate to healthcare. a. Mathematical: • Average

	• Ratios • Fractions • Percentages • Addition / Subtraction • Multiplication / Division b. Conversions: • Height (inches/meters) • Weight/mass (pounds/grams) • Length (inches/meters) • Volume (ml/cc) • Temperature (F/C) • Household measurements (Tbsp/tsp/cup/oz) 1.3.2 Demonstrate the ability to analyze diagrams, charts, graphs, and tables to interpret healthcare results. 1.3.3 Demonstrate use of the 24-hour clock/military time. **Foundation Standard 2: Communications: Demonstrate methods of delivering and obtaining information, while communicating effectively.** 2.1 Concepts of Effective Communication 2.1.5 Modify communication to meet the needs of the patient/client and be appropriate to the situation. 2.2 Medical Terminology 2.2.2 Interpret common medical abbreviations to communicate information. 2.3 Written Communication Skills 2.3.1 Use proper elements of written and electronic communication (spelling, grammar, and formatting). 2.3.2 Prepare examples of technical and informative writing. **Foundation Standard 4: Employability Skills: Use employability skills to enhance employment opportunities and job satisfaction.** 4.3 Career Decision-Making 4.31 Research levels of education, credentialing requirements, and employment trends in health professions. 4.3.2 Distinguish differences among careers within the health science pathways. • Biotechnology research and development • Diagnostic services • Health informatics • Support services

	• Therapeutic services **Foundation Standard 6: Ethics** **Understand accepted ethical practices with respect to cultural, social, and ethnic differences within the healthcare environment.** 6.1 Ethical Practice 6.1.2 Identify ethical issues and their implications related to healthcare. • Ethics committee • Euthanasia • In vitro fertilization • Organ donation • Scope of practice 6.2 Cultural, Social, and Ethnic Diversity 6.2.2 Demonstrate respectful and empathetic treatment of ALL patients/clients. • Civility • Customer service • Patient satisfaction **Foundation Standard 7: Safety Practices** **Identifying existing and potential hazards to clients, co-workers, and self. Employ safe work practices and follow health and safety policies and procedures to prevent injury and illness.** 7.1 Infection Control 7.1.2 Differentiate methods of controlling the spread and growth of pathogens. b. Standard precautions: • Handwashing • Gloving • Personal Protective Equipment (PPE) • Environmental cleaning 7.2 Personal Safety 7.2.3 Demonstrate and apply the use of personal protective equipment (PPE). 7.4 Common Safety Hazards 7.4.1 Observe all safety standards related to the occupational exposure to hazardous chemicals standard (safety data sheets [SDS]). 7.4.2 Comply with safety signs, symbols, and labels. **Foundation Standard 8: Teamwork Identify roles and responsibilities of individual members as part of the healthcare team.** 8.1 Healthcare Teams 8.1.2 Identify characteristics of effective teams:

	• Defined roles • Common purpose • Effective communication • Effective leadership • Measurable processes and outcomes • Mutual respect • Shared goals 8.2 Team Member Participation: 8.2.1 Recognize methods for building positive team relationships. 8.2.2 Analyze attributes and attitudes of an effective leader. a. Characteristics: • Focused and driven • Interpersonal skills • Motivates and inspires • Organized and balanced c. Roles: • Communicates vision • Leads change • Manages accountability **Standard 9: Health Maintenance Practices: Differentiate between wellness and disease. Promote disease prevention and model healthy behaviors**. 9.1 Healthy Behaviors 9.1.1 Promote behaviors of health and wellness. • Exercise • Nutrition • Relationships • Sleep habits • Stress management • Weight control
Aligned Washington State Academic Standards	
Science	**HS. Structure and Function** HS.LS1.1 Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells.

	HS.LS1.2 Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. **HS. Inheritance and Variation of Traits** HS.LS3.1 Ask questions to clarify the relationships about the role of DNA and chromosomes in coding the instructions of characteristics traits passed from parent to offspring.

Science and Engineering Practice	Disciplinary Core Idea	Crosscutting Concept
Asking questions (for science) and defining problems (for engineering) Developing and using models Planning and carrying out investigations Analyzing and interpreting data Using mathematics and computational thinking Constructing explanations (for science) and designing solutions (for engineering) Engaging in argument from evidence Obtaining, evaluating, and communicating information	PS3.B Energy-Conservation of Energy and Energy Transfer LS1.A Structure and Function LS1.C Organization for Matter and Energy Flow in Organisms LS3.A Inheritance of Traits	Patterns Cause and Effect Scale, Proportion, and Quantity Systems and Systems Model Structure and Function Stability and Change

Unit 2: Clinical Care	**Total Learning Hours for Unit:** 45

Unit Summary:

Students assume the role of different medical professionals working through the schedule of patients in a family care clinic. Over the course of the unit, students:

- Explore medical careers.
- Practice professional communication.
- Gain experience collecting, recording, and interpreting physiological data.
- Learn how to perform routine medical tests and evaluate results.

While "meeting" with patients, the interconnectedness between body systems is reinforced, and students explore the various causations and inheritance of disease.

Students are exposed to cutting-edge technologies that are revolutionizing health care and will evaluate their impact.

Students:

- Understand how to assess and evaluate an individual's health status. (PLTW 2.1)
- Explain why heredity is an important factor in human health. (PLTW 2.2)

- Analyze what qualities make an effective medical professional. (PLTW 2.3)

Performance Assessments: (Districts to complete for each unit)

Example assessments for this unit include:

Unit problem plus embedded assessments (i.e., Projects and formative assessments) within the curriculum or alternatives which the instructor designs. District will need to describe the performance assessments where students demonstrate their understanding and competency related to the academic and industry standards and competencies specific to each unit of instruction.

Problem 2.3.1: A New Patient (PLTW)

Scenario: Acting in the role of a Patient Intake Specialist, the student is tasked with helping a new patient at the PLTW Total Care Clinic. The Patient Intake Specialist needs to *evaluate* all medical evidence, *question* the family, *record* vital signs, *order and evaluate* bloodwork, and *synthesize data* to *make a diagnosis*. *Present*.

Leadership Alignment: (Districts to complete for each unit)

Leadership alignment must include a unit specific project/activity that aligns with the 21st Century Leadership Skills.

