West Windsor-Plainsboro Regional School District
Forensic Sciences Curriculum
Grades: 11-12

The Mission of the West Windsor-Plainsboro Science Department

Our mission is to cultivate science learners who have the foundational knowledge to make ethical, scientifically literate decisions and the ability to apply scientific practices in order to contribute to the needs of society and a changing world.

- **Vision**

  We envision a K-12 science experience that supports and challenges every student in their science learning journey. We will:

  - Capitalize on diversity by reaching and exciting students at all levels and interests by differentiating learning within classrooms and by offering a robust program of studies.
  - Emphasize authentic science and engineering practices and leverage the interdisciplinary nature of science with arts, technology, math, reading, and writing.
  - Integrate scientific knowledge and 21st century competencies to prepare students to make informed decisions and take action to address real world problems.
  - Cultivate an inclusive and diverse community where all learners are welcomed, valued, respected, and celebrated.

Unit 0: Lab Safety and Procedures	
Content Area: Science	
Course & Grade Level: Forensic Science, 11-12	
Summary and Rationale	
This unit introduces students to basic forensics laboratory techniques, and safety standards. This is key to maintaining a safe working environment for the students and instructor. These concepts and practices will be used throughout the year any time students are working in the lab.	
Recommended Pacing	
4 days	
New Jersey Student Learning Standards	
Standard: NGSS	
CPI #	**Cumulative Progress Indicator (CPI)**
HS-ETS1-3	Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.
New Jersey Student Learning Standards for English Language Arts Companion Standards	
CPI #	**Cumulative Progress Indicator (CPI)**
ELA	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text
New Jersey Student Learning Standards for Career Readiness, Life Literacies and Key Skills	
CPI #	**Cumulative Progress Indicator (CPI)**
9.4.12.CI.1	Demonstrate the ability to reflect, analyze, and use creative skills and ideas.
9.4.12.CT.2	Explain the potential benefits of collaborating to enhance critical thinking and problem solving
Content Objectives	
● Identify common lab equipment.	
Ability Objectives	
● Demonstrate safe behavior in the laboratory. ● Properly use common laboratory equipment (Bunsen burner may be covered later). ● Demonstrate proper use and care of triple beam and/or top loading, and electronic balances. ● Demonstrate proficient setup and data collection/analysis.	
Evidence of Learning	
Sample Performance Tasks	
Analyze and describe a presented solution to a safety problem with consideration to constraints and environmental impact **(HS-ETS1-3)**	
Resources	
Core Text: Forensic Science: Fundamentals and Investigations**,** Bertino**,** ISBN 9780538731553 **Suggested Resources:** ● ACS safety video	

Unit 1: Observation and Conclusion - The Science Process for Forensics
Content Area: Science
Course & Grade Level: Forensic Science, 11-12
Summary and Rationale
As an introduction to forensic science, it is necessary to talk about how our observations are perceived by our brains. This is tied into looking for patterns in order to make sense of evidence and a situation. Activities in this unit

help students see that like science, crime cases are solved by making conclusions based on observations. However, we recognize the unreliability of eyewitness testimony or observations that are made by humans. Students study that there are internal and external influences on our ability to make reliable observations. This leads into our study of the Innocence Project and how in turn, this leads to the importance of physical evidence in a case.	
Recommended Pacing	
12-16 days	
New Jersey Student Learning Standards for	
Standard: NGSS	
CPI #	**Cumulative Progress Indicator (CPI)**
HS-LS1-2	Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms
HS-ETS1-1	Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.
New Jersey Student Learning Standards for English Language Arts Companion Standards	
CPI #	**Cumulative Progress Indicator (CPI)**
ELA	Determine the theme, central ideas, key information and/or perspective(s) presented in a primary or secondary source; provide an accurate summary that makes clear the relationships among the key details and ideas
ELA	Analyze in detail a series of events described in a text; draw connections between the events, to determine whether earlier events caused later ones or simply preceded them
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ELA	Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem
ELA	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
New Jersey Student Learning Standards for Career Readiness, Life Literacies and Key Skills	
CPI #	**Cumulative Progress Indicator (CPI)**
9.1.12.CFR.1	Compare and contrast the role of philanthropy, volunteer service, and charities in community development and quality of life in a variety of cultures.
9.1.12.CFR.2	Summarize causes important to you and compare organizations you seek to support to other organizations with similar missions
9.2.12.CAP.2	Develop college and career readiness skills by participating in opportunities such as structured learning experiences, apprenticeships, and dual enrollment programs.
9.2.12.CAP.4	Evaluate different careers and develop various plans (e.g., costs of public, private, training schools) and timetables for achieving them, including educational/training requirements, costs, loans, and debt repayment.
9.2.12.CAP.6	Identify transferable skills in career choices and design alternative career plans based on those skills.
9.2.12.CAP.7	Use online resources to examine licensing, certification, and credentialing requirements at the local, state, and national levels to maintain compliance with industry requirements in areas of career interest.
9.2.12.CAP.8	Determine job entrance criteria (e.g., education credentials, math/writing/reading comprehension tests, drug tests) used by employers in various industry sectors.
Interdisciplinary Standards	
Standard 6.1 U.S. History	America in the World. All students will acquire the knowledge and skills to think analytically about how past and present interactions of people, cultures, and the environment shape the American

	heritage. Such knowledge and skills enable students to make informed decisions that reflect fundamental rights and core democratic values as productive citizens in local, national, and global communities.
Standard 6.2 World History	Global Studies: All students will acquire the knowledge and skills to think analytically and systematically about how past interactions of people, cultures, and the environment affect issues across time and cultures. Such knowledge and skills enable students to make informed decisions as socially and ethically responsible world citizens in the 21st century.
Math	Reason abstractly and quantitatively
Math	Choose a level of accuracy appropriate to limitations on measurement when reporting quantities of the factors as applied to Forensic Science.
Math	Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays
Math	Define appropriate quantities for the purpose of descriptive modeling.

