PLTW Medical Interventions
Unit 1 Framework

PLTW Framework - Overview

PLTW Unit Frameworks provide an overview of the levels of understanding that each build upon the higher level: Knowledge and Skills, Objectives, Domains, and Competencies. The most fundamental level of learning is defined by course Knowledge and Skills statements. Each Knowledge and Skills statement reflects specifically what students will know and be able to do after they've had the opportunity to learn the course content. Students apply Knowledge and Skills to achieve learning Objectives, which are skills that directly relate to the workplace or applied academic settings. Objectives are organized by higher-level Domains.

Essential Questions

1.1 - 1 What are medical interventions?

1.1 - 2 What evidence helps scientists determine the source of a potential outbreak of an infectious disease?

1.1 - 3 What factors speed up or slow down the spread of disease through a population?

1.1 - 4 How has advanced technology, such as bioinformatics, changed disease detection?

1.2 - 1 Why are certain classes of antibiotics prescribed to treat specific bacterial infections?

1.2 - 2 Why can bacterial cells transfer genes from one bacterial cell to another and why is this important?

1.2 - 3 How has the development of antibiotics impacted human health?

1.2 - 4 What actions are humans taking that are contributing to bacteria becoming resistant to commonly used antibiotics?

1.3 - 1 How does dysfunction in human anatomy relate to different types of hearing loss?

1.3 - 2 How is hearing loss diagnosed?

1.3 - 3 How is the type of hearing loss related to options for treatment?

1.3 - 4 What are the bioethical concerns related to the use of cochlear implant technology?

1.4 - 1 How do vaccines aid the immune system in fighting off infection?

1.4 - 2 How has vaccination impacted disease trends locally and globally?

1.4 - 3 Why are plasmids important tools in genetic engineering?

1.4 - 4 What role do epidemiologists play in the detection, prevention, and treatment of both chronic and infectious disease?

Competencies, Domains, Objectives, Knowledge and Skills

Transportable Knolwedge and Skills

Core workplace skills that students and workers need to acquire, that can be used across all stages of a career, and that, because of their universal utility, are transportable from job to job, from employer to employer, across the economy.

Career Readiness (CAR):

Biomedical science solutions have global impacts in economic, environmental, and societal contexts.

CAR-A Explain the education and skills required for biomedical science professionals.

CAR-A.1 Identify and describe the different careers of professionals who research, diagnose, and treat medical conditions.

APB:	1.1.1	1.1.2	1.1.3	1.1.4	1.1.5	1.1.6	
	☐	☐	☐	☐	☐	☐	
	1.2.1	1.2.2	1.2.3	1.2.4	1.3.1	1.3.2	1.3.3
	☐	☐	☐	☐	☑	☑	☐

CAR-A.2 Describe the education requirements, salary ranges, professional licensure, skills, and responsibilities for biomedical science professionals.

APB:	1.1.1	1.1.2	1.1.3	1.1.4	1.1.5	1.1.6	
	☐	☐	☐	☐	☐	☐	
	1.2.1	1.2.2	1.2.3	1.2.4	1.3.1	1.3.2	1.3.3
	☐	☐	☐	☐	☐	☑	☐

CAR-A.6 Apply professional standards, as they relate to the habits and characteristics of a biomedical science professional.

APB:	1.1.1	1.1.2	1.1.3	1.1.4	1.1.5	1.1.6	
	☐	☐	☑	☑	☑	☑	
	1.2.1	1.2.2	1.2.3	1.2.4	1.3.1	1.3.2	1.3.3
	☐	☑	☑	☐	☐	☑	☐

CAR-B Describe the societal impact of biomedical science professionals.

CAR-B.1 Describe the impact that biomedical science research and interventions have on society, including disease diagnosis, prevention, and treatment.

APB:	1.1.1	1.1.2	1.1.3	1.1.4	1.1.5	1.1.6	
	☑	☐	☑	☐	☑	☑	
	1.2.1	1.2.2	1.2.3	1.2.4	1.3.1	1.3.2	1.3.3
	☐	☑	☑	☑	☐	☑	☑

CAR-B.2 Describe the global impact of biomedical science solutions.