Example:

- Collect, document, and assess a patient's vital signs, physical exam results, and lab test results to evaluate their condition and form a diagnosis. Critical Thinking, Problem Solving, Reason Effectively, Make Judgements and Decisions
- Propose a care plan to treat or manage a condition. Critical Thinking, Problem Solving
- Adapt communication and demonstrate empathy to meet the needs of a patient. Communication and Collaboration, Communicate Clearly

Industry Standards and/or Competencies:

C3 Technical Knowledge and Skills

D7 General Laboratory Practices: The practice of biomedical sciences requires the application of common tools, techniques, and technologies to solve problems.

O7.1 Demonstrate mastery of general laboratory practice common to many biomedical science fields.

KS 7.1.1 Use and apply principles of measurement.
KS 7.1.2 Calculate concentrations and/or prepare solutions.
KS 7.1.4 Practice precise and accurate micro pipetting.
KS 7.1.5 Demonstrate proper use of a microscope to view biological samples.
KS 7.1.6 Demonstrate aseptic technique.
KS 7.1.8 Demonstrates an ability to accurately follow a lab protocol.

D8 Clinical Medicine: Patient records and other pieces of medical evidence can be used to assess a person's health and identify disease.

O8.1 Document patient information.

KS 8.1.1 Use medical terminology to transcribe and communicate information, data, and observation.
KS 8.1.2 Maintain accurate patient records and demonstrate why this is important.
KS 8.1.3 Demonstrate adherence to HIPAA guidelines to maintain patient privacy.

O8.2 Synthesize complex medical information to diagnose a disease, disorder, or injury or to determine cause of death.

KS 8.2.1 Collect, assess and interpret patient vital signs.

KS 8.2.2 Select and use appropriate diagnostic tools and tests to evaluate a patient's condition.
KS 8.2.3 Interpret medical information and/or laboratory test results to draw conclusions.
KS 8.2.4 Identify causes (environmental, genetic, lifestyle, and the like) of health conditions.
KS 8.2.5 Describe how a condition or disorder impacts body systems.

O8.3 Respond to patient and/or community needs and propose treatment strategies for disease, disorder, injury, or the prevention thereof.

KS 8.3.1 Prescribe a viable course of action to treat or manage a condition.
KS 8.3.3 Describe the impact of lifestyle habits on human health and disease risk.
KS 8.3.4 Describe measures to prevent disease, disorder, or injury, such as regular doctor's visits and screening tests.

D9 Molecular Biology and Genetics: Analyzing DNA offers insight into human identity and the causes of genetic diseases.

O9.1 Explain the role of DNA, RNA, and proteins in the inheritance of traits and the development of diseases or disorders.

KS 9.1.1 Describe the structure and function of nucleic acids and the relationship among genes, alleles, chromosomes, proteins, and traits.
KS 9.1.2 Explain how the order and chemical properties of amino acids influence a protein’s structure and function.
KS 9.1.3 Describe the processes of DNA replication and protein synthesis.
KS 9.1.4 Explain how mutations in nucleic acids can lead to diseases or disorders or promote evolutionary change.
KS 9.1.5 Demonstrate how environmental factors can lead to genetic mutations.

O9.2 Describe cell division and the process by which chromosomes replicate leading to genetic diversity.

KS 9.2.1 Differentiate between mitosis and meiosis and model how these processes lead to genetic diversity.
KS 9.2.2 Analyze karyotypes to diagnose chromosomal abnormalities.

O9.3 Analyze genetic information to predict patterns of inheritance.

KS 9.3.1 Predict the pattern of gene inheritance using Punnett squares.
KS 9.3.2 Predict the pattern of gene inheritance using pedigree analysis.

O9.4 Select and use appropriate tools, techniques, and/or technologies to analyze genetic information and diagnose disease.

KS 9.4.1 Explain and demonstrate techniques in molecular biology (DNA extraction, restriction digestion, gel electrophoresis) and interpret results.
KS 9.4.2 Utilize bioinformatics to analyze and compare genetic information.

D11 Cell Biology: Understanding the proper function of cells can help determine when something goes wrong.

O11.1 Explain how the composition, structure, and activities of cells build functional systems in the human body.

KS 11.1.1 Differentiate between prokaryotic and eukaryotic cells.
KS 11.1.2 Describe the relationship of cells, tissues, organs, and systems in the human body.
KS 11.1.3 Identify the structure and function of macromolecules that are used in the body.
KS 11.1.5 Interpret the interaction between cells, and between cells and their environment.

D12 Anatomy and Physiology: Biomedical scientists need to understand how the body functions in order to support patient health.

O12.1 Explain the connection between structure and function in biology.

KS 12.1.1 Describe the anatomy and physiology of key human body systems as well as the organization and interaction of these systems.

KS 12.1.2 Understand that interactions between internal and external sources can affect body systems and cell functions.

KS 12.1.3 Explain how organ anatomy (such as that of the heart or brain) is related to function.

KS 12.1.4 Demonstrate how a change in structure in the body impacts function.

O12.2 Describe how the systems of the body work together to maintain homeostasis.

KS 12.2.1 Cite examples of how body systems collaboratively function to maintain homeostasis and health.

KS 12.2.2 Demonstrate how feedback loops help maintain homeostasis in the body.

KS 12.2.3 Create, describe, and analyze models of biological processes to explain proper and improper functioning.

Aligned National Standards

National Health Science Standards

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

1.1 Human Anatomy and Physiology

1.1.1 Describe the organization of the human body and directional terms.

a. Identify levels of organization:

- Chemical
- Cellular
- Tissue
- Organ
- System
- Organism

e. Identify body cavities:

- Abdominal
- Cranial
- Dorsal
- Pelvic
- Spinal
- Thoracic

1.1.2 Identify basic structures and describe functions of human body systems.

d. Cardiovascular

- Structures of the cardiovascular system:
  - o Identify cardiovascular organs
  - o Label the parts of the heart
  - o Distinguish blood components
- Functions of the cardiovascular system:
  - o Blood flow through the heart and body

