

Biomedical Science Program: Scope & Sequence

Year 1- Semester 1

BIO101 Bioscience I

(91 days)

District Pre-Assessment

Unit 1: Introduction to Biotechnology

(5 days- 4 Classroom, 1 Lab)

- Scavenger Hunt
- Discovering Cells
- Cell Organelle
- BCLT 1

Professional Skills: 1.0, 2.0, 3.0, 4.0

Academic Standards: ELA.11-12.L.4, ELA.11-12.RI.2, ELA.11-12.RI.10

Technical Standards: 3, 7

Work-based Learning: Career Research, Simulated Labs

CTSO Integration (Leadership Skills): Introduction to HOSA

OSHA 10 Certification

Unit 2: Laboratory Safety

(5 days- 4 Classroom, 1 Lab)

- Chemicals, glassware, labeling, storing, symbols
- Chem Math
- Discovering Cells

Professional Skills: 1.0, 2.0, 3.0, 4.0

Academic Standards: ELA.11-12.L.4, ELA.11-12.RI.2, ELA.11-12.RI.10

Technical Standard: 1

Work-based Learning: Simulated Labs, *OSHA 10

CTSO Integration (Leadership Skills): HOSA Officer Visit, CTSO Meeting

* Occupational Safety and Health Administration (OSHA)- Will be trained during the program, scheduled date and time subject to change.

Unit 3: Biosafety and Sterility

(5 days- 4 Classroom, 1 Lab)

- Career Info Sheet
- Blood Typing
- Cholesterol Diagnosis
- ABORh Genetics

Professional Skills: 1.0, 2.0, 3.0, 4.0

Academic Standards: ELA.11-12.L.4, ELA.11-12.RI.2, ELA.11-12.RI.10

Technical Standard: 2, 7

Work-based Learning: Simulated Labs

CTSO Integration (Leadership Skills): Officer Elections, CTSO Meeting, CTSO Officer Training

Unit 4: Biotechnology by the Numbers

(15 days- 4 Classroom, 1 Lab)

- Micropipetting Basics
- Measurement Lab
- Serial Dilutions
- Measurement, micropipettes, and centrifuge
- Detection of Influenza Virus
- Math for Nurses

Professional Skills: 1.0, 2.0, 3.0, 4.0

Academic Standards: ELA.11-12.L.4, ELA.11-12.RI.2, ELA.11-12.RI.10, Math: 5.NF.B6, 6.RP.A.3, 7.EE.B.3,A-CED.A.1

Technical Standard: 13

Work-based Learning: Simulated Labs

CTSO Integration (Leadership Skills): CTSO Meeting

HOSA Fall Leadership Conference

Unit 5: The Molecule of Life

(15 days- 4 Classroom, 1 Lab)

- Monohybrid Cross
- DNA Fingerprinting
- DNA Paternity
- Sickle Cell Southern Blot
- Nucleic Acid COVID-19
- Chromosome Spread

Professional Skills: 1.0, 2.0, 3.0, 4.0

Academic Standards: ELA.11-12.L.4, ELA.11-12.RI.2, ELA.11-12.RI.10

Technical Standard: 10, 12

Work-based Learning: Simulated Labs

CTSO Integration (Leadership Skills): CTSO Meeting, Fall Leadership Conference

Unit 6: Gene Expression

(15 days- 4 Classroom, 1 Lab)

- Sickle Cell Gene Detection
- Purification of Proteins

Professional Skills: 1.0, 2.0, 3.0, 4.0

Academic Standards: ELA.11-12.L.4, ELA.11-12.RI.2, ELA.11-12.RI.10

Technical Standard: 4, 12

Work-based Learning: Simulated Labs

CTSO Integration (Leadership Skills): CTSO Meeting

Unit 7: Genomics and Precision Medicine

(15 days- 4 Classroom, 1 Lab)

- Mitosis Escape Room
- Zombie Genes
- Stages of the Cell Cycle
- Illumina Genomic Discoveries

