

Biotechnology 1 G/T Essential Curriculum

Unit 1- Introduction to Biotech through Forensics

Unit Goal: Connect an overview of mathematical, laboratory, and processing skills to the characteristics of effective scientific research and development of scientific products.

Student Learning Objectives:

Use metric units to convey equivalent values in applied units as used in the science laboratory setting.

Use best laboratory practices to safely handle reagents and operate laboratory equipment.

Accurately use the measuring tools of the science laboratory to dispense consistence volumes of liquids.

Use laboratory analysis to assess the significance of evidence found at a crime scene.

Use sound scientific protocols and approaches to effectively analysis evidence from a crime scene.

Make connections between the outcomes of laboratory analysis and the actions at the scene of a crime.

Lab Safety

Lab Documentation

Metric Unit Conversions

Pipetting

Solution Terminology

Percent Solutions

Chromatography

Antibody/Antigen Testing

Gel Electrophoresis

Unit 2- Bacterial Molecular Biology

Unit Goal: Demonstrate how microbial sampling, culturing, and observations can be used to analyze the health of an environment.

Student Learning Objectives:

Collect samples of microbes from the environment and grow them in laboratory cultures.

Plate out bacterial cultures using uniform spreading and streaking techniques.

Use aseptic technique when handling and transferring microbial samples.

Identify useful microorganisms to act as indicator species for specific environmental conditions.

Recognize that organization and complexity of the microbial world mirrors the macroecosystem hierarchy.

Use biotechnology techniques to genetically modify bacteria for specific expression.

Compare and Contrast 2 different bacterial transformation techniques.

Microbes

Water pollution

Pond Water Ecology

Aseptic Technique

Streaking for Isolation

Bacterial Reproduction/Conjugation

Bacterial Transformation (Chemical/Heat Shock, Electroporation)

Unit 3 – DNA

Unit Goal: Relate the genetic code to regulation and control mechanisms that define gene expression.

Student Learning Objectives:

Identify the component of the central dogma of genetics.

Connect gene expression with mechanisms of genetic inheritance.

Use patterns produced by restriction digest of linear DNA to indicate a phenotype and predict a genotype.

Use techniques in biotechnology to study DNA.

Central dogma	Restriction Analysis	DNA/Restriction Enzyme Challenge
PCR and SNPs	Restriction Endonucleases	Mendelian Genetics
Genetic Counseling	Prenatal Diagnosis	Types of Inheritance

Unit 4 – RNA

Unit Goal: Use RNA-based biotechnology and bioinformatics techniques confirm the identity of a virus.

Student Learning Objectives:

Identify the methods for inoculating plants with a virus.

Relate importance of virology to agricultural and horticultural endeavors.

Use computer based design strategies to research primer sequence identity.

Apply understanding of RNA-DNA relationship to create cDNA.

Distinguish between viral infection types and symptoms.

Connect viral classifications with methods of analysis.

Identify the harmful and beneficial effects of viral infections.

Connect the mechanisms of treating viral infections with the characteristics of the virus lifecycle.

Plant Virus Inoculation	Bioinformatics (Databases, Primer Design,)	RNA Extraction
Serial Dilutions	Reverse-Transcriptase PCR (RT-PCR)	

Unit 5 – Proteins

Unit Goal: Employ knowledge of protein structure, function, and chemical properties to perform analysis of proteins using biotechnology techniques.

Student Learning Objectives:

Isolate and purify proteins using chromatography techniques.

Determine purity and concentration of protein sample extract using spectrophotometry and gel electrophoresis.

Relate epigenetic processes to modification and regulation of proteins.

Connect mis-folding of proteins to disease processes.

Use hybridization techniques to identify the presence of a specific protein.

Dilutions	Column Chromatography I (HIC)	Spectrophotometry
Standard Curve	Bradford Assay	PAGE Gel Electrophoresis
DAS-ELISA	Epigenetics	Protein Structure and Function
Protein Synthesis Regulation	Prions- Infectious Proteins	Monoclonal/Polyclonal Antibodies
Western Blot		

Unit 6 – Genetic Recombination/Engineering

Unit Goal: Exhibit independence and competence in the biotechnology laboratory setting by accurately applying skills and acquired knowledge of microbiology, molecular biology and genetics.

Student Learning Objectives:

Modify the genetic profile of a bacteria to change its gene expression.

Use patterns produced by restriction digest and gel electrophoresis to verify genetic modification.

Plate out bacterial cultures using uniform spreading and streaking techniques.

Use aseptic technique when handling and transferring microbial samples.

Relate epigenetic processes to regulation of protein expression.

Extraction of Plasmid DNA	Gel Electrophoresis	Recombinant Plasmids
Bacterial Transformation	Bacterial Culturing	Restriction Analysis/Mapping (Plasmid)