- o Transports nutrients, waste, antibodies, hormones, and gases
- o Cardiac conduction system

f. Respiratory

- • Structures of the respiratory system:
  - o Identify respiratory organs
- • Functions of the respiratory system:
  - o Gas exchange

g. Nervous

- • Structures of the nervous system:
  - o Identify organs of the nervous system
  - o Identify structures of the special sense organs
- • Functions of the nervous system:
  - o Sensation
  - o Movement
  - o Processing

h. Endocrine

- • Structures of the endocrine system:
  - o Identify endocrine glands
- • Functions of the endocrine system:
  - o Production of hormones
  - o Regulation of body processes
  - o Controls metabolism
  - o Regulates growth, development, and maturation

1.2 Diseases and Disorders

1.2.1 Describe etiology, pathology, diagnosis, treatment, and prevention of common diseases and disorders, including, but not limited to the following:

- • Arthritis
- • Asthma
- • Cancer
- • Cataracts
- • Concussion / Traumatic Brain Injury (TBI)
- • Cystic fibrosis
- • Diabetes mellitus
- • Dementia
- • Gastric ulcer
- • Hepatitis

	• Hypertension • Melanoma • Muscular Dystrophy • Myocardial Infarction • Sexually Transmitted Infection (STI) • Stroke / Cerebrovascular Accident (CVA) • Tuberculosis • Urinary Tract Infection (UTI) 1.2.2 Describe biomedical therapies as they relate to the prevention, pathology, and treatment of disease. • Gene testing • Gene therapy • Cloning • Stem cell research 1.3 Medical Mathematics 1.3.1 Demonstrate competency using basic math skills and mathematical conversions as they relate to healthcare. b. Mathematical: • Average • Ratios • Fractions • Percentages • Addition / Subtraction • Multiplication / Division c. Conversions: • Height (inches/meters) • Weight/mass (pounds/grams) • Length (inches/meters) • Volume (ml/cc) • Temperature (F/C) • Household measurements (Tbsp/tsp/cup/oz) 1.3.2 Demonstrate the ability to analyze diagrams, charts, graphs, and tables to interpret healthcare results. 1.3.3 Demonstrate use of the 24-hour clock/military time. **Foundation Standard 2: Communications: Demonstrate methods of delivering and obtaining information, while communicating effectively.**

	2.1 Concepts of Effective Communication 2.1.1 Model verbal and nonverbal therapeutic communication. • Active listening • Silence • Summarizing • Reflecting 2.1.4 Interpret elements of communication using sender-message-receiver feedback model. 2.1.5 Modify communication to meet the needs of the patient/client and be appropriate to the situation. 2.1.6 Describe appropriate interactions with patients throughout various stages of psychosocial development. 2.2 Medical Terminology 2.2.2 Interpret common medical abbreviations to communicate information. 2.3 Written Communication Skills 2.3.1 Use proper elements of written and electronic communication (spelling, grammar, and formatting). 2.3.2 Prepare examples of technical and informative writing. **Foundation Standard 3: Systems: Identify how key systems affect services performed and quality of care.** 3.1 Healthcare Delivery Systems 3.1.2 Examine the healthcare consumer's rights and responsibilities within the healthcare system. • Self-advocacy • Compliance • Patient's Bill of Rights **Foundation Standard 4: Employability Skills: Use employability skills to enhance employment opportunities and job satisfaction.** 4.1 Personal Traits of the Healthcare Professional 4.1.1 Identify personal traits and attitudes desirable in a career ready member of a health team. • Acceptance of criticism • Competence • Dependability • Discretion • Empathy • Enthusiasm

	• Honesty • Initiative • Integrity • Patience • Positive Attitude • Responsibility • Self-motivation • Tact • Team player • Willingness to learn 4.1.2 Summarize professional standards as they apply to hygiene, dress, language, confidentiality and behavior. 4.3 Career Decision-Making 4.31 Research levels of education, credentialing requirements, and employment trends in health professions. 4.3.2 Distinguish differences among careers within the health science pathways. • Biotechnology research and development • Diagnostic services • Health informatics • Support services • Therapeutic services **Foundation Standard 5: Legal Responsibilities: Describe legal responsibilities, limitations, and implications on healthcare worker actions.** 5.2 Legal Practices 5.2.1 Apply standards for the safety, privacy and confidentiality of health information. • HIPAA • Privileged communication 5.2.3 Summarize the essential characteristics of a patient's basic rights within a healthcare setting. **Foundation Standard 6: Ethics: Understand accepted ethical practices with respect to cultural, social, and ethnic differences within the healthcare environment.** 6.1 Ethical Practice 6.1.1 Differentiate between ethical and legal issues impacting healthcare. 6.1.2 Identify ethical issues and their implications related to healthcare. • Ethics committee • Euthanasia

	• In vitro fertilization • Organ donation • Scope of practice 6.2 Cultural, Social, and Ethnic Diversity 6.2.2 Demonstrate respectful and empathetic treatment of ALL patients/clients. • Civility • Customer service • Patient satisfaction **Foundation Standard 7: Safety Practices: Identifying existing and potential hazards to clients, co-workers, and self. Employ safe work practices and follow health and safety policies and procedures to prevent injury and illness.** 7.1 Infection Control 7.1.2 Differentiate methods of controlling the spread and growth of pathogens. b. Standard precautions: • Handwashing • Gloving • Personal Protective Equipment (PPE) • Environmental cleaning d. Bloodborne pathogen precautions 7.2 Personal Safety 7.2.3 Demonstrate and apply the use of personal protective equipment (PPE). 7.4 Common Safety Hazards 7.4.1 Observe all safety standards related to the occupational exposure to hazardous chemicals standard (safety data sheets [SDS]). 7.4.2 Comply with safety signs, symbols, and labels. **Foundation Standard 8: Teamwork Identify roles and responsibilities of individual members as part of the healthcare team**. 8.1 Healthcare Teams 8.1.1 Evaluate roles and responsibilities of healthcare team members. 8.1.2 Identify characteristics of effective teams: • Defined roles • Common purpose • Effective communication • Effective leadership • Measurable processes and outcomes • Mutual respect