Professional Skills: 1.0, 2.0, 3.0, 4.0

Academic Standards: ELA.11-12.L.4, ELA.11-12.RI.2,
ELA.11-12.RI.10

Technical Standard: 10

Work-based Learning: Simulated Labs

CTSO Integration (Leadership Skills): CTSO Meeting, HOSA
Regional Online Testing

HOSA Regional Online Testing

Unit 8: Experimental Design

(10 days- 4 Classroom, 1 Lab)

- Research
- Integumentary
- Scientific Method

Professional Skills: 1.0, 2.0, 3.0, 4.0, 5.0, 8.0

Academic Standards: ELA.11-12.L.4, ELA.11-12.RI.2,
ELA.11-12.RI.10

Technical Standard: 2, 3, 4, 11

Work-based Learning: Simulated Labs

CTSO Integration (Leadership Skills): Regional Online Testing,
CTSO Meeting

Unit 9: Review & Exam

(10 days- 4 Classroom, 1 Lab)

- Elf, Gingerbread, Snowman Genetics
- Animal Cells

Professional Skills: 1.0, 2.0, 3.0, 4.0, 5.0

Academic Standards: ELA.11-12.L.4, ELA.11-12.RI.2,
ELA.11-12.RI.10

Technical Standard:

Work-based Learning: Simulated Labs

CTSO Integration (Leadership Skills): CTSO Meeting, Online
Regional Testing

Semester Exam

Year 1- Semester 2

BIO102 Bioscience II

(86 days)

Unit 1: Genetics and Beyond: Epigenetics

(15 days- 10 Classroom, 5 Lab)

- Diabetes
 - DNA Fingerprinting by Restriction Enzymes
- Professional Skills: 1.0, 2.0, 3.0, 4.0
Academic Standards: ELA.11-12.L.4, ELA.11-12.RI.2, ELA.11-12.RI.10
Technical Standard: 4, 7
Work-based Learning: Simulated Labs
CTSO Integration (Leadership Skills): State Online Testing, CTSO Meeting

HOSA State Online Testing

Unit 2: STEM Cells: Home for the Future

(10 days- 6 Classroom, 4 Lab)

- Blood Based Cancers
 - NOVA Stem
- Professional Skills: 1.0, 2.0, 3.0, 4.0
Academic Standards: ELA.11-12.L.4, ELA.11-12.RI.2, ELA.11-12.RI.10
Technical Standard: 5
Work-based Learning: Simulated Labs
CTSO Integration (Leadership Skills): HOSA Region 2 Conference Prep, CTSO Meeting

HOSA Regional Conference

Unit 3: Genetic Engineering: The Dawn of CRISPR

(10 days- 6 Classroom, 4 Lab)

- CRISPR Research
 - CRISPR Activity
- Professional Skills: 1.0, 2.0, 3.0, 4.0
Academic Standards: ELA.11-12.L.4, ELA.11-12.RI.2, ELA.11-12.RI.10
Technical Standard: N/A, BASE Standard
Work-based Learning: Simulated Labs
CTSO Integration (Leadership Skills): CTSO Meeting

Unit 4: Immunology: Our Great Defender

(15 days- 10 Classroom, 5 Lab)

- Intro to ELISA
 - ELISA Covid
 - Single ELISA
 - Quant ELISA
- Professional Skills: 1.0, 2.0, 3.0, 4.0
Academic Standards: ELA.11-12.L.4, ELA.11-12.RI.2, ELA.11-12.RI.10
Technical Standard: 4, 7
Work-based Learning: Simulated Labs
CTSO Integration (Leadership Skills): CTSO Meeting

Unit 5: Model Organisms

(15 days- 10 Classroom, 4 Lab)

- Bacterial Fingerprinting
 - ID Bacteria
 - Chromatography/Vaping
- Professional Skills: 1.0, 2.0, 3.0, 4.0, 8.0
Academic Standards: ELA.11-12.L.4, ELA.11-12.RI.2, ELA.11-12.RI.10
Technical Standard: 6, 8
Work-based Learning: Simulated Labs
CTSO Integration (Leadership Skills): State Leadership Conference Prep, CTSO Meeting

HOSA State Leadership Conference

Unit 6: Biotechnology in Agriculture and the Environment

(10 days- 6 Classroom, 4 Lab)