APB:	1.1.1	1.1.2	1.1.3	1.1.4	1.1.5	1.1.6	
	☑	☐	☐	☐	☐	☐	
	1.2.1	1.2.2	1.2.3	1.2.4	1.3.1	1.3.2	1.3.3
	☐	☑	☑	☐	☐	☐	☐

Competencies, Domains, Objectives, Knowledge and Skills

Communication (COM):

Biomedical science requires effective communication with a variety of audiences using multiple modalities.

COM-A Communicate effectively with a specific audience.

COM-A.1 Follow acceptable formats for writing assignments and professional presentations.

APB:	1.1.1	1.1.2	1.1.3	1.1.4	1.1.5	1.1.6
	☑	☑	☑	☑	☑	☑

1.2.1	1.2.2	1.2.3	1.2.4	1.3.1	1.3.2	1.3.3
☑	☑	☑	☑	☑	☑	☑

COM-A.2 Modify communications to meet the needs of the audience and be appropriate to the situation.

APB:	1.1.1	1.1.2	1.1.3	1.1.4	1.1.5	1.1.6
	☑	☑	☑	☑	☑	☑

1.2.1	1.2.2	1.2.3	1.2.4	1.3.1	1.3.2	1.3.3
☑	☑	☑	☑	☑	☑	☑

COM-A.3 Properly cite references for all reports in an accepted format.

APB:	1.1.1	1.1.2	1.1.3	1.1.4	1.1.5	1.1.6
	☐	☐	☐	☐	☐	☑

1.2.1	1.2.2	1.2.3	1.2.4	1.3.1	1.3.2	1.3.3
☐	☐	☑	☐	☑	☐	☑

COM-A.4 Use proper elements of written communication (spelling, grammar, and formatting).

APB:	1.1.1	1.1.2	1.1.3	1.1.4	1.1.5	1.1.6
	☑	☑	☑	☑	☑	☑

1.2.1	1.2.2	1.2.3	1.2.4	1.3.1	1.3.2	1.3.3
☑	☑	☑	☑	☑	☑	☑

Collaboration (COL):

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

COL-A Create an effective team environment to promote successful goal attainment.

COL-A.1 Respect others' viewpoints.

APB:	1.1.1	1.1.2	1.1.3	1.1.4	1.1.5	1.1.6
	☐	☐	☐	☑	☐	☐

1.2.1	1.2.2	1.2.3	1.2.4	1.3.1	1.3.2	1.3.3
☐	☐	☑	☐	☑	☐	☑

COL-A.2 Demonstrate teamwork and describe the importance of each teammember's contribution to the project.

	1.1.1	1.1.2	1.1.3	1.1.4	1.1.5	1.1.6
APB:	☐	☐	☐	☑	☐	☐

1.2.1	1.2.2	1.2.3	1.2.4	1.3.1	1.3.2	1.3.3
☐	☐	☑	☐	☐	☑	☑

COL-A.3 Identify basic conflict resolution strategies and employ those strategies as necessary and appropriate.

	1.1.1	1.1.2	1.1.3	1.1.4	1.1.5	1.1.6
APB:	☐	☐	☐	☑	☐	☐

1.2.1	1.2.2	1.2.3	1.2.4	1.3.1	1.3.2	1.3.3
☐	☐	☑	☐	☐	☐	☑

Ethical Reasoning and Mindset (ERM):

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

ERM-A Apply professional standards, as they relate to the personal traits of a biomedical science professional.

ERM-A.1 Demonstrate professional standards, such as creativity, perseverance, honesty, integrity, and accountability, which should be exhibited by biomedical professionals.

	1.1.1	1.1.2	1.1.3	1.1.4	1.1.5	1.1.6
APB:	☐	☐	☐	☐	☐	☐

1.2.1	1.2.2	1.2.3	1.2.4	1.3.1	1.3.2	1.3.3
☐	☐	☐	☐	☐	☐	☐

ERM-A.2 Describe the importance of privacy for all individuals.

	1.1.1	1.1.2	1.1.3	1.1.4	1.1.5	1.1.6
APB:	☐	☐	☐	☐	☐	☐

1.2.1	1.2.2	1.2.3	1.2.4	1.3.1	1.3.2	1.3.3
☐	☐	☐	☐	☐	☐	☑

ERM-A.3 Create and support an environment that fosters teamwork, emphasizes quality, and promotes learning.