Instructional Focus

Unit Enduring Understandings

- Science is dynamic and is a constant influx of information & technological advances impacts existing knowledge.
- A scientific problem may have more than one viable answer.
- The scientific process is a cycle of making observations, asking questions, making predictions, testing predictions and asking more questions.
- Forensics uses observed patterns to solve mysteries.
- The human brain perceives information uniquely in each individual

Unit Essential Questions

- How much of science is "common sense"?
- How do scientists think?
- How reliable are eyewitnesses?
- What evidence is used to overturn convictions that were based on eyewitness testimony?

Content Objectives

- Discuss the limitations of eyewitness accounts of events and the factors that influence them.
- Define the term observation and perception
- Explain the purpose of the Innocence Project

Ability Objectives

- Draw conclusions based on eyewitness accounts and compare them to conclusions from physical evidence.
- Understand that the goal of forensic science is to find the unique source of the evidence.
- Make accurate observations while in labs and record results clearly and concisely.
- Differentiate between an observation and a conclusion
- Perform laboratory activities in class while following all safety rules.
- Solve pretend criminal cases using observation and deduction skills.

Understanding Observations and Witness Testimony

APA National Standards for High School Psychology Curricula

Standard Area: Social Interactions

- 1.2 Describe the relationship between attitudes (implicit and explicit) and behavior.
- 1.3 Identify persuasive methods used to change attitudes.
- 2.2 Describe effects of others' presence on individuals' behavior.
- 3.1 Discuss the nature and effects of stereotyping, prejudice, and discrimination.

Standard Area: Memory

- 3.1 Discuss the nature and effects of stereotyping, prejudice, and discrimination.
- 3.1 Analyze the importance of retrieval cues in memory.

- 3.4. Explain how memories can be malleable.

Standard Area: Thinking

- 1.2 Define processes involved in problem solving and decision making.

Evidence of Learning

Sample Performance Task

- Based on observed patterns and the knowledge that the universe is consistent, predict an unknown characteristic(s) and support it using logical thinking. (**HS-FS1-1)**
- Based on the knowledge that the universe is consistent, evaluate the validity and reliability of and/or synthesize multiple claims and explanations that come from eyewitness reports, verifying the data when possible. Form an argument based on data and evidence that explains the outcome of a crime. (**HS-LS1-2)**
- Analyze demographic data on prison populations to understand disproportionality in the incarceration of racial groups. (**HS-ETS1-1)**

Resources

Common Assessment: NGSS Aligned Lesson Template - Unit 1
Engineering, Technology, and the Application of Science

Unit 2: Physical Evidence and Law	
Content Area: Science	
Course & Grade Level: Forensic Sciences, 11-12	
Summary and Rationale	
Forensic science utilizes all levels of scientific inquiry to analyze physical evidence with the ultimate goal of recreating the events of the crime for a jury in a court of law. Hence, in this unit students will learn proper crime scene procedure and understand the necessity for establishing a chain of custody. They will detail the role that evidence plays in recreating the events of a crime. They will be able to describe the two types of evidence that can be found at a crime scene and differentiate between class and individual evidence. This lays the foundation for the upcoming units that delve into different pieces of evidence, such as hair, blood, and bones. They will understand the importance of following the principles of scientific method and the need for collecting control samples at every crime scene. They will define and demonstrate proper evidence collection procedure at a mock crime scene. This helps to explain the rationale for the laws around evidence collection and presentation in court.	
Recommended Pacing	
24-28 days	
New Jersey Student Learning Standards for	
Standard: NGSS	
CPI #	**Cumulative Progress Indicator (CPI)**
HS-ETS1-2	Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering
HS-ETS1-3	Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.
Standard: Climate	
CPI #	**Cumulative Progress Indicator (CPI)**
HS-ESS3-1	Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and climate change have influenced human activity.
New Jersey Student Learning Standards for English Language Arts Companion Standards	
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9.4.12.CT.2	Explain the potential benefits of collaborating to enhance critical thinking and problem solving
9.4.12.IML.1	Compare search browsers and recognize features that allow for filtering of information.
9.4.12.IML.2	Evaluate digital sources for timeliness, accuracy, perspective, credibility of the source, and relevance of information, in media, data, or other resources.
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Math	Choose a level of accuracy appropriate to limitations on measurement when reporting quantities of the factors as applied to Forensic Science.
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Content Objectives

- Explain Locard's exchange principle.
- Describe examples of materials that could be transferred from a crime-scene to a suspect or vice versa .
- Discuss how the intensity, duration and nature of the materials in contact can affect the extent of the transfer.
- Distinguish between direct, circumstantial, biological, physical, trace, class, and individual evidence.
- Describe the role of each of the following people at a crime scene: Police officer, Crime Scene Investigator, Medical Examiner, Detective, Other specialists

- Summarize the seven steps of a crime-scene investigation.
- Explain the Frye and Daubert standards and their relationship to the 4th amendment.
- Know the 4th amendment and explain the importance of knowing your rights when interacting with law enforcement
- Distinguish between the different methods of collection and packaging of the various types of evidence that may be found at a crime scene.
- Describe what is meant by physical evidence and give examples.
- List the steps of Crime Scene Processing/Management and describe the tasks necessary (preserving & isolating the scene, observe & document the scene, search scene, collect and package evidence, maintain chain of custody)

Ability Objectives

- Distinguish what physical evidence can and cannot prove in court.
- Distinguish between a primary and a secondary crime scene.
- Determine the significance of class evidence vs individual .
- Critique how evidence is collected and whether it violates an individual's rights.
- Preserve (photograph) and protect the crime scene from contamination by using appropriate equipment.
- Observe (using an appropriate search pattern) and document the scene (photograph and sketch).
- Properly open and seal an evidence bag and fill out the chain of custody form.
- Demonstrate proper use of metric measurements (to the nearest tenth) and procedure to calculate scale.

Evidence of Learning

Sample Performance Task

- Utilizing a systematic approach to observations, communicate technical information in the form of a two dimensional crime scene model drawn to scale that allows for the recreation of the crime scene. (**HS-ETS1-2)**
- Gather and analyze evidence to construction an explanation for how the availability of natural resources, occurrence of natural hazards, and climate change have influenced human activity, specifically crime rates **(HS-ESS3-1)**

Resources

Common Assessment: NGSS Aligned Lesson Template - Unit 2
Engineering, Technology, and the Application of Science

Unit 3: Death and Entomology

Content Area: Science

Course & Grade Level: Forensic Sciences, 11-12

Summary and Rationale

Many crimes involve intentional or unintentional death of a person. Hence, one task of the medical examiner is to determine the official manner, cause and mechanism of death. Time of death is also an important clue for investigators. Biological changes in the body, as well as entomological succession, offer clues that may be vital to catching a killer or setting a suspect free.