	• Shared goals 8.2 Team Member Participation 8.2.1 Recognize methods for building positive team relationships. 8.2.2 Analyze attributes and attitudes of an effective leader. a. Characteristics: • Focused and driven • Interpersonal skills • Motivates and inspires • Organized and balanced c. Roles: • Communicates vision • Leads change • Manages accountability 8.2.4 Evaluate why teamwork is an important part of healthcare and how it improves patient care. **Foundation Standard 9: Health Maintenance Practices: Differentiate between wellness and disease. Promote disease prevention and model healthy behaviors.** 9.1 Healthy Behaviors 9.1.1 Promote behaviors of health and wellness: • Exercise • Nutrition • Relationships • Sleep habits • Stress management • Weight control 9.1.2 Examine various aspects of behavioral health: • Anxiety • Depression • Substance abuse • Suicide 9.1.3 Describe strategies for prevention of disease: • Community health education outreach programs • Immunizations • Medical, dental, and mental health screenings • Routine physical exams • Stress management

	9.2 Healthcare Across the Lifespan 9.2.1 Discuss physical, mental, social and behavioral development and its impact on healthcare. **Foundation Standard 10: Technical Skills: Apply and demonstrate technical skills and knowledge common to health career specialties.** 10.1 Technical Skills 10.1.1 Demonstrate procedures for measuring and recording vital signs including the normal ranges: • Blood pressure • Temperature • Oxygen saturation • Pain • Pulse • Respirations **Foundation Standard 11: Information Technology in Healthcare: Apply information technology practices common across health professions.** 11.1 Key Principles, components and practices of Health Information Systems 11.1.1 Identify components of an electronic health record (EHR) and/or electronic medical record (EMR): • Diagnostic tests • History and physical • Medications • Patient demographics • Progress notes • Treatment Plan 11.1.2 Explore different types of health data collection tools: • Medical wearable devices • Patient monitoring equipment • Phone application • Telemedicine/telehealth 11.1.3 Create electronic documentation that reflects timeliness, completeness, and accuracy.
Aligned Washington State Academic Standards	
Science	**HS. Structure and Function**

	HS.LS1.1 Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells. HS.LS1.2 Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. HS.LS1.3 Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis. **HS. Matter and Energy in Organisms and Ecosystems** HS.LS1.6 Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules. HS.LS2.5 Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among biosphere, atmosphere, hydrosphere, and geosphere. **HS. Inheritance and Variation of Traits** HS.LS1.4 Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintain complex organisms. HS.LS3.1 Ask questions to clarify the relationships about the role of DNA and chromosomes in coding the instructions of characteristics traits passed from parent to offspring. HS.LS3.2 Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors. HS.LS3.3 Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population. **HS. Engineering Design** HS.ETS1.3 Evaluate a solution to a complex real-world problem based on a prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.

Science and Engineering Practice	Disciplinary Core Idea	Crosscutting Concept
Asking questions (for science) and defining problems (for engineering) Developing and using models Planning and carrying out investigations Analyzing and interpreting data Using mathematics and computational thinking Constructing explanations (for science) and designing solutions (for engineering)	PS1.A Structure and Properties of Matter PS3.A Definitions of Energy PS3.B Conservation of Energy and Energy Transfer ETS1.A Defining and Delimiting Engineering Problems ETS1.B Developing Possible Solutions LS1.A Structure and Function	Patterns Cause and Effect Scale, Proportion, and Quantity Systems and Systems Models Structure and Function Stability and Change

Engaging in argument from evidence Obtaining, evaluating, and communicating information	LS1.B Growth and Development of Organisms LS1.C Organization for Matter and Energy Flow in Organisms LS2.B Cycles of Matter and Energy Transfer in Ecosystems LS3.A Inheritance of Traits LS4.A Evidence of Common Ancestry and Diversity	

Unit 3: Outbreaks and Emergencies	**Total Learning Hours for Unit:** 45

Unit Summary:

Working as public health officials and then as emergency responders, students are presented a series of events they must address while exploring careers in epidemiology, public health, microbiology, and emergency medicine. Students have opportunities to develop their professional communication and presentation skills. Key skills highlighted include data analysis, medical decision-making, patient diagnosis, identification of agents of disease, first aid, triage, and strategies involved in disaster preparedness and response.

Students:

- Identify ways, and for what purpose, microorganisms can be characterized. (PLTW 3.1)
- Explain what professionals respond to emergency situations, what are their roles, and how they work together. (PLTW 3.2)
- Analyze the ways that technology enables a faster response and quicker resolution during medical emergencies. (PLTW 3.3)

Performance Assessments: (Districts to complete for each unit)

Example assessments for this unit include:

Unit problem plus embedded assessments (i.e., Projects and formative assessments) within the curriculum or alternatives which the instructor designs. District will need to describe the performance assessments where students demonstrate their understanding and competency related to the academic and industry standards and competencies specific to each unit of instruction.

Problem 3.3.2 Public Health Emergency Apps (PLTW)

Acting as an Emergency Public Health Official, the student will *plan the design of an app* to be used to address one of the following services: trace outbreaks, respond to emergencies (local or global), increase response efficiency in emergencies, or provide another public health function. *Present* the app to the appropriate audience.

Leadership Alignment: (Districts to complete for each unit)

Leadership alignment must include a unit specific project/activity that aligns with the 21st Century Leadership Skills.

Example:

- Analyze the features and interactivity of an app. Information Communication and Technology Literacy, Apply Technology Effectively

- Analyze user needs and design and sketch a basic app design. Information Communication and Technology Literacy, Apply Technology Effectively
- Innovate a design to solve a biomedical science problem. Creativity and Innovation, Implement Innovations
- Design an app to assist people in a public health emergency. Creativity and Innovation, Implement Innovations
- Work collaboratively with a team while demonstrating the professional characteristics of a biomedical scientist. Communication and Collaboration, Collaborate with Others

Industry Standards and/or Competencies:

C3 Technical Knowledge and Skills

D7 General Laboratory Practices: The practice of biomedical sciences requires the application of common tools, techniques, and technologies to solve problems.

O7.1 Demonstrate mastery of general laboratory practice common to many biomedical science fields.

KS 7.1.1 Use and apply principles of measurement.
KS 7.1.2 Calculate concentrations and/or prepare solutions.
KS 7.1.5 Demonstrate proper use of a microscope to view biological samples.
KS 7.1.6 Demonstrate aseptic technique.
KS 7.1.7 Practice culturing techniques.
KS 7.1.8 Demonstrates an ability to accurately follow a lab protocol.

D8 Clinical Medicine: Patient records and other pieces of medical evidence can be used to assess a person's health and identify disease.

O8.1 Document patient information.