	1.1.1	1.1.2	1.1.3	1.1.4	1.1.5	1.1.6
APB:	☑	☑	☑	☑	☑	☑

1.2.1	1.2.2	1.2.3	1.2.4	1.3.1	1.3.2	1.3.3
☑	☑	☑	☑	☑	☑	☑

ERM-A.7 Weigh the ethical implications of biomedical science decisions.

	1.1.1	1.1.2	1.1.3	1.1.4	1.1.5	1.1.6
APB:	☐	☐	☐	☐	☐	☐

1.2.1	1.2.2	1.2.3	1.2.4	1.3.1	1.3.2	1.3.3
☐	☐	☐	☐	☐	☐	☑

Competencies, Domains, Objectives, Knowledge and Skills

ERM-B Evaluate ethical and moral issues related to various medical interventions.

ERM-B.4 Describe the bioethical concerns and considerations related to the use of cochlear implant technology.

	1.1.1	1.1.2	1.1.3	1.1.4	1.1.5	1.1.6
APB:	☐	☐	☐	☐	☐	☐

1.2.1	1.2.2	1.2.3	1.2.4	1.3.1	1.3.2	1.3.3
☐	☐	☐	☐	☐	☐	☑

Critical and Creative Problem-Solving (CCP):

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.

CCP-A Devise and execute a plan to solve a problem.

CCP-A.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.

	1.1.1	1.1.2	1.1.3	1.1.4	1.1.5	1.1.6
APB:	☐	☐	☑	☐	☑	☑

1.2.1	1.2.2	1.2.3	1.2.4	1.3.1	1.3.2	1.3.3
☑	☐	☑	☐	☑	☑	☐

CCP-A.2 Devise and execute a plan to solve a problem while considering the impacts of the possible solutions.

	1.1.1	1.1.2	1.1.3	1.1.4	1.1.5	1.1.6
APB:	☐	☐	☐	☑	☐	☑

1.2.1	1.2.2	1.2.3	1.2.4	1.3.1	1.3.2	1.3.3
☐	☐	☑	☐	☐	☐	☐

CCP-A.3 Describe how persistence is a key mindset when identifying problems and/or pursuing solutions.

	1.1.1	1.1.2	1.1.3	1.1.4	1.1.5	1.1.6
APB:	☐	☐	☐	☑	☐	☐

1.2.1	1.2.2	1.2.3	1.2.4	1.3.1	1.3.2	1.3.3
☐	☐	☐	☐	☐	☐	☐

CCP-A.4 Outline how different processes inform biomedical science decisions, improve solutions, and inspire new ideas.

	1.1.1	1.1.2	1.1.3	1.1.4	1.1.5	1.1.6
APB:	☐	☐	☐	☐	☐	☐

1.2.1	1.2.2	1.2.3	1.2.4	1.3.1	1.3.2	1.3.3
☐	☐	☐	☐	☐	☐	☐

CCP-D Explain the value of diverse perspectives in the problem-solving process.

CCP-D.1 Explain how solutions for complex problems can require interdisciplinary collaboration to incorporate a wide range of perspectives and skills.

	1.1.1	1.1.2	1.1.3	1.1.4	1.1.5	1.1.6
APB:	☐	☐	☐	☐	☐	☑

1.2.1	1.2.2	1.2.3	1.2.4	1.3.1	1.3.2	1.3.3
☐	☐	☐	☐	☑	☐	☐

CCP-E Explain how scientists use calculated risks to increase scientific knowledge.

CCP-E.1 Explain the importance of risk taking in performing experiments and developing solutions.

	1.1.1	1.1.2	1.1.3	1.1.4	1.1.5	1.1.6
APB:	☐	☐	☐	☐	☐	☐

1.2.1	1.2.2	1.2.3	1.2.4	1.3.1	1.3.2	1.3.3
☐	☐	☑	☐	☐	☐	☐

CCP-E.2 Identify the pros and cons associated with decisions made in biomedical science.

	1.1.1	1.1.2	1.1.3	1.1.4	1.1.5	1.1.6
APB:	☐	☐	☐	☐	☐	☐

1.2.1	1.2.2	1.2.3	1.2.4	1.3.1	1.3.2	1.3.3
☐	☐	☐	☐	☐	☐	☑

CCP-E.3 Describe how failure, or unexpected results, can produce positive outcomes by improving understanding.

