CTE
Career & Technical Education

Biotechnology 1 & 2
Scope & Sequence: Year 1

Semester 1

Quarter 1

Technical Standards: 1, 2, 3, 9, 10
Professional Standards: 1-3

Unit 1

Lab Safety, Lab Operations & Microscopy

- Explore the fundamentals of lab safety.
- Understand and demonstrate Standard Operating Procedures in a Biotechnology Lab.
- Cover the fundamentals of Microscopy as it relates to and introduces Cellular Biology.
- Explore Cell Structure, Function and Diversity.

Technical Standards: 1, 2, 3, 7, 9, 10
Professional Standards: 1-4

Unit 2

Volumetric Analysis

- Explore fundamentals of Serological Pipet, Transfer Pipet and Micropipet proficiency.
- Demonstrate proficiency with meniscus, graduated cylinders.
- Demonstrate proficiency with standard biotechnology units for volume and mass, review averages and standard deviation, practice of unit conversion and dimensional analysis.

Quarter 2

Technical Standards: 7, 9, 11, 13
Professional Standards: 1-4

Unit 3

Making Solutions and Media (Buffers and Broth)

- Introduce the concept of C1V1=C2V2 in Dilutions Pipet Lab.
- Cover basic dilutions calculations and demonstrate proficiency.
- Cover types of media in microbiology and biotechnology.
- Perform mass to volume for media calculations and % solutions.

Technical Standards: 7, 9, 10, 11, 13
Professional Standards: 1-5

Unit 4

Microbiology

- Make LB Agar Plates.
- Understand and demonstrate sterile technique.
- Explore microbial diversity.
- Cover bacterial collection techniques, incubation, biohazard, Biosafety Cabinet (or laminar flow hood) and autoclaving.
- Cover types of Biosafety Laboratory Levels.

Technical Standards: 3, 9, 10, 11, 13, 14
Professional Standards: 3-5

Unit 5

Experimental Design

- Review fundamentals of experimental design.
- Student explores experimental design demonstrating proficiency with appropriate controls and variables.

Semester 2

Quarter 3

Technical Standards: 3, 8, 9, 10, 13
Professional Standards: 1-5

Unit 6

DNA, RNA, Proteins & The Central Dogma

- Explore structure and function of DNA with historical perspective.
- Explore the Central Dogma by introducing Replication, Transcription, Translation and Gene Regulation.
- Explore the importance and diversity of proteins.

Technical Standards: 3, 7, 9, 10, 12,
Professional Standards: 1-5

Unit 7

Gel Electrophoresis

- Learn about and explore the technique of Gel Electrophoresis and its applications to Biotechnology and Forensics.
- Learn how to make Agarose and cast an Agarose Gel.
- Demonstrate proficiency in casting gel, setting up Electrophoresis apparatus, loading and running a sample.

Technical Standards: 10, 12, 12.1, 13
Professional Standards: 1-5

Unit 8

Restriction Enzymes & Genetic Engineering

- Cover restriction enzymes as they relate to genetic engineering and biotechnology.
- Perform restriction enzyme digest in Lambda DNA Lab.

Quarter 4

Technical Standards: 11, 12, 13, 14
Professional Standards: 1-5

Unit 9

pGLO Transformation Lab, PCR & Bioinformatics

- Introduce plasmids as they relate to biotechnology and genetic engineering
- Demonstrate understanding and proficiency in culturing and incubating bacteria.
- Perform heat induced transformation.
- Confirm transformation with Polymerase Chain Reaction (PCR).
- Introduce methods of DNA sequencing and Bioinformatics.
- Demonstrate understanding of gene regulation, inhibitors and promoters by inducing cells to express GFP with arabinose.

Technical Standards: 1-14
Professional Standards: 1-5

*Unit 10

Extension/Enrichment Topics and Labs (As time permits)

- Bioinformatics (BLAST)
- DNA Sequencing
- Protein Electrophoresis
- Protein Assay

Dual Enrollment opportunity with University of Arizona MCB101

TUCSON UNIFIED SCHOOL DISTRICT

51% of the entire program will be conducted in a lab setting. The lab consists of hand-on learning projects and experiences where student will practice the necessary skills to complete the current unit study.