- Purification GFP
 - BIO Fuels
 - GMO
- Professional Skills: 1.0, 2.0, 3.0, 4.0
Academic Standards: ELA.11-12.L.4, ELA.11-12.RI.2, ELA.11-12.RI.10
Technical Standard: 5
Work-based Learning: Simulated Labs
CTSO Integration (Leadership Skills): CTSO Meeting

Unit 7: Starting Your Job in the Industry

(10 days- 9 Classroom, 1 Lab)

- DNA PCR Amplification
 - Diff Bioeng/biomed
- Professional Skills: 1.0, 2.0, 3.0, 4.0, 7.0, 8.0, 9.0
Academic Standards: ELA.11-12.L.4, ELA.11-12.RI.2, ELA.11-12.RI.10, ELA.11-12.W.4, ELA.11-12.W.5
Technical Standard: 3, 7, 12
Work-based Learning: Simulated Labs, Career Preparation
CTSO Integration (Leadership Skills): CTSO Meeting

Unit 8: Scientific Communication in Biotechnology

(5 days- 4 Classroom, 1 Lab)

- Body Systems

Professional Skills: 1.0, 2.0, 3.0, 4.0

Academic Standards: ELA.11-12.L.4, ELA.11-12.RI.2, ELA.11-12.RI.10

Technical Standard: 11

Work-based Learning: Simulated Labs

CTSO Integration (Leadership Skills): CTSO Meeting, HOSA Banquet

Unit 9: Review & Exam

(5 days- 4 Classroom, 1 Lab)

- Research

- Sickle Cell Southern Blot

Professional Skills: 1.0, 2.0, 3.0, 4.0, 5.0

Academic Standards: ELA.11-12.L.4, ELA.11-12.RI.2, ELA.11-12.RI.10, ELA.11-12.SL.3, ELA.11-12.W.8

Technical Standard:

Work-based Learning: Simulated Labs

CTSO Integration (Leadership Skills): CTSO Meeting

District Post-Assessment

Year 2- Semester 1

BIO201 Bioscience III

(91 Days)

Unit 1: Managing a Biotech Laboratory

(13 days- 9 Classroom, 4 Lab)

- Safety in the Laboratory
- Every Lab Member is Responsible
- Labeling and Storage of Laboratory Materials
- Keeping Inventory of Supplies
- Use and Maintenance of Laboratory Equipment

Professional Skills: 1.0, 2.0, 3.0, 4.0, 7.0, 8.0, 9.0

Academic Standards: ELA.11-12.W4

Technical Standard: 1.2, 1.3, 1.4, 1.5, 2.1, 2.2, 2.3, 5.1, 5.2, 5.4, 5.10

Work-based Learning: Simulated Labs

CTSO Integration (Leadership Skills): HOSA Officer Elections,

HOSA Research Assignment, Choose Competition, HOSA

T-shirt Design, Program Of Work, Bylaws, Submission Of All

Chapter Forms, CTSO Officer Training, HOSA Officer Visit

Unit 2: Experimental Design

(9 days- 8 Classroom, 1 Lab)

- Research in Biotechnology
- A Good Experimental Design
- The Green Fluorescent Protein
 - Avoiding Bias in Data
 - Statistics Remove the Guesswork

Professional Skills: 1.0, 3.0, 5.0, 8.0

Academic Standards: ELA.11-12. W.7

Technical Standard: 2.5, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 5.2, 5.10

Work-based Learning: Simulated Labs

CTSO Integration (Leadership Skills): CTSO Meeting

Unit 3: Spectrophotometer and Microscope

(14 days- 5 Classroom, 9 Lab)

- Essential Lab Equipment
- Understanding Spectroscopy
- Using Spectrophotometers to Analyze Solutions
 - Microscopy in the Biotech Lab
 - Applications of Spectroscopy

Professional Skills: 1.0, 2.0

Academic Standards: ELA.11-12.R1.10, 6.EE.A.2, 7.EE.B.3

Technical Standard: 3.1, 7.5, 7.9, 13.1, 13.4

Work-based Learning: Simulated Labs

CTSO Integration (Leadership Skills): CTSO/HOSA Week?