	1.1.1	1.1.2	1.1.3	1.1.4	1.1.5	1.1.6
APB:	☐	☐	☐	☑	☐	☐

1.2.1	1.2.2	1.2.3	1.2.4	1.3.1	1.3.2	1.3.3
☐	☐	☑	☑	☐	☐	☐

Experimental Design (EXD):

An experimental design process is a systematic approach to investigate and gain knowledge.

EXD-A Design and carry out an experiment that investigates a research question.

EXD-A.1 Develop a testable hypothesis and design an experimental protocol that evaluates its validity.

	1.1.1	1.1.2	1.1.3	1.1.4	1.1.5	1.1.6
APB:	☐	☐	☐	☑	☐	☐

1.2.1	1.2.2	1.2.3	1.2.4	1.3.1	1.3.2	1.3.3
☐	☐	☐	☐	☐	☐	☐

EXD-A.3 Identify and explain the purpose and importance of experimental controls.

	1.1.1	1.1.2	1.1.3	1.1.4	1.1.5	1.1.6
APB:	☐	☐	☐	☐	☐	☐

1.2.1	1.2.2	1.2.3	1.2.4	1.3.1	1.3.2	1.3.3
☐	☑	☑	☐	☐	☐	☐

EXD-A.4 Maintain a detailed repeatable account of an experiment in a physical or digital laboratory notebook.

APB:	1.1.1	1.1.2	1.1.3	1.1.4	1.1.5	1.1.6
	☐	☐	☐	☑	☑	☐

1.2.1	1.2.2	1.2.3	1.2.4	1.3.1	1.3.2	1.3.3
☐	☑	☑	☑	☐	☐	☐

EXD-A.5 Conduct background research using credible sources to identify and investigate a relevant research question.

APB:	1.1.1	1.1.2	1.1.3	1.1.4	1.1.5	1.1.6
	☐	☐	☐	☐	☑	☐

1.2.1	1.2.2	1.2.3	1.2.4	1.3.1	1.3.2	1.3.3
☐	☐	☑	☐	☐	☐	☐

EXD-A.6 Select and use appropriate equipment to conduct experiments.

APB:	1.1.1	1.1.2	1.1.3	1.1.4	1.1.5	1.1.6
	☐	☐	☐	☑	☑	☐

1.2.1	1.2.2	1.2.3	1.2.4	1.3.1	1.3.2	1.3.3
☐	☑	☑	☐	☐	☐	☐

EXD-A.7 Identify possible sources of errors, and when appropriate, redesign and repeat the experiment.

APB:	1.1.1	1.1.2	1.1.3	1.1.4	1.1.5	1.1.6
	☐	☐	☐	☐	☑	☐

1.2.1	1.2.2	1.2.3	1.2.4	1.3.1	1.3.2	1.3.3
☐	☐	☑	☐	☐	☐	☐

EXD-A.8 Communicate the findings of an experiment in oral and written (including digital) form.

APB:	1.1.1	1.1.2	1.1.3	1.1.4	1.1.5	1.1.6
	☐	☐	☐	☑	☑	☐

1.2.1	1.2.2	1.2.3	1.2.4	1.3.1	1.3.2	1.3.3
☐	☑	☑	☑	☐	☐	☐

EXD-A.9 Describe why experimental design is a continual process.

APB:	1.1.1	1.1.2	1.1.3	1.1.4	1.1.5	1.1.6
	☐	☐	☐	☑	☐	☐

1.2.1	1.2.2	1.2.3	1.2.4	1.3.1	1.3.2	1.3.3
☐	☐	☐	☐	☐	☐	☐

EXD-B Collect and analyze data to draw conclusions.

EXD-B.1 Demonstrates an ability to accurately follow a lab protocol.

APB:	1.1.1	1.1.2	1.1.3	1.1.4	1.1.5	1.1.6
	☐	☐	☐	☐	☑	☐

1.2.1	1.2.2	1.2.3	1.2.4	1.3.1	1.3.2	1.3.3
☐	☑	☑	☑	☐	☐	☐

EXD-B.2 Display data appropriately and accurately in multiple formats (graphs, tables, diagrams).

