HIGH SCHOOL MODULES*

Biotechnology

	Students will…	Skills	Standards	DCIs
Gel Electrophoresis with dyes *All levels—60 minutes*	Load and run agarose gel	Micropipeting, gel electrophoresis	Reinforce 8-PS2-3	PS2.B
Intro to Techniques: DNA Isolation, PCR, and Analysis *Intermediate/Advanced—90 minutes*	Isolate own DNA, **simulate** PCR, and analyze results	Micropipeting, DNA isolation, PCR, gel electrophoresis	B-LS1-1	LS1.A
Microarray -Cancer: determining gene expression *Advanced—60 minutes*	Simulate a microarray test to examine gene expression profiles	Cytogenetics, microarray	B-LS1-1 B-LS3-2	LS1.A, LS3.A LS3.B
Karyotypes and Genetic Disorders *Intermediate / Advanced—90 minutes* **Can be modified for CP level classes*	Review clinical information to construct a diagnostic karyotype	Use of microscopes, karyotype boards, and genetic websites	B-LS3-1 B-LS1-1 B-LS1-4	LS1.A LS3.A

Forensics, environmental and mammalian genetics

Bobby Dunbar mystery *Basic/Intermediate -60 minutes*	Investigate a case of questionable identity – based on a true story	Micropipeting, gel electrophoresis	B-LS1-1	LS1.A, LS3.A
Florida Man *Basic/Intermediate-90 minutes*	Solve a perplexing mystery that is based on a true event	Micropipeting, gel electrophoresis, and fingerprint analysis	B-LS1-1 , B-LS3-1 B-LS3-3	LS3.A, LS1.A LS2.B
Detecting GMOs *Basic:60 minutes; Expanded:90 minutes (PCR set-up)*	Confirm successful DNA recombination with gel electrophoresis	Micropipeting, DNA isolation and amplification, gel electrophoresis	B-LS2-7 B-LS2-6	LS4.D ETS 1.B LS2.C
Mad Cow Disease—Prions *Basic— 60 min, Intermediate—90 min (PCR)*	Determine which company is illegally using cattle tissue in animal feed	Micropipeting, DNA amplification via PCR, gel electrophoresis	B-LS1-1 B-LS3-2	LS1.A LS3.B
The Mystery of the Corn Destroyer *Basic-60 minutes; Expanded (PCR)-90 minutes*	Students will analyze environmental DNA (eDNA) to determine the cause of crop destruction	Expanded version of micropipeting, gel electrophoresis, and PCR	B-LS3-7 B-LS2-6 B-LS4-6	LS4.B ETS 1.B LS4.C
Sasha the Cat's Genetic Disguise *Intermediate- 90 minutes*	Students will explain the origin of calico cats utilizing X and Y patterns of inheritance and SRY trait determination	Micropipeting, gel electrophoresis, karyotype analysis, Punnett square construction	B-LS1-1 B-LS1-4 B-LS3-2	LS3.A LS1.B LS3.B
NEW! Is Cancer Contagious? *Advanced- 60 minutes*	Explore this question using a simulated microarray test with a facial cancer in the Tasmanian devil population.	Cytogenetics, microarray, gene expression, heredity	B-LS1-1 B-LS3-2	LS1.A LS3.A LS3.B

Medical Genetics

Mystery of the Crooked Cell *Intermediate—60-90 minutes*	Test human hemoglobin to diagnose sickle cell disease and trait	Micropipeting, gel electrophoresis	B-LS1-1, B-LS3-2 B-LS3-1	LS1.A, LS3.A LS3.B
Muscular dystrophy: A genetic disorder *Intermediate—60 minutes*	Test patient samples to determine their clinical status for this condition	Micropipeting, gel electrophoresis	B-LS1-2	LS1.A
Name That Disorder *Intermediate / Advanced —60 minutes*	Diagnose a genetic disorder using multiple biochemical tests	Chemical analyses of unknowns	B-LS1-1, B-LS3-2 C-PS1-5	LS1.A, LS3.A, LS3.B PS1.B
A Cancer Family Tree *Advanced—90 minutes*	Diagnose Li-Fraumeni syndrome through pedigree analysis and gene testing	Micropipeting, gel electrophoresis	B-LS3-2 B-LS1-4	LS3.B LS1.B
You Are What You Eat—The Folic Acid Story *Advanced—90 minutes*	Test food samples for folic acid content. Aligns with GGC work on neural tube defects	Bradford Assay, spectrometry, standard curve creation, and analysis	B-LS1-4, B-LS3-1 B-LS3-3 C-PS4-5	LS1.B, LS1.A, LS2.A LS3.B, PS4.B, PS4.C

Enhanced Activities

What's My Genotype? *Advanced—4-5 hours (modified version available)*	Determine students' individual genotypes for PTC sensitivity	Micropipeting, DNA isolation and amplification, gel electrophoresis	B-LS1-1 B-LS3-1	LS3.A LS1.A
X-L Inheritance—Rett Syndrome *Advanced—2 hours*	Analyze PCR products to diagnose Rett syndrome	Micropipeting, PCR, gel electrophoresis, and Sanger sequenc	B-LS3-1	LS1.A LS3.A
CRISPR in the treatment of cystic fibrosis *Intermediate/Advanced- 60 minutes*	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	B-LS1-1 B-LS3-1	LS1.A, LS3.A

*** All activities align with and support the South Carolina College and Career -Ready Science Standards 2021.**