Recommended Pacing

12 - 16 days

New Jersey Student Learning Standards for

Standard: NGSS

CPI #	Cumulative Progress Indicator (CPI)
HS-LS4-5	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

HS-LS2-8	Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce.
HS-LS2-6	Evaluate claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.
HS-PS1-5	Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs.
Standard: Climate	
CPI #	**Cumulative Progress Indicator (CPI)**
HS-ESS3-1	Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and climate change have influenced human activity.
New Jersey Student Learning Standards for English Language Arts Companion Standards	
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New Jersey Student Learning Standards for Career Readiness, Life Literacies and Key Skills	
CPI #	**Cumulative Progress Indicator (CPI)**
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9.4.12.CT.1	Identify problem-solving strategies used in the development of an innovative product or practice.
9.4.12.CT.2	Explain the potential benefits of collaborating to enhance critical thinking and problem solving
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9.4.12.IML.2	Evaluate digital sources for timeliness, accuracy, perspective, credibility of the source, and relevance of information, in media, data, or other resources.
9.4.12.IML.3	Analyze data using tools and models to make valid and reliable claims, or to determine optimal design solutions.
9.4.12.IML.4	Assess and critique the appropriateness and impact of existing data visualizations for an intended audience.
Interdisciplinary Standards (fill-in Science, or SS, or Math, etc..)	
Standard 6.1 U.S. History	America in the World. All students will acquire the knowledge and skills to think analytically about how past and present interactions of people, cultures, and the environment shape the American heritage. Such knowledge and skills enable students to make informed decisions that reflect fundamental rights and core democratic values as productive citizens in local, national, and global communities.
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Math	Reason abstractly and quantitatively
Math	Choose a level of accuracy appropriate to limitations on measurement when reporting quantities of the factors as applied to Forensic Science.
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Instructional Focus

Unit Enduring Understandings

- It is impossible to determine the precise moment of death.
- The variety and stage of development of insects found at the scene build an estimated timeline.
- The decomposition of a corpse has different stages.
- Various environmental factors may influence the estimation of time of death.

Unit Essential Questions

- What can insects tell us about a crime?
- What can we learn from a dead body?

Content Objectives

- Describe and recognize the stages of decomposition.
- Know the 3 mortises and how they are used to determine time of death.
- Identify the conditions that exist to cause the different insects to arrive at the scene.

Ability Objectives

- Identify and describe the four stages of a blowfly.
- List the different insects that can arrive at a crime scene and what stage they would be present.
- Given the proper tables students can identify the possible time of death for a given scenario using observations of the body and bug activity .
- Determine the manner, cause and mechanism of death.

Evidence of Learning

Sample Performance Task

- Evaluate the merits and limitations of the insect-based time of death models that incorporate biotic and abiotic factors. **(HS-LS4-5, HS-LS2-8, HS-LS2-6)**
- Utilizing the algor mortis mathematical model, determine the time of death based on environmental factors. **(HS-LS4-5, HS-ESS3-1, HS-PS1-5)**
- Analyze data to construct an explanation for how climate change could affect using body decomposition and insect activity to determine time of death, now and in the future. **(HS-LS4-5, HS-ESS3-1, HS-LS2-8)**

Resources

Unit 4: Forensic Anthropology

Content Area: Science

Course & Grade Level: Forensic Sciences, 11-12

Summary and Rationale

Sometimes a body found at a crime scene is beyond recognition and bones may be able to offer the only clues to the person's identity as well as manner and cause of death. Evaluating subtle differences in characteristics in bones demonstrates the power of patterns as well as the fallibility of forensic investigations. Using body measurements to determine height allows for comparison of data and evaluation of patterns.

Recommended Pacing

12 - 16 days

New Jersey Student Learning Standards for

Standard: NGSS

CPI #	Cumulative Progress Indicator (CPI)
HS-LS4-1	Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.
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
Standard: Climate	
CPI #	**Cumulative Progress Indicator (CPI)**
HS-ESS3-1	Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and climate change have influenced human activity.
New Jersey Student Learning Standards for English Language Arts Companion Standards	
CPI #	**Cumulative Progress Indicator (CPI)**
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9.4.12.IML.2	Evaluate digital sources for timeliness, accuracy, perspective, credibility of the source, and relevance of information, in media, data, or other resources.
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9.4.12.IML.4	Assess and critique the appropriateness and impact of existing data visualizations for an intended audience.
Interdisciplinary Standards (fill-in Science, or SS, or Math, etc..)	
Standard 6.1 U.S. History	America in the World. All students will acquire the knowledge and skills to think analytically about how past and present interactions of people, cultures, and the environment shape the American heritage. Such knowledge and skills enable students to make informed decisions that reflect fundamental rights and core democratic values as productive citizens in local, national, and global communities.
Standard 6.2 World History	Global Studies: All students will acquire the knowledge and skills to think analytically and systematically about how past interactions of people, cultures, and the environment affect issues across time and cultures. Such knowledge and skills enable students to make informed decisions as socially and ethically responsible world citizens in the 21st century.
Math	Reason abstractly and quantitatively

Math	Choose a level of accuracy appropriate to limitations on measurement when reporting quantities of the factors as applied to Forensic Science.
Math	Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays
Math	Define appropriate quantities for the purpose of descriptive modeling.

Instructional Focus

Unit Enduring Understandings

- Bones and teeth provide evidence of physical characteristics of the person and their lifestyle.
- Characteristics of the bones and teeth can provide clues as to the manner and cause of death.
- Race is a social categorization of people and has no scientific or anatomical basis. Therefore, it is very difficult and irresponsible to attempt to determine race from a person's skeleton.

Unit Essential Questions

- What can bones tell us about the death of a person and about the people themselves?
- Are there any relationships between bone length and an individual's height?

