

**MOORESTOWN TOWNSHIP PUBLIC SCHOOLS
MOORESTOWN, NEW JERSEY**

*Moorestown High School
Science Department*

*Forensics CP
Grades: 11-12*

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[Course Description and Fundamental Concepts](#)

Forensic Science is a comprehensive subject which incorporates biology, chemistry, physics and other core subject areas. This course will apply the New Jersey Student Learning Science for Science, Crosscutting Concepts, Engineering and Technology, along with Science and Engineering practices which will bridge disciplinary boundaries that unite core ideas throughout the fields of science. Students will research, read and discuss famous forensic case studies.

Major topics for the class will include: processing a crime scene, collecting and preserving evidence, analysis of trace evidence such as hairs, fibers, glass and paint; and autopsies, drugs, toxicology, serology, DNA fingerprinting , blood spatter, fingerprints, firearms, tool and bite mark impressions are all explored in detail. The course combines scientific theory with experimentation which actively involves students in the class. The experiments reinforce previously learned scientific and engineering practices and incorporate new skills which demonstrate “real life” application of science.

[New Jersey Student Learning Standards \(NJSLS\)](#)

Subject/Content Standards

Include grade appropriate subject/content standards that will be addressed

Standard #	Standard Description
<i>HS-PS1</i>	
<i>HS-PS1-1</i>	<i>Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms.</i>
<i>HS-PS1-2</i>	<i>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.</i>
<i>HS-PS1-3</i>	<i>Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles.</i>
<i>HS-PS1-4</i>	<i>Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy.</i>
<i>HS-PS1-5</i>	<i>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.</i>
<i>HS-PS1-6</i>	<i>Refine the design of a chemical system by specifying a change in conditions that would produce increased amounts of products at equilibrium.</i>
<i>HS-PS3</i>	
<i>HS-PS3-1</i>	<i>Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known..</i>
<i>HS-PS3-2</i>	<i>Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motions of particles (objects) and energy associated with the relative position of particles (objects).</i>
<i>HS-PS4</i>	
<i>HS-PS4-2</i>	<i>Evaluate questions about the advantages of using a digital transmission and storage of information.</i>

<i>HS-PS4-5</i>	<i>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.</i>
<i>HS-LS1</i>	
<i>HS-LS1-2</i>	<i>Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.</i>
<i>HS-LS1-4</i>	<i>Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.</i>
<i>HS-LS2</i>	
<i>HS-LS2-3</i>	<i>Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.</i>
<i>HS-LS3</i>	
<i>HS-LS3-3</i>	<i>Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.</i>
<i>ETS1 Engineering Design</i>	
<i>HS-ETS1-1</i>	<i>Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.</i>
<i>HS-ETS1-2</i>	<i>Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.</i>
<i>HS-ETS1-3</i>	<i>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.</i>
<i>HS-ETS1-4</i>	<i>Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.</i>

English Companion Standards

List grade-level appropriate companion standards for History, Social Studies, Science and Technical Subjects (CTE/Arts) 6-12. English Companion Standards are required in these subject/content areas.

Unit Addressed	Standard #	Standard Description
Unit 3,4,6,7	<i>RST.9-10.7</i>	<i>Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.</i>
Unit 1	<i>RST.9-10.8</i>	<i>Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem.</i>
Unit 1,2,3,4,5,6,7,8	<i>RST.11-12.1</i>	<i>Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.</i>
Unit 1,5	<i>RST.11-12.7</i>	<i>Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.</i>
Unit 1	<i>RST.11-12.8</i>	<i>Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.</i>
Unit 5	<i>RST.11-12.9</i>	<i>Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. (HS-LS3-1)</i>
Unit 1,2,3,4,5,6,7,9	<i>WHST.9-12.2</i>	<i>Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.</i>
Unit 2,3,4,6,7	<i>WHST.9-12.5</i>	<i>Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.</i>
Unit 3,4,5,7,8	<i>WHST.9-12.7</i>	<i>Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.</i>