KS 8.1.1 Use medical terminology to transcribe and communicate information, data, and observation.
KS 8.1.2 Maintain accurate patient records and demonstrate why this is important.
KS 8.1.3 Demonstrate adherence to HIPAA guidelines to maintain patient privacy.

O8.2 Synthesize complex medical information to diagnose a disease, disorder, or injury or to determine cause of death.

KS 8.2.1 Collect, assess and interpret patient vital signs.
KS 8.2.2 Select and use appropriate diagnostic tools and tests to evaluate a patient's condition.
KS 8.2.3 Interpret medical information and/or laboratory test results to draw conclusions.
KS 8.2.4 Identify causes (environmental, genetic, lifestyle, and the like) of health conditions.
KS 8.2.5 Describe how a condition or disorder impacts body systems.

O8.3 Respond to patient and/or community needs and propose treatment strategies for disease, disorder, injury, or the prevention thereof.

KS 8.3.1 Prescribe a viable course of action to treat or manage a condition.
KS 8.3.2 Demonstrate appropriate public health measures by proposing strategies for responding to health crises and/or disasters.
KS 8.3.4 Describe measures to prevent disease, disorder, or injury, such as regular doctor's visits and screening tests.

D10 Microbiology: Biomedical scientists' study and manipulate microorganisms to understand their properties (i.e., growth and behavior) and their role in infectious disease.

O10.1 Identify and describe pathogens that cause infectious disease.

KS 10.1.1 Identify the structures of bacterial cells and viruses.
KS 10.1.2 Characterize and identify bacteria by their shape, colony morphology, metabolism, and reaction to the Gram stain.
KS 10.1.3 Describe the mode of transmission and reproduction of various infectious agents.
KS 10.1.4 Describe the prevention and treatment of infectious disease.
O10.2 Describe how the components of the human immune system fight disease and can be used in prevention and diagnosis.
KS 10.2.1 Describe how the immune system responds when an antigen enters the body.
KS 10.2.2 Describe immune-based prevention of and treatment for various infectious agents.
D11 Cell Biology: Understanding the proper function of cells can help determine when something goes wrong.
O11.1 Explain how the composition, structure, and activities of cells build functional systems in the human body.
KS 11.1.1 Differentiate between prokaryotic and eukaryotic cells.
KS 11.1.2 Describe the relationship of cells, tissues, organs, and systems in the human body.
KS 11.1.4 Demonstrate how the structure of the cell membrane impacts homeostasis.
KS 11.1.5 Interpret the interaction between cells, and between cells and their environment.
D12 Anatomy and Physiology: Biomedical scientists need to understand how the body functions in order to support patient health.
O12.1 Explain the connection between structure and function in biology.
KS 12.1.1 Describe the anatomy and physiology of key human body systems as well as the organization and interaction of these systems.
KS 12.1.2 Understand that interactions between internal and external sources can affect body systems and cell functions.
KS 12.1.4 Demonstrate how a change in structure in the body impacts function.
O12.2 Describe how the systems of the body work together to maintain homeostasis.
KS 12.2.1 Cite examples of how body systems collaboratively function to maintain homeostasis and health.
KS 12.2.2 Demonstrate how feedback loops help maintain homeostasis in the body.
KS 12.2.3 Create, describe, and analyze models of biological processes to explain proper and improper functioning

Aligned Washington State Academic Standards

National Health Science Standards	**Foundation Standard 1: Academic Foundation Understand human anatomy, physiology, common diseases and disorders, and medical math principles**. 1.1 Human Anatomy and Physiology 1.1.1 Describe the organization of the human body and directional terms. a. Identify Levels of Organization: • Chemical • Cellular • Tissue • Organ • System • Organism d. Use directional terms:

- Anterior / Posterior
- Medial / Lateral
- Proximal / Distal
- Superficial / Deep
- Superior / Inferior
- Ventral / Dorsal

1.1.2 Identify basic structures and describe functions of human body systems.

e. Lymphatic / Immune

- Structures of the lymphatic system
  - o Identify lymphatic organs
- Functions of the lymphatic system
  - o Provide protection against disease
  - o Movement of lymph fluid

f. Respiratory

- Structures of the respiratory system
  - o Identify respiratory organs
- Functions of the respiratory system
  - o Gas exchange

g. Nervous

- Structures of the nervous system
  - o Identify organs of the nervous system
  - o Identify structures of the special sense organs
- Functions of the nervous system
  - o Sensation
  - o Movement
  - o Processing

1.2 Diseases and Disorders

1.2.1 Describe etiology, pathology, diagnosis, treatment, and prevention of common diseases and disorders, including, but not limited to the following:

- Arthritis
- Asthma
- Cancer
- Cataracts
- Concussion / Traumatic Brain Injury (TBI)
- Cystic fibrosis
- Diabetes mellitus

- Dementia
- Gastric ulcer
- Hepatitis
- Hypertension
- Melanoma
- Muscular Dystrophy
- Myocardial Infarction
- Sexually Transmitted Infection (STI)
- Stroke / Cerebrovascular Accident (CVA)
- Tuberculosis
- Urinary Tract Infection (UTI)

1.2.2 Describe biomedical therapies as they relate to the prevention, pathology, and treatment of disease.

- Gene testing
- Gene therapy
- Cloning
- Stem cell research

1.3 Medical Mathematics

1.3.1 Demonstrate competency using basic math skills and mathematical conversions as they relate to healthcare.

b. Mathematical:

- Average
- Ratios
- Fractions
- Percentages
- Addition / Subtraction
- Multiplication / Division

c. Conversions:

- Height (inches/meters)
- Weight/mass (pounds/grams)
- Length (inches/meters)
- Volume (ml/cc)
- Temperature (F/C)
- Household measurements (Tbsp/tsp/cup/oz)

1.3.2 Demonstrate the ability to analyze diagrams, charts, graphs, and tables to interpret healthcare results.

1.3.3 Demonstrate use of the 24-hour clock/military time.

Foundation Standard 2: Communications: Demonstrate methods of delivering and obtaining information, while communicating effectively.