(Program Rotations), CTSO Meeting

Unit 4: Preparing Solutions

(13 days- 6 Classroom, 7 Lab)

- What is a Solution?
- Making a 1 Molar Solution
- Choosing the Right Glassware

- Dilutions of Stock Solutions
- The Beauty of Buffers

Professional Skills: 1.0, 2.0

Academic Standards: 5.NF.B.3, 5.NF.B.6, 5.NF.B.7, 6.RP.A.3, 6.EE. A.2, 7.RP.A.3, A-CED.A.1

Technical Standard: 7.2, 7.3, 7.4, 7.8, 10.1, 10.2, 10.3, 10.4, 10.5, 10.6

Work-based Learning: Simulated Labs

CTSO Integration (Leadership Skills): CTSO Meeting

HOSA Fall Leadership Conference

Semester Midterm Exam

Unit 5: Bacteria in Biotechnology

(10 days- 5 Classroom, 5 Lab)

- Bacteria: Harmful or Helpful?
- Growing Bacteria in the Laboratory
- Describing a Pure Culture
 - Identifying Bacteria
 - Bacterial Metabolism: Aerobic Respiration

Professional Skills: 1.0, 2.0

Academic Standards: ELA.11-12. W.7

Technical Standard: 8.1, 8.2, 8.3, 8.4, 8.5, 8.6, 8.7, 8.8

Work-based Learning: Simulated Labs

CTSO Integration (Leadership Skills): CTSO Meeting

Unit 6: Genetically Engineering Bacteria

(13 days- 8 Classroom, 5 Lab)

- Giving Bacteria New Functions
- Cloning a Gene of Interest
- Using a cDNA Library
 - Making Recombinant Plasmids
 - Let's Transform E. Coli

Professional Skills: 1.0, 2.0

Academic Standards: ELA.11-12. W.7

Technical Standard: 8.1, 8.2, 8.3, 8.4, 8.5, 8.6, 8.7, 8.8

Work-based Learning: Simulated Labs

CTSO Integration (Leadership Skills): CTSO Meeting

Unit 7: Mammalian Cell Culture

(10 days- 5 Classroom, 5 Lab)

- What is Cell Culture?
- Eukaryotic Cell Lines
- Growing Cell Lines
 - Performing Cell Culture Experiments
 - Applications of Cell Culture

Professional Skills: 1.0, 2.0

Academic Standards: ELA.11-12. W.7

Technical Standard: 5.3, 5.9

Work-based Learning: Simulated Labs

CTSO Integration (Leadership Skills): CTSO Meeting

HOSA Regional Online Testing

Unit 8: Purification of Proteins

(10 days- 5 Classroom, 5 Lab)

- Purification Based on Structure
- Isolating Proteins of Interest
- Characterization of Protein Purification
 - Applications of Protein Purification

Professional Skills: 1.0, 2.0

Academic Standards: ELA.11-12.SL.4

Technical Standard: 9.1, 9.2, 9.3, 9.4, 11.2

Work-based Learning: Simulated Labs

CTSO Integration (Leadership Skills):

Unit 9: REVIEW and Exam

(5 days- 4 Classroom, 1 Lab)

- Review
- Make-Ups
- Open Lab

Professional Skills: 2.0, 3.0, 5.0

Academic Standards: ELA.11-12. W.7

Technical Standard: 7.1

Work-based Learning: Simulated Labs

CTSO Integration (Leadership Skills): CTSO Meeting

Semester Final Exam

Year 2- Semester 2

BIO202 Bioscience IV

(86 Days)

Unit 1: Genetic Diseases and Gene Therapy

(13 days- 8 Classroom, 5 Lab)

- Evolution of Medicine
- Neurological Diseases
- Curing Genetic Disease
 - Gene Therapy Clinical Trials

Professional Skills: 1.0, 2.0

Academic Standards: ELA.11-12. W.7

Technical Standard: 5.3, 11.1, 11.7, 12.5, 12.8

Work-based Learning: Simulated Labs

CTSO Integration (Leadership Skills): CTSO Meeting

HOSA State Online Testing

Unit 2: Genetic Testing

(10 days- 5 Classroom, 5 Lab)

- Should I Take a Genetic Test?
- How Does Genetic Testing Work?
- Direct-to-Consumer Genetic Testing
 - Privacy Issues
 - Interpreting Results