	1.1.1	1.1.2	1.1.3	1.1.4	1.1.5	1.1.6
APB:	☐	☐	☐	☑	☑	☐

1.2.1	1.2.2	1.2.3	1.2.4	1.3.1	1.3.2	1.3.3
☐	☑	☑	☑	☐	☐	☐

EXD-B.3 Perform necessary data calculations to analyze experimental data.

	1.1.1	1.1.2	1.1.3	1.1.4	1.1.5	1.1.6
APB:	☐	☐	☐	☐	☑	☐

1.2.1	1.2.2	1.2.3	1.2.4	1.3.1	1.3.2	1.3.3
☐	☑	☐	☑	☐	☑	☐

EXD-B.4 Draw logical conclusions from experimental data.

	1.1.1	1.1.2	1.1.3	1.1.4	1.1.5	1.1.6
APB:	☐	☐	☐	☑	☑	☐

1.2.1	1.2.2	1.2.3	1.2.4	1.3.1	1.3.2	1.3.3
☐	☑	☑	☑	☐	☑	☐

Competencies, Domains, Objectives, Knowledge and Skills

Technical Knowledge and Skills

Every career field requires technical literacy and career-specific knowledge and skills to support professional practice.

General Laboratory Practices (GLP):

The practice of biomedical sciences requires the application of common tools, techniques, and technologies to solve problems.

GLP-A Select and use appropriate tools, technology, and/or software for experimental and clinical data collection and analysis.

GLP-A.2 Describe and apply aseptic techniques for handling and culturing microbial samples.

	1.1.1	1.1.2	1.1.3	1.1.4	1.1.5	1.1.6							
APB:	☐	☐	☐	☐	☐	☐							
	1.2.1	1.2.2	1.2.3	1.2.4			1.3.1	1.3.2	1.3.3				
	☐	☑	☑	☐			☐	☐	☐				

GLP-A.4 Describe the various laboratory methods that are used to manufacture vaccines.

	1.1.1	1.1.2	1.1.3	1.1.4	1.1.5	1.1.6							
APB:	☐	☐	☐	☐	☐	☐							
	1.2.1	1.2.2	1.2.3	1.2.4			1.3.1	1.3.2	1.3.3				
	☐	☐	☐	☐			☐	☐	☐				

GLP-A.6 Select and use appropriate technology (probes and sensors) and software to collect and analyze physiological data.

	1.1.1	1.1.2	1.1.3	1.1.4	1.1.5	1.1.6							
APB:	☐	☐	☐	☐	☐	☐							
	1.2.1	1.2.2	1.2.3	1.2.4			1.3.1	1.3.2	1.3.3				
	☐	☐	☐	☐			☐	☑	☐				

Analysis of Medical Evidence (AME):

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

AME-B Collect and analyze medical information to evaluate the cause, prevention, and treatment of disease.

AME-B.1 Analyze connections between patients in an outbreak situation, determine appropriate tests to identify the pathogen, and determine the steps for treatment and containment.

	1.1.1	1.1.2	1.1.3	1.1.4	1.1.5	1.1.6							
APB:	☐	☑	☑	☐	☑	☑							
	1.2.1	1.2.2	1.2.3	1.2.4			1.3.1	1.3.2	1.3.3				
	☐	☐	☐	☐			☐	☐	☐				

AME-B.2 Interpret concentration results of a quantitative antigen-based assay for various patients to infer a path of infection.

APB:	1.1.1	1.1.2	1.1.3	1.1.4	1.1.5	1.1.6
	☐	☐	☐	☐	☑	☐

1.2.1	1.2.2	1.2.3	1.2.4	1.3.1	1.3.2	1.3.3
☐	☐	☐	☐	☐	☐	☐

AME-B.3 Explain the impact vaccines have had on disease occurrence.

APB:	1.1.1	1.1.2	1.1.3	1.1.4	1.1.5	1.1.6
	☐	☐	☐	☐	☐	☐

1.2.1	1.2.2	1.2.3	1.2.4	1.3.1	1.3.2	1.3.3
☐	☐	☐	☐	☐	☐	☐

AME-B.6 Analyze patient symptoms and medical evidence to diagnose a fictional patient.

