



Grades 9–12

3.1.9-12.P Life Science: Inheritance and Variation of Traits

Students who demonstrate understanding 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.

Clarifying Statement: N/A

Assessment Boundary: Assessment does not include the phases of meiosis or the biochemical mechanism of specific steps in the process.

Science and Engineering Practices (SEP)	Disciplinary Core Ideas (DCI)	Crosscutting Concepts (CCC)
Asking Questions and Defining Problems Asking questions and defining problems in 9–12 builds on K–8 experiences and progresses to formulating, refining, and evaluating empirically testable questions and design problems using models and simulations. <ul style="list-style-type: none"> Ask questions that arise from examining models or a theory to clarify relationships. 	Structure and Function <ul style="list-style-type: none"> All cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the instructions that code for the formation of proteins, which carry out most of the work of cells. Inheritance of Traits <ul style="list-style-type: none"> Each chromosome consists of a single very long DNA molecule, and each gene on the chromosome is a particular segment of that DNA. The instructions for forming species' characteristics are carried in DNA. All cells in an organism have the same genetic content, but the genes used (expressed) by the cell may be regulated in different ways. Not all DNA codes for a protein; some segments of DNA are involved in regulatory or structural functions, and some have no as-yet known function. 	Cause and Effect <ul style="list-style-type: none"> Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.

Pennsylvania Context: N/A

PA Career Ready Skills: Explain how you situate yourself in a diverse community.



Connections to Other Standards Content and Practices

Standard Source	Possible Connections to Other Standard(s) or Practice(s)
Agriculture (AFNR)	CS.02.02.01.a: Identify and summarize the components within AFNR systems (e.g., Animal Systems: health, nutrition, genetics, etc.; Natural Resources Systems: soil, water, etc.).
Science, Environmental Literacy and Sustainability (NAEE)	9-12 Strand 2.1.B. Earth's living systems: Learners describe basic population dynamics, genetic mechanisms behind biological evolution, and the importance of diversity in living systems. They explain how changes in the hydrosphere, atmosphere, and geosphere affect the biosphere. They describe how human sustainability is dependent on the biosphere.
PA Core Standards: ELA	CC.3.5.9-12.A: Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. CC.3.5.11-12.A: 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. CC.3.5.9-10.I: Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. CC.3.5.11-12.I: Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.
PA Core Standards and Practices: Math	CC.2.4.HS.B.2: Summarize, represent, and interpret data on two categorical and quantitative variables. CC.2.4.HS.B.5: Make inferences and justify conclusions based on sample surveys, experiments, and observational studies.
PA Standards: Social Studies	N/A
Educational Technology (ISTE)	1.1. Empowered Learner: Students leverage technology to take an active role in choosing, achieving, and demonstrating competency in their learning goals, informed by the learning sciences.
Technology and Engineering (ITEEA)	STEL-10: Assess how similarities and differences among scientific, mathematical, engineering, and technological knowledge and skills contributed to the design of a product or system.