Unit 8 Genetics

Content Area: **Science**
Course(s): **Biology CP, Biology Honors, STEM Biology Honors**
Time Period: **September**
Length: **6 weeks**
Status: **Published**

Enduring Understandings

Big Idea: Organisms contain genetic information that influence their traits, and they pass this onto their offspring during reproduction. The development of technological applications for biology has resulted in advanced research and medicine

- Genes, which are located on chromosomes, are responsible for traits.
- Sorting and recombination of genes in sexual reproduction result in a great variety of possible gene combinations in the offspring of any two parents.
- There are predictable patterns of inheritance, and the variation that exists within a species is related to its mode of reproduction (sexual or asexual).
- DNA mutations that cause disease can be passed from one generation to the next.
- Genetic engineering can be used to modify the phenotype of an organism.
- Genetic engineering and biotechnology can be used to characterize and understand the human genome, and to identify and ultimately cure genetic disorders.

Essential Questions

- How is genetic information passed from one generation to the next?
- How is sexual reproduction different from asexual reproduction?
- What causes genetic variation among offspring in organisms that perform sexual reproduction?
- How do genes determine what an individual looks like?
- How can you determine the probability that an individual will inherit a particular trait?
- How do changes in genetic information affect organisms?
- Why are some traits more complex than others?
- How can genome studies and genetic engineering be used to cure disease?
- What are the moral, ethical and environmental issues raised by genetic engineering?

Content

Chapters 11 and 14

Vocabulary

- **inheritance**
- **dominance and recessive traits**
- **allele**
- **genotype**

- **phenotype**
- **sexual reproduction**
- **haploid**
- **diploid**
- **meiosis**
- **crossing-over**
- **non-disjunction**
- **chromosomal mutations**
- **incomplete dominance**
- **codominance**
- **multiple allele traits**
- **polygenic traits**
- **sex-linked inheritance**
- **pedigree**

Chapter 15

Vocabulary:

- Selective breeding
- hybridization
- inbreeding
- biotechnology
- genome
- gene therapy
- DNA fingerprinting
- gel electrophoresis
- PCR
- forensics

Skills

- Explain the process where an egg and sperm unite to begin the development of a new individual, and how that new individual receives genetic information from its parents
- Explain how sexually produced offspring are never identical to either of their parents
- Understand how new heritable characteristics can result from new combinations of existing genes in reproductive cells
- Identify that hereditary information is contained in genes, located in the chromosomes of each cell, and each gene carries a single unit of information
- Provide specific examples of how an inherited trait of an individual can be determined by one or many genes and a single gene can influence more than one trait
- Recognize that certain chemicals, pathogens, and high-energy radiation can seriously impair normal cell functions and the health of the organism
- Apply genetics understandings to analyze, support and/or critique current and emerging biotechnologies
- Identify emerging biotechnology that shows promise in preventing and treating disease
- Analyzing the current and potential impact of genome projects on human health (e.g. pathogenic

bacteria or disease vectors) or species with commercial importance (e.g. livestock and crop plants)

Resources

Standards

LA.9-10.CCSS.ELA-Literacy.CCRA.R.2	Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.
LA.9-10.CCSS.ELA-Literacy.CCRA.R.3	Analyze how and why individuals, events, and ideas develop and interact over the course of a text.
LA.9-10.CCSS.ELA-Literacy.CCRA.R.4	Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.
LA.9-10.CCSS.ELA-Literacy.CCRA.R.7	Integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, as well as in words.
LA.9-10.CCSS.ELA-Literacy.CCRA.R.8	Delineate and evaluate the argument and specific claims in a text, including the validity of the reasoning as well as the relevance and sufficiency of the evidence.
SCI.9-12.5.1.12	All students will understand that science is both a body of knowledge and an evidence-based, model-building enterprise that continually extends, refines, and revises knowledge. The four Science Practices strands encompass the knowledge and reasoning skills that students must acquire to be proficient in science.
SCI.9-12.5.1.12.A	Students understand core concepts and principles of science and use measurement and observation tools to assist in categorizing, representing, and interpreting the natural and designed world.
SCI.9-12.5.1.12.A.1	Refine interrelationships among concepts and patterns of evidence found in different central scientific explanations.
SCI.9-12.5.1.12.B	Students master the conceptual, mathematical, physical, and computational tools that need to be applied when constructing and evaluating claims.
SCI.9-12.5.1.12.B.3	Revise predictions and explanations using evidence, and connect explanations/arguments to established scientific knowledge, models, and theories.
SCI.9-12.5.1.12.C	Scientific knowledge builds on itself over time.
SCI.9-12.5.1.12.C.1	Reflect on and revise understandings as new evidence emerges.
SCI.9-12.5.1.12.C.2	Use data representations and new models to revise predictions and explanations.
SCI.9-12.5.1.12.D	The growth of scientific knowledge involves critique and communication, which are social practices that are governed by a core set of values and norms.
SCI.9-12.5.1.12.D.1	Engage in multiple forms of discussion in order to process, make sense of, and learn from others' ideas, observations, and experiences.
SCI.9-12.5.1.12.D.2	Represent ideas using literal representations, such as graphs, tables, journals, concept maps, and diagrams.