2.1 Concepts of Effective Communication

2.1.5 Modify communication to meet the needs of the patient/client and be appropriate to the situation.

2.2 Medical Terminology

2.2.1 Use common roots, prefixes, and suffixes to communicate information.

2.2.2 Interpret common medical abbreviations to communicate information.

2.3 Written Communication Skills

2.3.1 Use proper elements of written and electronic communication (spelling, grammar, and formatting).

2.3.2 Prepare examples of technical and informative writing.

Foundation Standard 3: Systems: Identify how key systems affect services performed and quality of care.

3.1 Healthcare Delivery Systems

3.1.1 Differentiate healthcare delivery systems and healthcare related agencies.

a. Types of practice settings:

- Acute care
- Ambulatory care
- Behavioral and mental health services
- Home care
- Long-term care
- Medical and dental practices

3.1.2 Examine the healthcare consumer's rights and responsibilities within the healthcare system.

- Self-advocacy
- Compliance
- Patient's Bill of Rights

Foundation Standard 4: Employability Skills: Use employability skills to enhance employment opportunities and job satisfaction.

4.1 Personal Traits of the Healthcare Professional

4.1.1 Identify personal traits and attitudes desirable in a career ready member of a health team.

- Acceptance of criticism
- Competence

- Dependability
- Discretion
- Empathy
- Enthusiasm
- Honesty
- Initiative
- Integrity
- Patience
- Positive Attitude
- Responsibility
- Self-motivation
- Tact
- Team player
- Willingness to learn

4.1.2 Summarize professional standards as they apply to hygiene, dress, language, confidentiality and behavior.

4.3 Career Decision-Making

4.31 Research levels of education, credentialing requirements, and employment trends in health professions.

4.3.2 Distinguish differences among careers within the health science pathways.

- Biotechnology research and development
- Diagnostic services
- Health informatics
- Support services
- Therapeutic services

Foundation Standard 5: Legal Responsibilities: Describe legal responsibilities, limitations, and implications on healthcare worker actions.

5.2 Legal Practices

5.2.1 Apply standards for the safety, privacy and confidentiality of health information.

- HIPAA
- Privileged communication

5.2.3 Summarize the essential characteristics of a patient's basic rights within a healthcare setting.

Foundation Standard 6: Ethics

Understand accepted ethical practices with respect to cultural, social, and ethnic differences within the healthcare environment.

6.1 Ethical Practice

6.1.1 Differentiate between ethical and legal issues impacting healthcare.

6.1.2 Identify ethical issues and their implications related to healthcare.

- Ethics committee
- Euthanasia
- In vitro fertilization
- Organ donation
- Scope of practice

6.2 Cultural, Social, and Ethnic Diversity

6.2.2 Demonstrate respectful and empathetic treatment of ALL patients/clients.

- Civility
- Customer service
- Patient satisfaction

Foundation Standard 7: Safety Practices

Identifying existing and potential hazards to clients, co-workers, and self. Employ safe work practices and follow health and safety policies and procedures to prevent injury and illness.

7.1 Infection Control

7.1.1 Explain principles of infection transmission.

a. Identify classifications of pathogens:

- Bacteria
- Fungi
- Parasites
- Protozoa
- Viruses

b. Describe characteristics of microorganisms:

- Aerobic
- Anaerobic
- Non-pathogenic
- Pathogenic

c. Recognize chain of infection.

d. Describe mode of transmission:

- Common vehicle (air, food, water)
- Direct
- Healthcare-associated infections (nosocomial)
- Indirect
- Opportunistic

	• Vectors 7.1.2 Differentiate methods of controlling the spread and growth of pathogens. a. Asepsis: • Sanitization • Antisepsis • Disinfection • Sterile technique • Sterilization b. Standard precautions: • Handwashing • Gloving • Personal Protective Equipment (PPE) • Environmental cleaning c. Isolation precautions: • Transmission-based contact e. Vaccinations: 7.2 Personal Safety 7.2.3 Demonstrate and apply the use of personal protective equipment (PPE). 7.4 Common Safety Hazards 7.4.1 Observe all safety standards related to the occupational exposure to hazardous chemicals standard (safety data sheets [SDS]). 7.4.2 Comply with safety signs, symbols, and labels. **Foundation Standard 8: Teamwork Identify roles and responsibilities of individual members as part of the healthcare team.** 8.1 Healthcare Teams 8.1.1 Evaluate roles and responsibilities of healthcare team members. 8.1.2 Identify characteristics of effective teams. • Defined roles • Common purpose • Effective communication • Effective leadership • Measurable processes and outcomes • Mutual respect • Shared goals 8.2 Team Member Participation 8.2.1 Recognize methods for building positive team relationships.

8.2.2 Analyze attributes and attitudes of an effective leader.

a. Characteristics:

- Focused and driven
- Interpersonal skills
- Motivates and inspires
- Organized and balanced

c. Roles:

- Communicates vision
- Leads change
- Manages accountability

8.2.4 Evaluate why teamwork is an important part of healthcare and how it improves patient care.

Standard 9: Health Maintenance Practices: Differentiate between wellness and disease. Promote disease prevention and model healthy behaviors.

9.1 Healthy Behaviors

9.1.1 Promote behaviors of health and wellness.

- Exercise
- Nutrition
- Relationships
- Sleep habits
- Stress management
- Weight control

9.1.2 Examine various aspects of behavioral health.

- Anxiety
- Depression
- Substance abuse
- Suicide

9.1.3 Describe strategies for prevention of disease.

- Community health education outreach programs
- Immunizations
- Medical, dental, and mental health screenings
- Routine physical exams
- Stress management

9.2 Healthcare Across the Lifespan

9.2.1 Discuss physical, mental, social and behavioral development and its impact on healthcare.

	Foundation Standard 10: Technical Skills: Apply and demonstrate technical skills and knowledge common to health career specialties. 10.1 Technical Skills 10.1.1 Demonstrate procedures for measuring and recording vital signs including the normal ranges. • Blood pressure • Temperature • Oxygen saturation • Pain • Pulse • Respirations
Aligned Washington State Academic Standards	
Science	**HS. Structure and Function** HS.LS1.1 Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells. HS.LS1.2 Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. **HS Inheritance and Variation of Traits** HS.LS1.4 Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintain complex organisms. HS.LS3.1 Ask questions to clarify the relationships about the role of DNA and chromosomes in coding the instructions of characteristics traits passed from parent to offspring. HS.LS3.2 Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors. HS.LS3.3 Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population. **HS. Natural Selection and Evolution** HS.LS4.3 Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait. **HS. Engineering Design** HS.ETS1.4 Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.