Unit 1,3,4,6,7,8	<i>WHST.11-12.8</i>	<i>Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.</i>
Unit 1,2	<i>WHST.9-12.1</i>	<i>Write arguments focused on discipline-specific content.</i>
Unit 3,4,5,7,8	<i>WHST.9-12.9</i>	<i>Draw evidence from informational texts to support analysis, reflection, and research.</i>
Unit 2,3,4,7	<i>SL.11-12.5</i>	<i>Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.</i>

Career Awareness, Exploration, Preparation, and Training ([Standard 9.2](#))

List appropriate units below for which standards will be addressed

By Grade 12

Unit Addressed	Core Idea	Standard / Description
1-9	There are strategies to improve one's professional value and marketability.	<p>9.2.12.CAP.1: Analyze unemployment rates for workers with different levels of education and how the economic, social, and political conditions of a time period are affected by a recession.</p> <p>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.</p> <p>9.2.12.CAP.3: Investigate how continuing education contributes to one's career and personal growth.</p>

	<p>Career planning requires purposeful planning based on research, self-knowledge, and informed choices.</p>	<p>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.</p> <p>9.2.12.CAP.5: Assess and modify a personal plan to support current interests and postsecondary plans.</p> <p>9.2.12.CAP.6: Identify transferable skills in career choices and design alternative career plans based on those skills.</p> <p>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.</p> <p>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.</p> <p>9.2.12.CAP.9: Locate information on working papers, what is required to obtain them, and who must sign them.</p> <p>9.2.12.CAP.10: Identify strategies for reducing overall costs of postsecondary education (e.g., tuition assistance, loans, grants, scholarships, and student loans).</p> <p>9.2.12.CAP.11: Demonstrate an understanding of Free Application for Federal Student Aid (FAFSA) requirements to apply for postsecondary education.</p>
	<p>An individual's income and benefit needs and financial plan can change over time.</p>	<p>9.2.12.CAP.12: Explain how compulsory government programs (e.g., Social Security, Medicare) provide insurance against some loss of income and benefits to eligible recipients.</p> <p>9.2.12.CAP.13: Analyze how the economic, social, and political conditions of a time period can affect the labor market.</p>
	<p>Securing an income involves an understanding of the costs and time in preparing for a career field, interview and negotiation skills, job searches, resume development, prior experience, and vesting and retirement plans.</p>	<p>9.2.12.CAP.14: Analyze and critique various sources of income and available resources (e.g., financial assets, property, and transfer payments) and how they may substitute for earned income.</p>

	<p>Understanding income involves an analysis of payroll taxes, deductions and earned benefits.</p>	<p>9.2.12.CAP.15: <i>Demonstrate how exemptions, deductions, and deferred income (e.g., retirement or medical) can reduce taxable income.</i></p> <p>9.2.12.CAP.16: <i>Explain why taxes are withheld from income and the relationship of federal, state, and local taxes (e.g., property, income, excise, and sales) and how the money collected is used by local, county, state, and federal governments.</i></p> <p>9.2.12.CAP.17: <i>Analyze the impact of the collective bargaining process on benefits, income, and fair labor practice.</i></p> <p>9.2.12.CAP.18: <i>Differentiate between taxable and nontaxable income from various forms of employment (e.g., cash business, tips, tax filing and withholding).</i></p> <p>9.2.12.CAP.19: <i>Explain the purpose of payroll deductions and why fees for various benefits (e.g., medical benefits) are taken out of pay, including the cost of employee benefits to employers and self-employment income.</i></p> <p>9.2.12.CAP.20: <i>Analyze a Federal and State Income Tax Return.</i></p>
	<p>There are ways to assess a business's feasibility and risk and to align it with an individual's financial goals.</p>	<p>9.2.12.CAP.21: <i>Explain low-cost and low-risk ways to start a business.</i></p> <p>9.2.12.CAP.22: <i>Compare risk and reward potential and use the comparison to decide whether starting a business is feasible.</i></p> <p>9.2.12.CAP.23: <i>Identify different ways to obtain capital for starting a business</i></p>