APB:	1.1.1	1.1.2	1.1.3	1.1.4	1.1.5	1.1.6
	☐	☐	☐	☐	☑	☑

1.2.1	1.2.2	1.2.3	1.2.4	1.3.1	1.3.2	1.3.3
☐	☐	☐	☐	☑	☑	☐

AME-B.7 Analyze disease data, design epidemiologic studies, and evaluate prevention and therapy for chronic and infectious diseases.

APB:	1.1.1	1.1.2	1.1.3	1.1.4	1.1.5	1.1.6
	☐	☐	☐	☐	☑	☑

1.2.1	1.2.2	1.2.3	1.2.4	1.3.1	1.3.2	1.3.3
☐	☐	☐	☐	☐	☐	☐

Diagnostic Testing (DIT):

Biomedical science professionals understand and use diagnostic tests to diagnose disorders and/or disease within the human body.

DIT-A Describe how diagnostic tests are used to assess the health of an individual and/or indicate the presence of disease.

DIT-A.1 Explain the principles of the Enzyme-linked Immunosorbent Assay (ELISA) test and interpret ELISA results to detect the presence and concentration of a pathogen.

APB:	1.1.1	1.1.2	1.1.3	1.1.4	1.1.5	1.1.6
	☐	☐	☐	☐	☑	☐

1.2.1	1.2.2	1.2.3	1.2.4	1.3.1	1.3.2	1.3.3
☐	☐	☐	☐	☐	☐	☐

DIT-A.2 Determine the appropriate hearing tests to diagnose sensorineural and conductive hearing loss.

APB:	1.1.1	1.1.2	1.1.3	1.1.4	1.1.5	1.1.6
	☐	☐	☐	☐	☐	☐

1.2.1	1.2.2	1.2.3	1.2.4	1.3.1	1.3.2	1.3.3
☐	☐	☐	☐	☑	☑	☐

DIT-A.3 Interpret audiograms to identify different types of hearing loss and select appropriate interventions.

APB:	1.1.1	1.1.2	1.1.3	1.1.4	1.1.5	1.1.6
	☐	☐	☐	☐	☐	☐

1.2.1	1.2.2	1.2.3	1.2.4	1.3.1	1.3.2	1.3.3
☐	☐	☐	☐	☐	☑	☐

Disease Physiology (DPH):

Biomedical science professionals apply their understanding of how malfunction(s) within the body lead to disease, and use this information to identify symptoms, and to diagnose, treat, and prevent disease.

DPH-A Explain the physiological processes associated with disease or injury.

DPH-A.1 Relate the structure of the ear to function and explain the pathophysiology of hearing loss.

APB:	1.1.1	1.1.2	1.1.3	1.1.4	1.1.5	1.1.6
	☐	☐	☐	☐	☐	☐

1.2.1	1.2.2	1.2.3	1.2.4	1.3.1	1.3.2	1.3.3
☐	☐	☐	☐	☑	☑	☐

Disease Prevention and Treatment (DPT):

Biomedical science professionals design and use medical interventions to improve health or treat disease.

DPT-A Describe how medical interventions are used to improve health or alter the course of an illness.

DPT-A.8 Describe how vaccinations protect against illness.

APB:	1.1.1	1.1.2	1.1.3	1.1.4	1.1.5	1.1.6
	☐	☐	☐	☐	☐	☐

1.2.1	1.2.2	1.2.3	1.2.4	1.3.1	1.3.2	1.3.3
☐	☐	☐	☐	☐	☐	☐

Microbiology (MIB):

Biomedical scientists study and manipulate microorganisms to study their properties, understand their role in infectious disease, and use them as vectors for genetic engineering.

MIB-B Explain the structure and function of bacterial cells and how antibiotics work to disrupt their growth.

MIB-B.1 Describe the function of the major structures in the bacterial cell and how these structures provide the cell defense.

APB:	1.1.1	1.1.2	1.1.3	1.1.4	1.1.5	1.1.6
	☐	☐	☐	☐	☐	☐

1.2.1	1.2.2	1.2.3	1.2.4	1.3.1	1.3.2	1.3.3
☑	☐	☐	☐	☐	☐	☐

MIB-B.2 Explain how the four main classes of antibiotics target specific bacterial structures and biological pathways.