Science and Engineering Practice	Disciplinary Core Idea	Crosscutting Concept

Asking questions (for science) and defining problems (for engineering) Developing and using models Planning and carrying out investigations Analyzing and interpreting data Using mathematics and computational thinking Constructing explanations (for science) and designing solutions (for engineering) Engaging in argument from evidence Obtaining, evaluating, and communicating information	ETS1.A Defining and Delimiting Engineering Problems ETS1.B Developing Possible Solutions LS1.A Structure and Function LS1.B Growth and Development of Organisms LS1.C Organization For Matter and Energy Flow in Organisms LS3.A Inheritance of Traits LS4.B Natural Selection	Patterns Cause and Effect Scale, Proportion, and Quantity Systems and Systems Models Structure and Function Stability and Change

Unit 4: Innovations Inc.	**Total Learning Hours for Unit:** 45

Unit Summary:

Students begin as interns at PLTW Innovation, Inc. and tour various labs, each dedicated to a different area of research, innovation, and design. They will investigate innovation in medical device development as they design model vessels for testing of cardiac stents. They will explore how computer-aided design (CAD) can be used for modeling and prototyping in innovation. Students will explore innovation in drug delivery as they design and test the formulation for a new drug. Focusing on large scale efforts in disease prevention and health promotions, they will then design a comprehensive initiative that could be implemented by a specific client.

Students:

- Identify how engineering and experimental design processes enable innovation. (PLTW 4.1)
- Analyze how innovations impact human health. (PLTW 4.2)
- Identify potential untapped resources that could advance the field of biomedical sciences. (PLTW 4.3)

Performance Assessments: (Districts to complete for each unit)

Example assessments for this unit include:

Unit problem plus embedded assessments (i.e., Projects and Informative assessments) within the curriculum or alternatives which the instructor designs. District will need to describe the performance assessments where students demonstrate their understanding and competency related to the academic and industry standards and competencies specific to each unit of instruction.

Problem 4.3.1 Pioneering the Future – Invitation to Innovation (PLTW)

Acting as an Innovator within the Medical Industry, the student is competing for open lab space at PLTW Innovation, Inc. To make your case and win lab occupancy, *apply all* you have learned in this unit (and course) to *design* a medical innovation. *Present* your innovation to the appropriate audience.

Leadership Alignment: (Districts to complete for each unit)

Leadership alignment must include a unit specific project/activity that aligns with the 21st Century Leadership Skills.

Example:

- Create an effective team environment to promote successful goal attainment. Communication and Collaboration, Collaborate with Others
- Apply an iterative design process to creatively address a need or solve a problem. Critical Thinking, Problem Solving, Use Systems Thinking

Industry Standards and/or Competencies:

C3 Technical Knowledge and Skills

D7 General Laboratory Practices: The practice of biomedical sciences requires the application of common tools, techniques, and technologies to solve problems.

O7.1 Demonstrate mastery of general laboratory practice common to many biomedical science fields.

KS 7.1.1 Use and apply principles of measurement.

KS 7.1.3 Develop and utilize a standard curve.

KS 7.1.4 Practice precise and accurate micro pipetting.

KS 7.1.6 Demonstrate aseptic technique.

KS 7.1.8 Demonstrates an ability to accurately follow a lab protocol.

D8 Clinical Medicine: Patient records and other pieces of medical evidence can be used to assess a person's health and identify disease.

O8.1 Document patient information.

KS 8.1.1 Use medical terminology to transcribe and communicate information, data, and observation.

O8.2 Synthesize complex medical information to diagnose a disease, disorder, or injury or to determine cause of death.

KS 8.2.1 Collect, assess and interpret patient vital signs.

KS 8.2.3 Interpret medical information and/or laboratory test results to draw conclusions.

KS 8.2.4 Identify causes (environmental, genetic, lifestyle, and the like) of health conditions.

KS 8.2.5 Describe how a condition or disorder impacts body systems.

O8.3 Respond to patient and/or community needs and propose treatment strategies for disease, disorder, injury, or the prevention thereof.

KS 8.3.1 Prescribe a viable course of action to treat or manage a condition.

KS 8.3.3 Describe the impact of lifestyle habits on human health and disease risk.

KS 8.3.4 Describe measures to prevent disease, disorder, or injury, such as regular doctor's visits and screening tests.

D10 Microbiology: Biomedical scientists' study and manipulate microorganisms to understand their properties (i.e., growth and behavior) and their role in infectious disease.

O10.2 Describe how the components of the human immune system fight disease and can be used in prevention and diagnosis.

KS 10.2.1 Describe how the immune system responds when an antigen enters the body.

KS 10.2.2 Describe immune-based prevention of and treatment for various infectious agents.

KS 10.2.3 Employ immunological techniques for identification and diagnosis.

D12 Anatomy and Physiology: Biomedical scientists need to understand how the body functions in order to support patient health.

O12.1 Explain the connection between structure and function in biology.

KS 12.1.1 Describe the anatomy and physiology of key human body systems as well as the organization and interaction of these systems.

KS 12.1.2 Understand that interactions between internal and external sources can affect body systems and cell functions.

KS 12.1.3 Explain how organ anatomy (such as that of the heart or brain) is related to function.

KS 12.1.4 Demonstrate how a change in structure in the body impacts function.

O12.2 Describe how the systems of the body work together to maintain homeostasis.

KS 12.2.1 Cite examples of how body systems collaboratively function to maintain homeostasis and health.

KS 12.2.3 Create, describe, and analyze models of biological processes to explain proper and improper functioning.

