Grades 11 - 12

Program Title: AP Gel Electrophoresis

Quarter 3

Number of Hours: 4

This lesson provides instructional support towards understanding of the following Performance Expectations.		
HS-LS3-1 Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring. **HS-LS3-2 Make and defend a claim based on evidence that inheritable genetic variations may result from (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors.**		
Science and Engineering Practices	**Disciplinary Core Ideas**	**Cross Cutting Concepts (CCCs)**
Planning and Carrying Out Investigations Asking Questions and Defining Problems Using Mathematics and Computational Thinking	LS3.A: Inheritance of Traits LS1.A: Structure and Function	Cause and Effect Systems and System Models _ Connections to Nature of Science: Science is a Human Endeavor
Maryland College and Career-Ready Standards (MD-CCRS)		
ELA/Literacy	RST.11 - 12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.	
Mathematics	MP.4 Model with Mathematics. HS-IF.C7 Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.	

AP GEL ELECTROPHORESIS		
OBJECTIVES: • Explain the principles at work in gel electrophoresis • Describe the role of restriction enzymes in biotechnology • Perform gel electrophoresis on restricted DNA samples • Estimate the lengths of restricted fragments of an unknown DNA sample using electrophoresis results obtained for a known DNA sample.		
	STUDENT DOES	**TEACHER DOES**
ENGAGEMENT 25 minutes	Contributes to group discussion on gel electrophoresis and other applications of recombinant DNA technology.	Leads verbal formative assessments of prior knowledge. Provides overview of objectives and expectations.
EXPLORATION 60 minutes	Reviews experiment procedure, predicts outcomes of each activity, pours agarose gel into mold, practices accurate micropipetting; extracts solid gel from mold.	Reviews foundational concepts including structure of DNA macromolecule, role of DNA in genetic code and consequences of copying errors or other changes in nucleotide sequence. Models techniques and monitors student mastery.

EXPLANATION 70 minutes	Places gel in electrophoresis chamber, loads the three DNA samples into gel, performs Electrophoresis, and stains gel. Reads and presents summary of article on recombinant DNA technology used to genetically modify organisms and conduct criminal investigations. Stains gel.	Monitors student progress and checks for understanding. Facilitates discussion. Models plotting data on log-linear graph paper and constructing best fit line.

ELABORATION 30 minutes	De-stains gel and visualizes DNA fragments using ultraviolet or visible light. Debates ethical issues related to the use of recombinant DNA technology. Measures fragment migration distances. Plots data on log-linear graph paper and constructs best-fit line.	Monitors student progress. Facilitates discussion. Asks students to identify and propose explanations for anomalies.

EVALUATION 25 minutes	Uses best fit-line to estimate sizes of unknown DNA sample fragments. Shares results in group discussion. Packs and cleans up.	Facilitates discussion. Reviews objectives and informally assesses student learning.