APB:	1.1.1	1.1.2	1.1.3	1.1.4	1.1.5	1.1.6
	☐	☐	☐	☐	☐	☐

1.2.1	1.2.2	1.2.3	1.2.4	1.3.1	1.3.2	1.3.3
☑	☐	☐	☐	☐	☐	☐

MIB-B.3 Compare the three types of bacterial gene transfer and the relationship of this transfer to antibiotic resistance.

APB:	1.1.1	1.1.2	1.1.3	1.1.4	1.1.5	1.1.6
	☐	☐	☐	☐	☐	☐

1.2.1	1.2.2	1.2.3	1.2.4	1.3.1	1.3.2	1.3.3
☐	☐	☑	☐	☐	☐	☐

MIB-B.4 Describe the ways in which the misuse of antibiotics can impact bacterial growth.

APB:	1.1.1	1.1.2	1.1.3	1.1.4	1.1.5	1.1.6
	☐	☐	☐	☐	☐	☐

1.2.1	1.2.2	1.2.3	1.2.4	1.3.1	1.3.2	1.3.3
☐	☐	☑	☑	☐	☐	☐

Molecular Biology and Genetics (MBG):

DNA analysis allows scientists to understand the causes and treatment of genetic disease, identify disease pathogens, as well as biomanufacture protein products.

MBG-D Select and use appropriate tools, techniques, and/or technologies to analyze genetic information and diagnose disease.

MBG-D.3 Describe how computer database technology can be used to analyze genetic information.

APB:	1.1.1	1.1.2	1.1.3	1.1.4	1.1.5	1.1.6
	☐	☐	☑	☐	☐	☐

1.2.1	1.2.2	1.2.3	1.2.4	1.3.1	1.3.2	1.3.3
☐	☐	☐	☐	☐	☐	☐

MBG-D.4 Use computer database technology to analyze genetic information and interpret the results.

APB:	1.1.1	1.1.2	1.1.3	1.1.4	1.1.5	1.1.6
	☐	☐	☑	☐	☐	☑

1.2.1	1.2.2	1.2.3	1.2.4	1.3.1	1.3.2	1.3.3
☐	☐	☐	☐	☐	☐	☐

Competencies, Domains, Objectives, Knowledge and Skills

MBG-F Explain how recombinant DNA technology allows scientists to custom-designed bacteria that can produce a variety of important protein products.

MBG-F.1 Explain how molecular tools, such as ligase and restriction enzymes, are used to cut and paste DNA from different sources.

APB: 1.1.1 ☐ 1.1.2 ☐ 1.1.3 ☐ 1.1.4 ☐ 1.1.5 ☐ 1.1.6 ☐

1.2.1 ☐ 1.2.2 ☐ 1.2.3 ☐ 1.2.4 ☐ | 1.3.1 ☐ 1.3.2 ☐ 1.3.3 ☐

MBG-F.2 Identify which restriction enzyme to use for a given situation.

APB: 1.1.1 ☐ 1.1.2 ☐ 1.1.3 ☐ 1.1.4 ☐ 1.1.5 ☐ 1.1.6 ☐

1.2.1 ☐ 1.2.2 ☐ 1.2.3 ☐ 1.2.4 ☐ | 1.3.1 ☐ 1.3.2 ☐ 1.3.3 ☐

MBG-F.4 Describe how recombinant DNA technology can be used to produce vaccines.

APB: 1.1.1 ☐ 1.1.2 ☐ 1.1.3 ☐ 1.1.4 ☐ 1.1.5 ☐ 1.1.6 ☐

1.2.1 ☐ 1.2.2 ☐ 1.2.3 ☐ 1.2.4 ☐ | 1.3.1 ☐ 1.3.2 ☐ 1.3.3 ☐

MBG-F.5 Insert plasmid DNA into bacterial cells in the laboratory and observe how this genetic information relates to new traits of the bacteria.

APB: 1.1.1 ☐ 1.1.2 ☐ 1.1.3 ☐ 1.1.4 ☐ 1.1.5 ☐ 1.1.6 ☐

1.2.1 ☐ 1.2.2 ☐ 1.2.3 ☐ 1.2.4 ☐ | 1.3.1 ☐ 1.3.2 ☐ 1.3.3 ☐