Content Objectives

- Bones contain a record of injuries and disease.
- A person's approximate age could be determined by examining their bones.
- Bones contain key features which can be used to determine the biological sex of a person. Bones cannot be used to determine the gender of a person.

Ability Objectives

- Distinguish between the biological sex of skeletal remains based on skull, jaw, brow ridge, pelvis, and femur.
- Demonstrate proper graphical analysis techniques; including preparing and reading graphs, identifying the dependent and independent variables, interpolating and extrapolating data in order to determine estimated height from bone length.

Evidence of Learning

Sample Performance Task

- Based on numerous parts of the skeletal system, plan an investigation of the proportional relationships between certain bones and overall height. **(HS-LS4-1)**
- Identify the key features of a pelvis and take measurements and observations in order to conclude the sex of the individual. **(HS-LS4-1)**
- Analyze data to construct an explanation for how the increased occurrence of natural disasters has impacted the need for forensic anthropologists **(HS-ESS3-1)**

Resources

Unit 5: Hair Evidence

Content Area: Science

Course & Grade Level: Forensic Science, 11-12

Summary and Rationale

Hair is a frequently found piece of class evidence which can identify a group of people who share similar traits. Hair has the ability to narrow the suspect pool, playing a crucial role at a crime scene. However, it alone is not sufficient for conviction. There are limitations to its use in a court of law. Additionally, students will ask a testable question, design an investigation to attempt to answer their question, and analyze hair in their investigation. It is assumed students have working knowledge of a compound light microscope but a review during this unit is advisable.

Recommended Pacing

8-12 days

New Jersey Student Learning Standards for

Standard: NGSS

CPI #	Cumulative Progress Indicator (CPI)
HS-LS1-2	Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
HS-LS3-3	Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.
New Jersey Student Learning Standards for English Language Arts Companion Standards	
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Math	Choose a level of accuracy appropriate to limitations on measurement when reporting quantities of the factors as applied to Forensic Science.
Math	Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays

Math	Define appropriate quantities for the purpose of descriptive modeling.

Instructional Focus

Unit Enduring Understandings

- Different types of hair have unique and measurable characteristics that will lead to particular species.
- Hair has the ability to narrow the suspect pool, however, it alone is not sufficient for conviction.

Unit Essential Questions

- How can you identify the hair as animal or human?
- How can you individualize a hair to a particular person or animal?
- How are hair samples collected for evidence?
- How does the Locard's Principle connect to the discovery of hair as forensic evidence?

Content Objectives

- Understand that hair is class evidence unless a root is attached. DNA evidence may be found in the root.
- Understand that hair evidence cannot be used to identify sex, age, race, etc.
- The medullary index is a ratio of the medulla's diameter to the hair's diameter.

Ability Objectives

- Explain how hair can be used to support circumstantial evidence.
- Explain how hair absorbs substances from within the body and from the environment.
- Identify the structure of hair and the purpose of each.
- Identify the three stages of growth.
- Use of the microscope to identify the scale pattern and medulla patterns of hairs.
- Determine the medullary index of a piece of hair to determine if it's human or animal

Evidence of Learning

Sample Performance Task

- Plan and conduct an investigation of the similarities and differences in the structure of human and animal hair as they perform an essential function of life. **(HS-LS1-2)**

Resources

Common Assessment: NGSS Aligned Lesson Template- Hair
Engineering, Technology, and the Application of Science

Unit 6: Fibers	
Content Area: Science	
Course & Grade Level: Forensic Sciences, 11-12	
Summary and Rationale	
Fibers from clothing can be transferred from one person to another or discarded unnoticed at the crime scene. The presence of unique fibers on a suspect's clothing or belongings does not prove guilt, but can link them to a particular person or location. Since fiber evidence is considered class evidence, understanding the importance of probability and statistics help the development of probative evidence in a criminal case.	
Recommended Pacing	
8-12 days	
New Jersey Student Learning Standards for	
Standard: NGSS	
CPI #	**Cumulative Progress Indicator (CPI)**
HS-LS1-2	Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
HS-PS2-6	Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.

HS-PS4-5	Communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy.
Standard: Climate	
CPI #	**Cumulative Progress Indicator (CPI)**
HS-ESS3-1	Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and climate change have influenced human activity.
New Jersey Student Learning Standards for English Language Arts Companion Standards	
CPI #	**Cumulative Progress Indicator (CPI)**
ELA	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
ELA	Determine the theme, central ideas, key information and/or perspective(s) presented in a primary or secondary source; provide an accurate summary that makes clear the relationships among the key details and ideas
ELA	Analyze in detail a series of events described in a text; draw connections between the events, to determine whether earlier events caused later ones or simply preceded them
ELA	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text
ELA	Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem
New Jersey Student Learning Standards for Career Readiness, Life Literacies and Key Skills	
CPI #	**Cumulative Progress Indicator (CPI)**
9.4.12.CI.1	Demonstrate the ability to reflect, analyze, and use creative skills and ideas.
9.4.12.CT.1	Identify problem-solving strategies used in the development of an innovative product or practice.
9.4.12.CT.2	Explain the potential benefits of collaborating to enhance critical thinking and problem solving
9.4.12.IML.1	Compare search browsers and recognize features that allow for filtering of information.
9.4.12.IML.2	Evaluate digital sources for timeliness, accuracy, perspective, credibility of the source, and relevance of information, in media, data, or other resources.
9.4.12.IML.3	Analyze data using tools and models to make valid and reliable claims, or to determine optimal design solutions.
9.4.12.IML.4	Assess and critique the appropriateness and impact of existing data visualizations for an intended audience.
Interdisciplinary Standards (fill-in Science, or SS, or Math, etc..)	
Standard 6.1 U.S. History	America in the World. All students will acquire the knowledge and skills to think analytically about how past and present interactions of people, cultures, and the environment shape the American heritage. Such knowledge and skills enable students to make informed decisions that reflect fundamental rights and core democratic values as productive citizens in local, national, and global communities.
Standard 6.2 World History	Global Studies: All students will acquire the knowledge and skills to think analytically and systematically about how past interactions of people, cultures, and the environment affect issues across time and cultures. Such knowledge and skills enable students to make informed decisions as socially and ethically responsible world citizens in the 21st century.
Math	Reason abstractly and quantitatively
Math	Choose a level of accuracy appropriate to limitations on measurement when reporting quantities of the factors as applied to Forensic Science.