Professional Skills: 1.0, 2.0

Academic Standards: ELA.11-12. W.7

Technical Standard: 5.1, 5.3, 5.8

Work-based Learning: Simulated Labs

CTSO Integration (Leadership Skills): CTSO Meeting

Unit 3: The Era of Biological Drugs

(15 days- 10 Classroom, 5 Lab)

- What is a Biological Drug?
- Monoclonal Antibodies as Biological Drugs
- Fighting Specific Diseases
 - How Biologics Treat Cancer- What is Cancer?
 - Manufacturing Biologics

Professional Skills: 1.0, 2.0

Academic Standards: ELA.11-12. W.7

Technical Standard: 5.7, 5.8, 7.1

Work-based Learning: Simulated Labs

CTSO Integration (Leadership Skills): CTSO Meeting

HOSA Regional Conference

Unit 4: Personalized Medicine

(15 days- 10 Classroom, 5 Lab)

- What is Personalized Medicine?
- Personalized CAR T-cell Immunotherapy
- Regenerative Medicine
 - Cloning of Human Embryos
 - Germline Engineering

Professional Skills: 1.0, 2.0

Academic Standards: ELA.11-12. W.7

Technical Standard: 5.7, 5.8

Work-based Learning: Simulated Labs

CTSO Integration (Leadership Skills):

Semester Midterm Exam

Unit 5: Artificial intelligence and Precision Medicine

(10 days- 5 Classroom, 5 Lab)

- Artificial Intelligence
- AI in Biotech: Handling Big Data
- Data-Driven Medicine
 - AlphaFold: AI Changes the World

Professional Skills: 1.0, 2.0

Academic Standards: ELA.11-12. W.7

Technical Standard: 5.1, 5.2

Work-based Learning: Simulated Labs, Resume writing, mock interviews, interview preparation

CTSO Integration (Leadership Skills): Interviewing Skills and Job Seeking Skills Competitions

Unit 6: CRISPR and Agricultural Sciences

(14 days- 8 Classroom, 6 Lab)

- CRISPR Changes Agriculture
- Current CRISPR-edited Crops
- CRISPR Crops of the Future
 - CRISPR Animals
 - De-Extinction and Extinction

Professional Skills: 1.0, 2.0

Academic Standards: ELA.11-12. W.7

Technical Standard: 5.3, 7.1

Work-based Learning: Simulated Labs

CTSO Integration (Leadership Skills): CTSO Meeting

HOSA State Leadership Conference

Unit 7: Biotechnology Companies

(8 days- 7 Classroom, 1 Lab)

- What Makes a Biotech Company Great?
- The Genesis of a Biotech Company
- Biologics Companies: Personalized Therapies
 - Biologics Companies: Vaccines and Laboratory Instrumentation

- Genomics Companies and Artificial Intelligence

Professional Skills: 1.0, 2.0, 4.0, 7.0, 8.0, 9.0

Academic Standards: ELA.11-12. W.7

Technical Standard: 1.1, 7.1

Work-based Learning: Simulated Labs

CTSO Integration (Leadership Skills): CTSO Meeting

Unit 8: Planning Your Biotech Career

(8 days- 7Classroom, 1 Lab)

- Let's Get to Work!
- Higher Education Career Path
- Applying for a Job
 - Landing (and Keeping) the Job

Professional Skills: 1.0, 2.0, 4.0, 7.0, 8.0, 9.0

Academic Standards: ELA.11-12.W.4, ELA.11-12.W.5

Technical Standard: 1.1, 7.1

Work-based Learning: Simulated Labs

CTSO Integration (Leadership Skills):CTSO Meeting

Unit 9:

(5 days- 4 Classroom, 1 Lab)

- Review
- Make-Ups
- Open Lab

Professional Skills: 1.0, 2.0

Academic Standards: ELA.11-12. W.7

Technical Standard: 7.1

Work-based Learning: Resume writing, mock interviews, interview preparation

CTSO Integration (Leadership Skills): Interviewing Skills and Job Seeking Skills Competitions

HOSA International Leadership Competition

ADE Skill Standards Assessment

BACE Biotechnician Assistant Credentialing Exam