SCI.9-12.5.3.12	All students will understand that life science principles are powerful conceptual tools for making sense of the complexity, diversity, and interconnectedness of life on Earth. Order in natural systems arises in accordance with rules that govern the physical world, and the order of natural systems can be modeled and predicted through the use of mathematics.
SCI.9-12.5.3.12.A	Living organisms are composed of cellular units (structures) that carry out functions required for life. Cellular units are composed of molecules, which also carry out biological functions.
SCI.9-12.5.3.12.A.6	Describe how a disease is the result of a malfunctioning system, organ, and cell, and relate this to possible treatment interventions (e.g., diabetes, cystic fibrosis, lactose intolerance).
SCI.9-12.5.3.12.D	Organisms reproduce, develop, and have predictable life cycles. Organisms contain genetic information that influences their traits, and they pass this on to their offspring during reproduction.
SCI.9-12.5.3.12.D.2	Predict the potential impact on an organism (no impact, significant impact) given a change in a specific DNA code, and provide specific real world examples of conditions caused by mutations.
SCI.9-12.5.3.12.D.3	Demonstrate through modeling how the sorting and recombination of genes during sexual reproduction has an effect on variation in offspring (meiosis, fertilization).
SCI.9-12.5.3.12.E	Sometimes, differences between organisms of the same kind provide advantages for surviving and reproducing in different environments. These selective differences may lead to dramatic changes in characteristics of organisms in a population over extremely long periods of time.
SCI.9-12.5.3.12.E.1	Account for the appearance of a novel trait that arose in a given population.
SCI.9-12.5.3.12.E.2	Estimate how closely related species are, based on scientific evidence (e.g., anatomical similarities, similarities of DNA base and/or amino acid sequence).
CCSS.ELA-Literacy.RH.9-10.2	Determine the central ideas or information of a primary or secondary source; provide an accurate summary of how key events or ideas develop over the course of the text.
CCSS.ELA-Literacy.RH.9-10.3	Analyze in detail a series of events described in a text; determine whether earlier events caused later ones or simply preceded them.
CCSS.ELA-Literacy.RH.9-10.4	Determine the meaning of words and phrases as they are used in a text, including vocabulary describing political, social, or economic aspects of history/social studies.
CCSS.ELA-Literacy.RH.9-10.7	Integrate quantitative or technical analysis (e.g., charts, research data) with qualitative analysis in print or digital text.
CCSS.ELA-Literacy.RH.9-10.8	Assess the extent to which the reasoning and evidence in a text support the author's claims.
CCSS.ELA-Literacy.WHST.9-10	Writing
CCSS.ELA-Literacy.WHST.9-10.1	Write arguments focused on discipline-specific content.
CCSS.ELA-Literacy.WHST.9-10.1.a	Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that establishes clear relationships among the claim(s), counterclaims, reasons, and evidence.
CCSS.ELA-Literacy.WHST.9-10.1.b	Develop claim(s) and counterclaims fairly, supplying data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form and in a manner that anticipates the audience's knowledge level and concerns.
CCSS.ELA-Literacy.WHST.9-10.1.d	Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
CCSS.ELA-Literacy.WHST.9-10.1.e	Provide a concluding statement or section that follows from or supports the argument presented.
CCSS.ELA-Literacy.WHST.9-10.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.

Integration of Knowledge and Ideas

Text Types and Purposes

Craft and Structure