Math	Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays
Math	Define appropriate quantities for the purpose of descriptive modeling.

Instructional Focus

Unit Enduring Understandings

- Different fibers have different and often unique physical and chemical properties.
- Probability is a mathematical way of assessing the probative value of fibers.

Unit Essential Questions

- What are fibers?
- What factors increase the probative value of fibers?

Content Objectives

- Understand that probability can be used to determine the chances that a fiber is a match, even when it is class evidence.
- Hair and certain natural fibers are difficult to distinguish by microscope alone and often require additional analysis.

Ability Objectives

- Identify weave patterns to help identify material left at a crime scene.
- Analyze fiber evidence using destructive and nondestructive methods to determine the type of fiber.
- Compare and contrast various types of fibers through physical and chemical analysis to determine if it is natural or synthetic
- Describe principal characteristics of common fibers used in their identification.

Evidence of Learning

Sample Performance Task

- Using detailed examinations of fiber properties, frame a hypothesis as to their origin being either synthetic or organic. **(HS-LS1-2)**
- Use the mathematical model for probability and given data to determine the probability of a given fiber coming from a given suspect.
- Construct an explanation about how the impact of the availability of natural resources will change over time and affect the individuality of fibers and the use of it as individual evidence. **(HS-ESS3-1)**
- Evaluate the merits and limitations of different methods of analysis, based on knowledge of molecular structure. **(HS-PS2-6, HS-PS4-5)**

Resources

Common Assessments: Fiber NGSS Aligned Lesson Template- Fiber Engineering, Technology, and the Application of Science

Unit 7: Casts and Impressions

Content Area: Science

Course & Grade Level: Forensic Sciences, 11-12

Summary and Rationale

Forensic specialists use impressions left by shoes, feet, tools and tires during crime-scene investigations. Forensic investigators have developed procedures for observing and capturing information from each kind of impression. In some criminal investigations, impressions and the casts made of impressions found at a crime scene are the only evidence that can help an investigator reconstruct a crime. Shoe, footprint, tool, and tire tread evidence is usually class evidence. This provides the basis for the further study of individualized impressions, like fingerprints. Bite-mark impressions used to be considered valuable evidence, however, recent studies have shown it to be very unreliable.

Recommended Pacing	
8-12 days	
New Jersey Student Learning Standards for	
Standard: NGSS	
CPI #	**Cumulative Progress Indicator (CPI)**
HS-PS2-1	Analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration.
HS-ETS1-3	Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.
HS-ETS1-2	Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
New Jersey Student Learning Standards for English Language Arts Companion Standards	
CPI #	**Cumulative Progress Indicator (CPI)**
ELA	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
ELA	Determine the theme, central ideas, key information and/or perspective(s) presented in a primary or secondary source; provide an accurate summary that makes clear the relationships among the key details and ideas
ELA	Analyze in detail a series of events described in a text; draw connections between the events, to determine whether earlier events caused later ones or simply preceded them
ELA	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text
ELA	Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem
New Jersey Student Learning Standards for Career Readiness, Life Literacies and Key Skills	
CPI #	**Cumulative Progress Indicator (CPI)**
9.4.12.CI.1	Demonstrate the ability to reflect, analyze, and use creative skills and ideas.
9.4.12.CT.1	Identify problem-solving strategies used in the development of an innovative product or practice.
9.4.12.CT.2	Explain the potential benefits of collaborating to enhance critical thinking and problem solving
9.4.12.IML.1	Compare search browsers and recognize features that allow for filtering of information.
9.4.12.IML.2	Evaluate digital sources for timeliness, accuracy, perspective, credibility of the source, and relevance of information, in media, data, or other resources.
9.4.12.IML.3	Analyze data using tools and models to make valid and reliable claims, or to determine optimal design solutions.
9.4.12.IML.4	Assess and critique the appropriateness and impact of existing data visualizations for an intended audience.
Interdisciplinary Standards (fill-in Science, or SS, or Math, etc..)	
Standard 6.1 U.S. History	America in the World. All students will acquire the knowledge and skills to think analytically about how past and present interactions of people, cultures, and the environment shape the American heritage. Such knowledge and skills enable students to make informed decisions that reflect fundamental rights and core democratic values as productive citizens in local, national, and global communities.
Standard 6.2 World History	Global Studies: All students will acquire the knowledge and skills to think analytically and systematically about how past interactions of people, cultures, and the environment affect issues

	across time and cultures. Such knowledge and skills enable students to make informed decisions as socially and ethically responsible world citizens in the 21st century.
Math	Reason abstractly and quantitatively
Math	Choose a level of accuracy appropriate to limitations on measurement when reporting quantities of the factors as applied to Forensic Science.
Math	Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays
Math	Define appropriate quantities for the purpose of descriptive modeling.

Instructional Focus

Unit Enduring Understandings

- Impressions are class evidence, but can be individualized.
- Each kind of impression tells us different and important pieces of what has happened at the crime scene.
- Due to the transitory nature of impressions, special techniques are used to collect evidence from shoes, footprints, tire treads, and tool marks.

Unit Essential Questions

- What factors increase the probative value of impressions?

Content Objectives

- Explain how the various types of impressions can be used as evidence.
- Forensics scientists may request access to databases of tread patterns for shoes and tires, which may help the investigation.
- Understand that unique features distinguish similar impressions and can individualize class evidence.

Ability Objectives

- Describe how to make foot, shoe, and tire impressions through various methods.
- List the factors that can help individualize each type of impression evidence.
- Distinguish between latent, patent, and plastic impressions.
- Demonstrate proper graphical analysis techniques; including preparing and reading graphs, identifying the dependent and independent variables, interpolating and extrapolating data in order to determine estimated height from bone length.

