

HIGH SCHOOL MODULES*

Biotechnology	Students will...	Skills	Standards	SEPS
Gel Electrophoresis with Dyes <i>All levels—60 minutes</i>	Load and run agarose gel	Micropipeting, gel electrophoresis	H.B.1	H.B.1A.3 H.B.1A.4-6
Intro to Techniques: DNA Isolation, PCR, and Analysis <i>Intermediate/Advanced—90 minutes</i>	Isolate own DNA, simulate PCR and analyze results	Micropipeting, DNA isolation, PCR, gel electrophoresis	H.B.1, H.B.2 AP 3.A	H.B.1A3, H.B.2A.1 3.A.1
NEW! CRISPR in the Treatment of Cystic Fibrosis <i>Intermediate/Advanced- 60 minutes</i>	Simulate the use of CRISPR-Cas 9 to target a specific CF mutation in a patient. Determine effectiveness of treatment.	Micropipeting, guide RNA (gRNA) design, gel electrophoresis	H.B.1, H.B.2 AP 3.A	H.B.1A3, H.B.2A1, 3.A.1
Microarray -Cancer: Determining Gene Expression <i>Advanced—60 minutes</i>	Simulate a microarray test to examine gene expression profiles	Cytogenetics, microarray	H.B.1, H.B.2, H.B.4 AP 3.A	H.B.1A.3, 4, and 7, H.B.2A.1, H.B.2D.3, H.B.4B.2, AP 3.A.4
Karyotypes and Genetic Disorders <i>Intermediate / Advanced—90 minutes</i> <i>*Can be modified for CP level classes with background in chromosomes</i>	Review clinical information to construct a diagnostic karyotype	Use of microscopes, karyotype boards and genetic websites	H.B.1, H.B.4, AP 2.E	H.B.1A.3, H.B.4B.2, H.B.4D.1, AP2E.1, 2E.2

Forensics and Environmental Science

Bobby Dunbar Mystery <i>Basic/Intermediate -60 minutes</i>	A case of questionable identity – based on a true story	Micropipeting, gel electrophoresis	H.B.1	H.B.1A.1, 3, and 6
NEW! Florida Man <i>Intermediate - 90 minutes</i>	Solve a perplexing mystery that is based on a true event	Micropipeting, gel electrophoresis and fingerprint analysis	H.B.1	H.B.1A.1, 3, and 6
Detecting GMOs <i>Basic—60 minutes Expanded—90 minutes (PCR set-up)</i>	Confirm successful DNA recombination with gel electrophoresis	Micropipeting, DNA isolation and amplification, gel electrophoresis	H.B.1, H.B.2 AP 3.A	H.B.1A.1, 3, 4 and 7 H.B.2A.1, AP 3.A.1
Mad Cow Disease—Prions <i>Basic— 60 min, Intermediate—90 min (PCR)</i>	Determine which company is illegally using cattle tissue in animal feed	Micropipeting, DNA amplification via PCR, gel electrophoresis	H.B.1, H.B.2 AP 3.B	H.B.1A3, H.B.2B.2, AP 3B.2
Characteristics of Inheritance: Blood Types <i>Intermediate/Advanced—90 minutes</i>	Conduct testing to determine the blood types of four surgical patients	Micropipeting, antigen/antibody	H.B.1, H.B.2 and 4 AP 3.A	H.B.1A3, H.B.2A.1, 3.A.

Medical Genetics

Mystery of the Crooked Cell <i>Intermediate—60-90 minutes</i>	Test human hemoglobin to diagnose sickle cell disease and trait	Micropipeting, gel electrophoresis	H.B.1, H.B.4	H.B.1A.1, 3; H.B.4A.1, 4D.1, 4B.2
Muscular Dystrophy: A Genetic Disorder <i>Intermediate—60 minutes</i>	Test patient samples to determine their clinical status for this condition	Micropipeting, gel electrophoresis	H.B.1, H.B.4	H.B.1A.1, 3; H.B.4A.1, 4D.1, 4B.2
Name That Disorder <i>Intermediate / Advanced —60 minutes</i>	Diagnose a genetic disorder using multiple biochemical tests	Chemical analyses of unknowns	H.B.1, H.B.2, H.B.4, AP 3.A, 3.C	H.B.1A.3, 4, 6; H.B.2A.1, H.B.2B.1, H.B.4B.1, 2; AP 3.A.3, 3.C.1
A Cancer Family Tree <i>Advanced—90 minutes</i>	Diagnose Li-Fraumeni syndrome through pedigree analysis and gene testing	Micropipeting, gel electrophoresis	H.B.1, H.B.2, H.B.4 AP 3.A	H.B.1A.1, 3, 4; H.B.2D.2,3; H.B.4A.1, H.B.4B.2, H.B.4D.1, Z, AP 3A.1-4
You Are What You Eat—The Folic Acid Story <i>Advanced—90 minutes</i>	Test various food samples for folic acid content. Aligns with GGC work on neural tube defects	Bradford Assay, spectrometry, standard curve creation and analysis	H.B.1, H.B.2, H.B.4, AP2.E, 4.B, 3.A	H.B.1A.3, 4, 5; H.B.2A.1; H.B.4B.2; H.B.4D.1; AP 2.3.1, 2;3.A; 4.B.1

Activities Requiring Extended Time

Mitochondrial DNA Analysis <i>Advanced—3-4 hours</i>	Isolate and analyze two specific regions of mitochondrial DNA	Micropipeting, DNA isolation, PCR, and gel electrophoresis	H.B.2, H.B.4, AP 2.A, 2.B, 3.A, 3.B	H.B.2B.1; H.B.4B.2; AP2.A.1,2.B.1; 3.A.4; 3.B.2
What's My Genotype? <i>Advanced—4-5 hours (modified version available)</i>	Determine students genotype for PTC paper phenotype	Micropipeting, DNA isolation and amplification, gel electrophoresis	H.B.4, AP 3.A	H.B.4A.1,2; H.B.4B.2; AP3.A.2,3
X-L Inheritance—Rett Syndrome <i>Advanced—2 hours</i>	Test PCR products to diagnose Rett syndrome	Micropipeting, PCR, gel electrophoresis, and Sanger sequencing	H.B.1, H.B.4 AP 3.A	H.B.1A.3, H.B.4B.2, H.B.4D.1 AP 3A.2,3,4
NEW! Cells of the Brain <i>Advanced - 2-3 hours</i> <i>*This activity is only available during field trips to GGC</i>	Analyze different cell types in the brain using vertical gel electrophoresis	Micropipeting, vertical gel electrophoresis Analyze protein profiles of various cell types	H.B.4, AP 3A	H.B.4A1,2; H.B.4B.2; AP3A.2,3

* All activities align with and support SC Academic Standards and Performance Indicators for Science 2014.
Alignment with 2022 Standards to be completed for school year 2023-2024.