SUBJECT: Honors Genetics	GRADE: 11/12
Unit Title: Advanced Mendelian Genetics & Complex Traits	**Time Frame: Approx. 15 days**

UNIT OVERVIEW

Students will be able to predict and explain the inheritance patterns of complex traits that do not follow simple dominant/recessive Mendelian rules, by analyzing real-world phenotypic variations and family pedigrees, and constructing models of gene interaction.

LRG SKILLS AND DISPOSITIONS	PA STANDARDS
• Teamwork and Collaboration • Critical Thinking	STEELS: 3.1.9-12.P, 3.1.9-12.Q, 3.1.9-12.R, NGSS: HS-LS1-1, HS-LS3-1, HS-LS-2

COMPETENCIES	LEARNING TARGETS
How can seemingly simple genetic rules lead to the incredible diversity of traits we observe, and why don't all inherited characteristics follow straightforward patterns?	• I can construct a model or explanation to illustrate the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring. • I can make and defend a claim based on evidence that inheritable genetic variations may result from new genetic combinations through meiosis or interactions with the environment • I can apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.

SUBJECT: Honors Genetics	GRADE: 11/12
Unit Title: Chromosomal Variation and Inheritance	**Time Frame: Approx 15 days**

UNIT OVERVIEW

Students will be able to explain how changes in chromosome structure and number arise, and predict their potential impacts on an organism's development and traits, by analyzing visual evidence of chromosomal abnormalities and investigating associated human conditions.	
LRG SKILLS AND DISPOSITIONS	**PA STANDARDS**
• Teamwork and Collaboration • Communication	STEELS: 3.1.9-12.P, 3.1.9-12.Q, 3.1.9-12.R, 3.1.9-12.D NGSS: HS-LS1-1, HS-LS3-1, HS-LS-2, HS-LS1-4
COMPETENCIES	**LEARNING TARGETS**
What happens when chromosomes behave unexpectedly during cell division, and how do these large-scale changes impact an organism's development and traits?	• I can use a model to illustrate the role of cellular division. • I can clarify relationships about the role of DNA and chromosomes in coding instructions. • I can defend a claim that variations result from errors during replication, meiosis, or environmental factors. • I can evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs. (Applying to gene therapies and other medical interventions).

SUBJECT: Honors Genetics	**GRADE: 11/12**
Unit Title: The Genetics of Cancer: A Disease of the Genes	**Time Frame: Approx. 15 days**
UNIT OVERVIEW	
Students will construct a comprehensive explanation of how cancer arises from an accumulation of genetic mutations, and how disruptions in DNA structure, replication, and repair mechanisms contribute to its development, ultimately analyzing how genetic understanding informs cancer	

prevention, diagnosis, and treatment strategies.

LRG SKILLS AND DISPOSITIONS	PA STANDARDS
• Teamwork and Collaboration	STEELS: 3.1.9-12.A, 3.1.9-12.P, 3.1.9-12.Q, 3.1.9-12.R, 3.1.9-12.D NGSS: HS-LS1-1, HS-LS3-1, HS-LS-2, HS-LS1-4, HS-ETS1-3

COMPETENCIES	LEARNING TARGETS
If cancer is a "disease of the genes," how do invisible changes in our DNA lead to uncontrolled cell growth?	• I can explain how DNA structure determines protein structure and function (connection specifically to DNA, cellular function and disease) • I can illustrate the role of cell division and differentiation on development of cancer (focus on disruption of normal cycle). • I can clarify how DNA and chromosomes code for traits (focus on mutations and disruption of normal function) • I can defend claims about the origin of genetic variations through errors in normal processes and/or through environmental exposure. • I can evaluate solutions to complex real-world problems as they apply to cancer treatments (as time allows).

SUBJECT: Honors Genetics	**GRADE: 11/12**
Unit Title: The Genetic Code: From Blueprint to Disease and Therapy	**Time Frame: Approx 40 days**

UNIT OVERVIEW

Students will construct an explanation of how genetic information flows from DNA to functional proteins, how variations (mutations) in this process lead to diverse genetic disorders, and how scientific advancements are developing strategies to diagnose, manage, and potentially correct these molecular defects.

LRG SKILLS AND DISPOSITIONS	PA STANDARDS

• Teamwork and Collaboration • Communication • Critical Thinking	STEELS: 3.1.9-12.A, 3.1.9-12.P, 3.1.9-12.Q, 3.1.9-12.R, NGSS: HS-LS1-1, HS-LS3-1, HS-LS-2, HS-ETS1-3
COMPETENCIES	**LEARNING TARGETS**
How does the precise flow of information from our genes to our proteins determine who we are, and how can understanding variations in this molecular blueprint lead to groundbreaking therapies for complex genetic disorders?	• I can construct an explanation based on evidence for how the structure of DNA determines the structure of proteins, which carry out the essential functions of life through systems of specialized cells. • I can ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring. • I can 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. (Focus on mutation's role). • I can evaluate the evidence supporting claims that changes in environmental conditions may result in (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species. (Connects to diseases prevalence and evolution of resistance if time allows, e.g., antibiotic resistance briefly). • I can evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs. (Applying to gene therapies and other medical interventions)