Unit 6 - DNA testing assists in the identification

Content Area: **Science**
Course(s): **Forensic Science**
Time Period: **February**
Length: **8 Blocks**
Status: **Published**

Enduring Understandings

DNA typing helps forensic scientists to definitively link biological evidence to a single individual.

Essential Questions

Why is DNA an effective form of identification?

Content

Vocabulary

- Amelogenin gene
- Amino acids
- Buccal cells
- Chromosome
- Complementary base pairing
- DNA
- Electrophoresis
- Epithelial cells
- Human genome
- Hybridization
- Low copy number
- Mitochondria
- Multiplexing
- Nucleotide
- Polymer

Skills

Name the parts of a nucleotide and explain how nucleotides are linked to form DNA
Understand the concept of base-pairing as it relates to the double-helix structure of DNA

Explain the technology of polymerase chain reaction (PCR) and how it applies to forensic DNA typing
Understand the use of DNA computerized databases in criminal investigation
List the necessary procedures for proper preservation of biological evidence for laboratory DNA analysis

Resources

- Teacher's Wraparound Edition for Forensic Science: An Introduction, 2nd Edition

  Richard Saferstein, Forensic Science Consultant ©2011 |Prentice Hall

- Instructor's Manual with Lesson Plans for Forensic Science: An Introduction, 2nd Edition

  Richard Saferstein, Forensic Science Consultant ©2011 |Prentice Hall

- Basic Laboratory Exercises for Forensic Science: An Introduction, 2nd Edition

  Richard Saferstein, Forensic Science Consultant ©2011 |Prentice Hall

- Forensic Science Experiments (Facts on File Science Experiments) Hardcover – October 1, 2009

  by Pamela Walker (Author), Elaine Wood (Author)

- Forensic Science Experiments on File (Facts on File Science Library) Ring-bound

- Crime Scene Investigations: Real-Life Science Labs For Grades 6-12

  by Pam Walker, Elaine Wood, Christopher Stone (Illustrator)

Assessments

Performance: Authentic Task
Activity: Recovering the Romanovs Students will learn how mitochondrial DNA works and how it can be used to find members of the same family.

Performance: Authentic Task
Activity: DNA Fingerprinting - You Be the Judge Students will look at actual cases from FBI and compare DNA profiles.

Standards

SEP.1	Asking Questions and Defining Problems
CCC.1	Patterns.
	Observed patterns in nature guide organization and classification and prompt questions about relationships and causes underlying them.
SEP.1.a	Ask questions
CCC.1.1	students observe patterns in systems at different scales and cite patterns as empirical evidence for causality in supporting their explanations of phenomena. They recognize classifications or explanations used at one scale may not be useful or need revision using a different scale; thus requiring improved investigations and experiments. They use mathematical representations to identify certain patterns and analyze patterns of performance in order to reengineer and improve a designed system.
CCC.2	Cause and effect: Mechanism and explanation.
SEP.1.a.1	that arise from careful observation of phenomena, or unexpected results, to clarify and/or seek additional information.
SEP.1.a.2	that arise from examining models or a theory, to clarify and/or seek additional information and relationships.
	Events have causes, sometimes simple, sometimes multifaceted. A major activity of science is investigating and explaining causal relationships and the mechanisms by which they are mediated. Such mechanisms can then be tested across given contexts and used to predict and explain events in new contexts.
CCC.2.1	students understand that empirical evidence is required to differentiate between cause and correlation and to make claims about specific causes and effects. They suggest cause and effect relationships to explain and predict behaviors in complex natural and designed systems. They also propose causal relationships by examining what is known about smaller scale mechanisms within the system. They recognize changes in systems may have various causes that may not have equal effects.
CCC.3	Scale, proportion, and quantity.
	In considering phenomena, it is critical to recognize what is relevant at different measures of size, time, and energy and to recognize how changes in scale, proportion, or quantity affect a system’s structure or performance.
SEP.3	Planning and Carrying Out Investigations
SEP.3.d	Select appropriate tools to collect, record, analyze, and evaluate data.
SCI.9-12.1.2	Classifications or explanations used at one scale may fail or need revision when information from smaller or larger scales is introduced; thus requiring improved investigations and experiments.
SCI.9-12.3.3	Patterns observable at one scale may not be observable or exist at other scales.
9-12.HS-LS1	From Molecules to Organisms: Structures and Processes
9-12.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.
9-12.HS-LS3	Heredity: Inheritance and Variation of Traits
9-12.HS-LS1-1	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.
9-12.HS-LS3-1.LS1.A.1	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.
9-12.HS-LS1-1.LS1.A.2	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.

9-12.HS-LS1-6.LS1.C.1	The sugar molecules thus formed contain carbon, hydrogen, and oxygen: their hydrocarbon backbones are used to make amino acids and other carbon-based molecules that can be assembled into larger molecules (such as proteins or DNA), used for example to form new cells.
9-12.HS-LS3-1.LS3.A.1	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.
9-12.HS-LS3-2.LS3.B	Variation of Traits
9-12.HS-LS3-2.LS3.B.1	In sexual reproduction, chromosomes can sometimes swap sections during the process of meiosis (cell division), thereby creating new genetic combinations and thus more genetic variation. Although DNA replication is tightly regulated and remarkably accurate, errors do occur and result in mutations, which are also a source of genetic variation. Environmental factors can also cause mutations in genes, and viable mutations are inherited.