Evidence of Learning

Sample Performance Task

- Compare patterns and measurements between a bite, tire, or shoe impression from a crime scene and from the lab to determine if they match. **(HS-ETS1-2)(HS-PS2-1)**
- Evaluate the merits and limitations of different methods of analysis, based on knowledge of the effects of environmental conditions, criteria, and restraints. **(HS-ETS1-3)**

Resources

Unit 8: Fingerprints

Content Area: Science

Course & Grade Level: Forensic Sciences, 11-12

Summary and Rationale

The patterns found on the skin of our fingers were realized long ago, but fingerprint analysis was a major breakthrough in forensic science as a means of personal identification. This was a massive development and is still used today as individual evidence to clear the innocent and convict the guilty. Close attention to detail and patience are a must throughout this unit. It is also important to understand there are many factors that determine what method forensic scientists choose when lifting fingerprints.

Recommended Pacing

12 - 16 days

New Jersey Student Learning Standards for	
Standard: NGSS	
CPI #	**Cumulative Progress Indicator (CPI)**
HS-LS3-3	Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.
HS-PS4-2	Evaluate questions about the advantages of using a digital transmission and storage of information.
HS-ETS1-3	Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.
New Jersey Student Learning Standards for English Language Arts Companion Standards	
CPI #	**Cumulative Progress Indicator (CPI)**
ELA	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
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New Jersey Student Learning Standards for Career Readiness, Life Literacies and Key Skills	
CPI #	**Cumulative Progress Indicator (CPI)**
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9.4.12.CT.2	Explain the potential benefits of collaborating to enhance critical thinking and problem solving
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Math	Reason abstractly and quantitatively

Math	Choose a level of accuracy appropriate to limitations on measurement when reporting quantities of the factors as applied to Forensic Science.
Math	Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays
Math	Define appropriate quantities for the purpose of descriptive modeling.

Instructional Focus

Unit Enduring Understandings

- Fingerprints have distinct features that allow for personal identification.
- Fingerprints are unique and do not change over an individual's lifetime.
- Fingerprints can be collected and documented using physical and chemical techniques.

Unit Essential Questions

- What makes fingerprints individual evidence?
- How, when and why do fingerprints form?
- How has the technology used in the analysis of fingerprints changed over time?

Content Objectives

- Understand that fingerprints are left by three "methods"
- Discuss the history of fingerprinting and how it evolved over time, including the technology used
- Identify the pros and cons of various lifting techniques

Ability Objectives

- Distinguish between the main types of prints as loops, arches and whorls and their subtypes of ulnar, radial, tented, accidental, plain, and central pocket.
- Learn to observe high level of detail (i.e. minutiae)
- Demonstrate the ability to develop, lift and classify a fingerprint.
- Determine the best lifting technique Given a scenario to decide which is best suited for the type of print and surface
- Demonstrate proper technique when rolling fingerprints
- Determine if two prints match based on the identification and location of minutiae.

Evidence of Learning

Sample Performance Task

- Collect and classify student data to confirm the occurrences of loops, arches, and whorls found within the world population. **(HS-LS3-3)**
- Evaluate the effectiveness of fingerprint identification systems and discuss how these systems have bias based on the fingerprint databases they access. **(HS-PS4-2, HS-ETS1-3)**
- Evaluate the merits and limitations of different methods of lifting and analysis, based on knowledge of the effects of environmental conditions, cost, safety, and reliability **(HS-ETS1-3)**

Resources

Common Assessment: Fingerprints
NGSS Aligned Lesson Template
Engineering, Technology, and the Application of Science

Unit 9: DNA Evidence

Content Area: Science

Course & Grade Level: Forensic Sciences, 11-12

Summary and Rationale

No two people have the exact same DNA, except for identical twins. DNA is an important form of individual evidence that carries an individual's genetic information. Electrophoresis of DNA creates a profile that can be used

to identify or exonerate persons of interest in crimes. Discussion and observation of how scientists determine the guilt or innocence of a person of interest.	
Recommended Pacing	
8 - 12 days	
New Jersey Student Learning Standards for	
Standard: NGSS	
CPI #	**Cumulative Progress Indicator (CPI)**
HS-LS3-3	Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.
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.
HS-LS3-2	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.
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.
New Jersey Student Learning Standards for English Language Arts Companion Standards	
CPI #	**Cumulative Progress Indicator (CPI)**
ELA	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
ELA	Determine the theme, central ideas, key information and/or perspective(s) presented in a primary or secondary source; provide an accurate summary that makes clear the relationships among the key details and ideas
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New Jersey Student Learning Standards for Career Readiness, Life Literacies and Key Skills	
CPI #	**Cumulative Progress Indicator (CPI)**
9.4.12.CI.1	Demonstrate the ability to reflect, analyze, and use creative skills and ideas.
9.4.12.CT.1	Identify problem-solving strategies used in the development of an innovative product or practice.
9.4.12.CT.2	Explain the potential benefits of collaborating to enhance critical thinking and problem solving
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9.4.12.IML.2	Evaluate digital sources for timeliness, accuracy, perspective, credibility of the source, and relevance of information, in media, data, or other resources.
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9.4.12.IML.4	Assess and critique the appropriateness and impact of existing data visualizations for an intended audience.
Interdisciplinary Standards (fill-in Science, or SS, or Math, etc..)	
Standard 6.1 U.S. History	America in the World. All students will acquire the knowledge and skills to think analytically about how past and present interactions of people, cultures, and the environment shape the American heritage. Such knowledge and skills enable students to make informed decisions that reflect

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Math	Reason abstractly and quantitatively
Math	Choose a level of accuracy appropriate to limitations on measurement when reporting quantities of the factors as applied to Forensic Science.
Math	Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays
Math	Define appropriate quantities for the purpose of descriptive modeling.

Instructional Focus

Unit Enduring Understandings

- DNA is individualizing evidence.
- Although all people share the same genetic code, there are enough differences between individuals in specific regions of the genome to differentiate between people.
- Statistical analysis helps determine the probability that two people would have the same sequence in a fragment of DNA.
- DNA evidence can be used to exonerate or convict, depending on the circumstances.

Unit Essential Questions

- To what extent can DNA analysis be used to determine relatedness among individuals and to help solve crimes?
- How does a DNA profile link to me?
- If all human beings share the same genetic code, how can DNA evidence be used to identify anyone?
- To what extent is DNA evidence conclusive?
- Why is DNA stronger evidence than blood types?