Aligned National Standards	
National Health Science Standards	**Foundation Standard 1: Academic Foundation Understand human anatomy, physiology, common diseases and disorders, and medical math principles.** 1.1 Human Anatomy and Physiology 1.1.2 Identify basic structures and describe functions of human body systems. d. Cardiovascular • Structures of the cardiovascular system: o Identify cardiovascular organs o Label the parts of the heart o Distinguish blood components • Functions of the cardiovascular system: o Blood flow through the heart and body o Transports nutrients, waste, antibodies, hormones, and gases o Cardiac conduction system i. Digestive • Structures of the digestive system: o Identify digestive organs in sequence o Differentiate between alimentary and accessory organs • Functions of the digestive system: o Chemical and mechanical digestion o Absorption of nutrients o Excretion of waste 1.2 Diseases and Disorders 1.2.1 Describe etiology, pathology, diagnosis, treatment, and prevention of common diseases and disorders, including, but not limited to the following: • Arthritis • Asthma • Cancer • Cataracts • Concussion / Traumatic Brain Injury (TBI)

	• Cystic fibrosis • Diabetes mellitus • Dementia • Gastric ulcer • Hepatitis • Hypertension • Melanoma • Muscular Dystrophy • Myocardial Infarction • Sexually Transmitted Infection (STI) • Stroke / Cerebrovascular Accident (CVA) • Tuberculosis • Urinary Tract Infection (UTI) 1.2.2 Describe biomedical therapies as they relate to the prevention, pathology, and treatment of disease: • Gene testing • Gene therapy • Cloning • Stem cell research 1.3 Medical Mathematics 1.3.1 Demonstrate competency using basic math skills and mathematical conversions as they relate to healthcare. b. Mathematical: • Average • Ratios • Fractions • Percentages • Addition / Subtraction • Multiplication / Division c. Conversions: • Height (inches/meters) • Weight/mass (pounds/grams) • Length (inches/meters) • Volume (ml/cc) • Temperature (F/C) • Household measurements (Tbsp/tsp/cup/oz)

	1.3.2 Demonstrate the ability to analyze diagrams, charts, graphs, and tables to interpret healthcare results. **Foundation Standard 2: Communications: Demonstrate methods of delivering and obtaining information, while communicating effectively.** 2.1 Concepts of Effective Communication 2.1.5 Modify communication to meet the needs of the patient/client and be appropriate to the situation. 2.2 Medical Terminology 2.2.2 Interpret common medical abbreviations to communicate information. 2.3 Written Communication Skills 2.3.1 Use proper elements of written and electronic communication (spelling, grammar, and formatting). 2.3.2 Prepare examples of technical and informative writing. **Foundation Standard 4: Employability Skills: Use employability skills to enhance employment opportunities and job satisfaction.** 4.3 Career Decision-Making 4.31 Research levels of education, credentialing requirements, and employment trends in health professions. 4.3.2 Distinguish differences among careers within the health science pathways: • Biotechnology research and development • Diagnostic services • Health informatics • Support services • Therapeutic services **Foundation Standard 6: Ethics** Understand accepted ethical practices with respect to cultural, social, and ethnic differences within the healthcare environment. 6.1 Ethical Practice 6.1.1 Differentiate between ethical and legal issues impacting healthcare. 6.1.2 Identify ethical issues and their implications related to healthcare: • Ethics committee • Euthanasia • In vitro fertilization • Organ donation • Scope of practice 6.2 Cultural, Social, and Ethnic Diversity

6.2.2 Demonstrate respectful and empathetic treatment of ALL patients/clients.

- Civility
- Customer service
- Patient satisfaction

Foundation Standard 7: Safety Practices

Identifying existing and potential hazards to clients, co-workers, and self. Employ safe work practices and follow health and safety policies and procedures to prevent injury and illness.

7.1 Infection Control

7.1.2 Differentiate methods of controlling the spread and growth of pathogens.

b. Standard precautions:

- Handwashing
- Gloving
- Personal Protective Equipment (PPE)
- Environmental cleaning

7.2 Personal Safety

7.2.3 Demonstrate and apply the use of personal protective equipment (PPE).

7.4 Common Safety Hazards

7.4.1 Observe all safety standards related to the occupational exposure to hazardous chemicals standard (safety data sheets [SDS]).

7.4.2 Comply with safety signs, symbols, and labels.

Foundation Standard 8: Teamwork Identify roles and responsibilities of individual members as part of the healthcare team.

8.1 Healthcare Teams

8.1.2 Identify characteristics of effective teams:

- Defined roles
- Common purpose
- Effective communication
- Effective leadership
- Measurable processes and outcomes
- Mutual respect
- Shared goals

8.2 Team Member Participation

8.2.1 Recognize methods for building positive team relationships.

8.2.2 Analyze attributes and attitudes of an effective leader.

a. Characteristics:

- Focused and driven

	• Interpersonal skills • Motivates and inspires • Organized and balanced c. Roles: • Communicates vision • Leads change • Manages accountability **Standard 9: Health Maintenance Practices: Differentiate between wellness and disease. Promote disease prevention and model healthy behaviors.** 9.1 Healthy Behaviors 9.1.1 Promote behaviors of health and wellness. • Exercise • Nutrition • Relationships • Sleep habits • Stress management • Weight control 9.1.2 Examine various aspects of behavioral health. • Anxiety • Depression • Substance abuse • Suicide 9.1.3 Describe strategies for prevention of disease. • Community health education outreach programs • Immunizations • Medical, dental, and mental health screenings • Routine physical exams • Stress management 9.2 Healthcare Across the Lifespan 9.2.1 Discuss physical, mental, social and behavioral development and its impact on healthcare.
Aligned Washington State Academic Standards	
Science	**HS. Structure and Function** HS.LS1.2 Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. **HS. Interdependent Relationships in Ecosystems**

	HS.LS2.8 Evaluate the evidence for the role of group behavior on an individuals' and species' chances to survive and reproduce. **HS. Earth and Human Activity** HS.ESS3.4 Evaluate or refine a technological solution that reduces impacts of human activities on natural systems. **HS. Engineering Design** HS.ETS1.1 Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants. HS.ETS1.2 Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering. HS.ETS1.3 Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.

Science and Engineering Practice	Disciplinary Core Idea	Crosscutting Concept
Asking questions (for science) and defining problems (for engineering) Developing and using models Planning and carrying out investigations Analyzing and interpreting data Using mathematics and computational thinking Constructing explanations (for science) and designing solutions (for engineering) Engaging in argument from evidence Obtaining, evaluating, and communicating information	ETS1.A Defining and Delimiting Engineering Problems ETS1.B Developing Possible Solutions LS1.A Structure and Function LS2.C Ecosystems Dynamics, Functioning, and Resilience LS4.D Biodiversity and Humans ESS3.C Human Impacts on Earth Systems	Patterns Cause and Effect Scale, Proportion, and Quantity Systems and System Models Structure and Function Stability and Change