

Teacher: Sarah Gates	Course: Genetics & Forensics	Grade Level(s):11-12
	Topic(s): Genetics	
Content/Big Ideas	<p>Heredity refers to specific mechanisms by which characteristics or traits are passed from one generation to the next via genes, and explains why offspring resemble, but are not identical to, their parents</p>	
Essential Questions	<p>How are the characteristics of one generation passed to the next?</p> <p>How can individuals of the same species and even siblings have different characteristics?</p>	
Concepts	<p>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.</p> <p>All cells in an organism have the same genetic content, but the genes used (expressed) by the cell may be regulated in different ways</p> <p>The information passed from parents to offspring is coded in the DNA molecules that form the chromosomes.</p> <p>In sexual reproduction, chromosomes can create new genetic combinations through the process of meiosis, which creates new genetic combinations and more genetic variation.</p> <p>Although DNA replication is tightly regulated and remarkably accurate, errors do occur and result in mutations, which are also a source of genetic variation.</p> <p>Environmental factors can also cause mutations in genes, and viable mutations are inherited.</p> <p>Environmental factors also affect expression of traits, and hence affect the probability of occurrences of traits in a population.</p>	

Competencies

Ask questions and obtain information about the role of patterns of gene sequences in DNA molecules and subsequent inheritance of traits.

Construct an explanation for how cell differentiation is the result of activation or inactivation of specific genes as well as small differences in the immediate environment of the cells.

Using a model, explain information that inheritable genetic variations may result from (1) genetic combinations in haploid sex cells, (2) errors occurring during replication, (3) crossover between homologous chromosomes during meiosis, and (4) environmental factors.

Communicate information that inheritable genetic variations may result from (1) genetic combinations in haploid sex cells, (2) errors occurring during replication, (3) crossover between homologous chromosomes during meiosis, and (4) environmental factors.

Use probability to explain the variation and distribution of expressed traits in a population

Standards/Benchmarks

3.1.B.B1. Explain that the information passed from parents to offspring is transmitted by means of genes which are coded in DNA molecules. Explain the basic process of DNA replication. Describe the basic processes of transcription and translation. Explain how crossing over, jumping genes, and deletion and duplication of genes results in genetic variation. Explain how mutations can alter genetic information and the possible consequences on resultant cells.

3.1.12.B1. Explain gene inheritance and expression at the molecular level

3.1.B.B2. Describe how the process of meiosis results in the formation of haploid gametes and analyze the importance of meiosis in sexual reproduction. Compare and contrast the function of mitosis and meiosis. Illustrate that the sorting and recombining of genes in sexual reproduction results in a great variety of possible gene combinations in offspring.

3.1.12.B2. Evaluate the process of sexual reproduction in influencing genetic variability in a population

3.1.B.B3. Describe the basic structure of DNA, including the role of hydrogen bonding. Explain how the process of DNA replication results in the transmission and conservation of the genetic code. Describe how transcription and translation result in gene expression. Differentiate among the end products of replication, transcription, and translation. Cite evidence to support that the genetic code is universal.

3.1.12.B3. Analyze gene expression at the molecular level. Explain the impact of environmental factors on gene expression.

3.1.B.B4. Explain how genetic technologies have impacted the fields of medicine, forensics, and agriculture

3.1.12.B4. Evaluate the societal impact of genetic engineering techniques and applications

3.1.B.B5. PATTERNS Describe how Mendel's laws of segregation and independent assortment can be observed through patterns of inheritance. Distinguish among observed inheritance patterns caused by several types of genetic traits (dominant, recessive, codominant, sex-linked, polygenic, incomplete dominance, multiple alleles) CONSTANCY AND CHANGE Explain how the processes of replication, transcription, and translation are similar in all organisms. Explain how gene actions, patterns of heredity, and reproduction of cells and organisms account for the continuity of life SCALE Demonstrate how inherited characteristics can be observed at the molecular, cellular, and organism levels.

3.1.12 B5. PATTERNS Relate the monomer structure of biomacromolecules to their functional roles.

Activities & Assessments	Lecture & Inquiry based assignments Assessments: Labs, Quizzes, Tests, Research Project on genetic disorder, Online Formative Assessments
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	Topic(s): Forensics
Content/Big Ideas	Understanding of science content is enhanced when concepts are grounded in inquiry experiences. The use of scientific inquiry will help ensure that students develop a deep understanding of science content, processes, knowledge and understanding of scientific ideas, and the work of scientists; therefore, inquiry is embedded as a strand throughout all content areas.
Essential Questions	<p>How are the concepts of genetics related to forensics?</p> <p>What laboratory techniques can be applied to solve real-life investigations into forensics?</p>
Concepts	<p>Asking questions and defining problems.</p> <p>Developing and using models.</p> <p>Planning and carrying out investigations.</p> <p>Constructing explanations and designing solutions.</p> <p>Analyzing and interpreting data.</p> <p>Using mathematics and computational thinking.</p> <p>Engaging in argument from evidence.</p> <p>Obtaining, evaluating, and communicating information.</p>

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<p>Standards/Benchmarks</p>	<p>3.1.B.B4. Explain how genetic technologies have impacted the fields of medicine, forensics, and agriculture</p> <p>3.1.12.B4. Evaluate the societal impact of genetic engineering techniques and applications</p> <p>3.4.10.B1. Compare and contrast how the use of technology involves weighing the trade-offs between the positive and negative effects.</p> <p>3.4.12.B1. Analyze ethical, societal, economic, and cultural considerations as related to the development, selection, and use of technologies.</p> <p>3.4.10.B2. Demonstrate how humans devise technologies to reduce the negative consequences of other technologies.</p> <p>3.4.12.B2. Illustrate how, with the aid of technology, various aspects of the environment can be monitored to provide information for decision making.</p> <p>3.4.10.B3. Compare and contrast how a number of different factors, such as advertising, the strength of the economy, the goals of a company and the latest fads, contribute to shaping the design of and demand for various technologies.</p>
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