Content Objectives

- Understand that DNA is individual evidence with its own limitations
- Know the different sources of DNA that could be left at a crime scene
- Describe the function and purpose of a restriction enzyme.
- Describe how radioactive probes are used in DNA fingerprinting.
- Describe how crime scene evidence is processed to obtain DNA.
- Describe and label the structure of a DNA molecule

Ability Objectives

- Explain how DNA evidence is compared for matching.
- Explain how a DNA fingerprint/profile is made.
- Read and compare gels to identify the person of interest that matches with the crime scene or paternity/maternity.
- Determine where a restriction enzyme will cut and how many bands will be produced after the digest and their size.

Evidence of Learning

Sample Performance Task

- Make a claim about the identity of a person based on the patterns of a DNA profile. **(HS-LS3-2)**
- Analyze data in order to compare and contrast various patterns from DNA samples to establish paternity based on slight variations in the DNA sequence. **(HS-LS3-3, HS-LS3-2, HS-LS3-1)**

Resources

Unit 10: Blood Evidence	
Content Area: Science	
Course & Grade Level: Forensic Sciences, 11-12	
Summary and Rationale	
In order to use blood in an investigation, one must understand the function and composition of blood in the human body. The presence of blood at a crime scene can help to eliminate suspects based on blood type. Forensics scientists not only test blood type, but also may be able to test for a DNA profile. Before these tests, scientists first use chemical reactions to determine that the stain is indeed blood and furthermore that it is human blood. This unit leads into the physics of blood in the next unit on blood spatter.	
Recommended Pacing	
4 - 8 days	
New Jersey Student Learning Standards for	
Standard: NGSS	
CPI #	**Cumulative Progress Indicator (CPI)**
HS-LS1-2	Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms
HS-LS3-3	Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population
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.
HS-LS4-3	Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait.
New Jersey Student Learning Standards for English Language Arts Companion Standards	
CPI #	**Cumulative Progress Indicator (CPI)**
ELA	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
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ELA	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text
ELA	Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem
New Jersey Student Learning Standards for Career Readiness, Life Literacies and Key Skills	
CPI #	**Cumulative Progress Indicator (CPI)**
9.4.12.CI.1	Demonstrate the ability to reflect, analyze, and use creative skills and ideas.
9.4.12.CT.1	Identify problem-solving strategies used in the development of an innovative product or practice.
9.4.12.CT.2	Explain the potential benefits of collaborating to enhance critical thinking and problem solving
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9.4.12.IML.2	Evaluate digital sources for timeliness, accuracy, perspective, credibility of the source, and relevance of information, in media, data, or other resources.
9.4.12.IML.3	Analyze data using tools and models to make valid and reliable claims, or to determine optimal design solutions.

9.4.12.IML.4	Assess and critique the appropriateness and impact of existing data visualizations for an intended audience.
Interdisciplinary Standards (fill-in Science, or SS, or Math, etc..)	
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Standard 6.2 World History	Global Studies: All students will acquire the knowledge and skills to think analytically and systematically about how past interactions of people, cultures, and the environment affect issues across time and cultures. Such knowledge and skills enable students to make informed decisions as socially and ethically responsible world citizens in the 21st century.
ELA	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
ELA	Determine the theme, central ideas, key information and/or perspective(s) presented in a primary or secondary source; provide an accurate summary that makes clear the relationships among the key details and ideas
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ELA	Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem
Math	Reason abstractly and quantitatively
Math	Choose a level of accuracy appropriate to limitations on measurement when reporting quantities of the factors as applied to Forensic Science.
Math	Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays
Math	Define appropriate quantities for the purpose of descriptive modeling.
Instructional Focus	
Unit Enduring Understandings	
● Blood's unique characteristics are used to eliminate and/or identify suspects. ● Genetic variation gives rise to different antigens on the red blood cells causing different blood types. ● Statistical analysis helps determine the probability that people would have the same blood type. ● Blood is considered class evidence	
Unit Essential Questions	
● How do we determine that there is blood at the crime scene? ● How could we distinguish between human and animal blood? ● How is blood used to eliminate suspects?	
Content Objectives	
● Explain how blood is characterized based on presence or absence of antigens including A,B,O,Rh. ● Understand what a presumptive blood tests is and how it works ● Explain why blood types provide class evidence and not individual evidence. ● Understand that Blood type allows investigators to identify a group of suspects. DNA within blood can individualize the evidence. ● Understand the composition of blood and the general functions of its components.	
Ability Objectives	

- Discuss and determine the presence of blood by using laboratory tests.
- Identify blood type based on lab results using anti-protein serums or by looking at a model.
- Predict the antigen-antibody response if given a blood type and the anti-serum
- Discuss the percent occurrence of the blood types within the population and relate to probability.

Evidence of Learning

Sample Performance Task

- Make a claim about the identity of a person based on the antigen - antibody relationship of a person's blood type. **(HS-LS1-2)**
- Draw a model of the antigen-antibody complex and describe the empirical evidence you would observe for any given combination. **(HS-LS1-2)**
- Utilize the punnett square model to determine the likely blood type inherited by an offspring. **(HS-LS3-3, HS-LS3-1, HS-LS4-3)**

Resources

Unit 11: Toxicology Evidence	
Content Area: Science	
Course & Grade Level: Forensic Sciences, 11-12	
Summary and Rationale	
Forensic toxicology is the study of poisons, the identification of drugs a person may have used, and the effects of poisons and drugs on the body. Using chemical reactions, drugs can be identified. Toxicological testing can also help determine the cause-and-effect relationships between exposure to a drug or other substance and the toxic or lethal effects of that exposure to humans. Controlled substances are divided into five classes based on patterns of effects on the body.	
Recommended Pacing	
8 - 12 days	
New Jersey Student Learning Standards for	
Standard: NGSS	
CPI #	**Cumulative Progress Indicator (CPI)**
HS-PS1-2	Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties.
HS-PS1-5	Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs.
HS-ETS1-3	Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.
New Jersey Student Learning Standards for English Language Arts Companion Standards	
CPI #	**Cumulative Progress Indicator (CPI)**
ELA	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
ELA	Determine the theme, central ideas, key information and/or perspective(s) presented in a primary or secondary source; provide an accurate summary that makes clear the relationships among the key details and ideas
ELA	Analyze in detail a series of events described in a text; draw connections between the events, to determine whether earlier events caused later ones or simply preceded them

ELA	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text
ELA	Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem
New Jersey Student Learning Standards for Career Readiness, Life Literacies and Key Skills	
CPI #	**Cumulative Progress Indicator (CPI)**
9.4.12.CI.1	Demonstrate the ability to reflect, analyze, and use creative skills and ideas.
9.4.12.CT.1	Identify problem-solving strategies used in the development of an innovative product or practice.
9.4.12.CT.2	Explain the potential benefits of collaborating to enhance critical thinking and problem solving
9.4.12.IML.1	Compare search browsers and recognize features that allow for filtering of information.
9.4.12.IML.2	Evaluate digital sources for timeliness, accuracy, perspective, credibility of the source, and relevance of information, in media, data, or other resources.
9.4.12.IML.3	Analyze data using tools and models to make valid and reliable claims, or to determine optimal design solutions.
9.4.12.IML.4	Assess and critique the appropriateness and impact of existing data visualizations for an intended audience.
Interdisciplinary Standards (fill-in Science, or SS, or Math, etc..)	
Standard 6.1 U.S. History	America in the World. All students will acquire the knowledge and skills to think analytically about how past and present interactions of people, cultures, and the environment shape the American heritage. Such knowledge and skills enable students to make informed decisions that reflect fundamental rights and core democratic values as productive citizens in local, national, and global communities.
Standard 6.2 World History	Global Studies: All students will acquire the knowledge and skills to think analytically and systematically about how past interactions of people, cultures, and the environment affect issues across time and cultures. Such knowledge and skills enable students to make informed decisions as socially and ethically responsible world citizens in the 21st century.
ELA	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
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ELA	Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem
Math	Reason abstractly and quantitatively
Math	Choose a level of accuracy appropriate to limitations on measurement when reporting quantities of the factors as applied to Forensic Science.
Math	Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays
Math	Define appropriate quantities for the purpose of descriptive modeling.
Instructional Focus	
Unit Enduring Understandings	

- Different chemicals have unique properties and have wide-ranging effects on human physiology.
- Chemical compounds classified in the Controlled Substances Act are regulated by the United States government.
- Toxicology has a long historical presence and many applications in assessing possible cause of death.
- Too much of anything can be lethal

Unit Essential Questions

- Is foul play involved?
- What laboratory tests do forensic scientists rely on to identify unknown chemicals?
- What effects do toxins have on the body?
- How do toxicologists determine the lethality of a substance?

Content Objectives

- Define and describe the goals and practices of toxicology and the vocabulary associated with poisons.
- Identify the five types of controlled substances and describe the source and effect on the body
- Describe the ways people can be exposed to drugs and factors that can affect toxicity
- Distinguish between acute and chronic poisoning
- Understand what LD50 is and how its determined

Ability Objectives

- Explain the various types of toxins that cause death.
- Relate signs and symptoms of overdose with a specific class of drugs or toxins.
- Interpret the lab results of color tests to determine the presence of certain toxins and drugs
- Determine the best method of drug analysis given a unknown sample
- Determine if something is more or less toxic by looking at the LD50 of the substance and calculate the lethal dosage of a substance

Evidence of Learning

Sample Performance Task

- Plan an investigation that will use empirical evidence of chemical reactions to identify an unknown substance**. (HS-PS1-2, HS-PS1-5, HS-ETS1-3)**
- Evaluate the merits and limitations of different methods of analysis, based on knowledge of chemical reactions, the effects of environmental conditions, cost, safety, and reliability **(HS-ETS1-3)**
- Research and describe the mechanism of death due to a chemical exposure and its post-mortem determination. **(HS-PS1-2)**

Resources

Unit 12: Blood Spatter Evidence

Content Area: Science

Course & Grade Level: Forensic Sciences, 11-12

Summary and Rationale

By examining blood spatter patterns left at a crime scene and using properties of physics, investigators can reconstruct the events of the crime. Investigators do so by determining the direction the blood was traveling, the angle of impact, and the point of origin of the blood.

Recommended Pacing

12 - 16 days

New Jersey Student Learning Standards for

Standard: NGSS

CPI #	Cumulative Progress Indicator (CPI)
HS-PS2-2	Use mathematical representations to support the claim that the total momentum of a system of objects is conserved when there is no net force on the system.

HS-PS2-1	Analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration.
New Jersey Student Learning Standards for English Language Arts Companion Standards	
CPI #	**Cumulative Progress Indicator (CPI)**
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Math	Choose a level of accuracy appropriate to limitations on measurement when reporting quantities of the factors as applied to Forensic Science.
Math	Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays
Math	Define appropriate quantities for the purpose of descriptive modeling.
Instructional Focus	
Unit Enduring Understandings	

• Patterns in blood distribution help sequence and reconstruct events. • Blood spatter analysis can help determine the manner of death.
Unit Essential Questions
• What does the blood pattern left at a scene tell us about the crime that took place?
Content Objectives
• Understand that the appearance of bloodstain patterns is affected by velocity, direction, and height of fall. • Identify spikes versus satellites in blood spatter • Explain the different categories of bloodstain patterns.
Ability Objectives
• Determine the point of origin of blood spatter using height and impact angle. • Apply mathematics and physics (calculate angle of impact) to the recreation of a crime scene. • Use blood-spatter evidence to recreate the events at a crime scene • Draw lines of convergence for any given blood spatter pattern.
Evidence of Learning
Sample Performance Task
• Using the properties of Newton's 2nd law plan an investigation that examines the properties of blood when acted upon by gravity of different heights above the earth. **(HS-PS2-2, HS-PS2-1)** • Analyze blood spatter data to reconstruct the events that took place at the crime scene **(HS-PS2-2, HS-PS2-1)**
Resources

Common Assessment: Blood Drop
NGSS Aligned Lesson Template
Engineering, Technology, and the Application of Science

Unit 13: End of Year Project (Common Assessment)
Content Area: Science
Course & Grade Level: Forensic Sciences, 11-12
Recommended Pacing
8 - 12 days