Life Literacies and Key Skills ([Standard 9.4](#))

List appropriate units below for which standards will be addressed

By Grade 12		
Unit Addressed	Core Idea	Standard / Description
1-9	<p>Creativity and Innovation: With a growth mindset, failure is an important part of success.</p>	<p>9.4.12.CI.1: <i>Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).</i></p>

1-9	<p>Creativity and Innovation: Innovative ideas or innovation can lead to career opportunities.</p>	<p><i>9.4.12.CI.2: Identify career pathways that highlight personal talents, skills, and abilities (e.g., 1.4.12prof.CR2b, 2.2.12.LF.8).</i></p> <p><i>9.4.12.CI.3: Investigate new challenges and opportunities for personal growth, advancement, and transition (e.g., 2.1.12.PGD.1).</i></p>
1-9	<p>Critical Thinking and Problem-solving: Collaboration with individuals with diverse experiences can aid in the problem-solving process, particularly for global issues where diverse solutions are needed.</p>	<p><i>9.4.12.CT.1: Identify problem-solving strategies used in the development of an innovative product or practice (e.g., 1.1.12acc.C1b, 2.2.12.PF.3).</i></p> <p><i>9.4.12.CT.2: Explain the potential benefits of collaborating to enhance critical thinking and problem solving (e.g., 1.3E.12profCR3.a).</i></p> <p><i>9.4.12.CT.3: Enlist input from a variety of stakeholders (e.g., community members, experts in the field) to design a service learning activity that addresses a local or global issue (e.g., environmental justice).</i></p> <p><i>9.4.12.CT.4: Participate in online strategy and planning sessions for course-based, school-based, or other projects and determine the strategies that contribute to effective outcomes.</i></p>
	<p>Digital Citizenship: Laws govern the use of intellectual property and there are legal consequences to utilizing or sharing another’s original works without permission or appropriate credit.</p>	<p><i>9.4.12.DC.1: Explain the beneficial and harmful effects that intellectual property laws can have on the creation and sharing of content (e.g., 6.1.12.CivicsPR.16.a).</i></p> <p><i>9.4.12.DC.2: Compare and contrast international differences in copyright laws and ethics</i></p>
9	<p>Digital Citizenship: Laws govern many aspects of computing, such as privacy, data, property, information, and identity. These laws can have beneficial and harmful effects, such as expediting or delaying advancements in computing and protecting or infringing upon people’s rights.</p>	<p><i>9.4.12.DC.3: Evaluate the social and economic implications of privacy in the context of safety, law, or ethics (e.g., 6.3.12.HistoryCA.1).</i></p> <p><i>9.4.12.DC.4: Explain the privacy concerns related to the collection of data (e.g., cookies) and generation of data through automated processes that may not be evident to users (e.g., 8.1.12.NI.3).</i></p> <p><i>9.4.12.DC.5: Debate laws and regulations that impact the development and use of software.</i></p>
9	<p>Digital Citizenship: Cultivating online reputations for employers and academia requires separating private and professional digital identities.</p>	<p><i>9.4.12.DC.6: Select information to post online that positively impacts personal image and future college and career opportunities.</i></p>

	<p>Digital Citizenship: Digital communities influence many aspects of society, especially the workforce. The increased connectivity between people in different cultures and different career fields have changed the nature, content, and responsibilities of many careers.</p>	<p><i>9.4.12.DC.7: Evaluate the influence of digital communities on the nature, content and responsibilities of careers, and other aspects of society (e.g., 6.1.12.CivicsPD.16.a).</i></p>
	<p>Digital Citizenship: Network connectivity and computing capability extended to objects, sensors and everyday items not normally considered computers allows these devices to generate, exchange, and consume data with minimal human intervention. Technologies such as Artificial Intelligence (AI) and blockchain can help minimize the effect of climate change.</p>	<p><i>9.4.12.DC.8: Explain how increased network connectivity and computing capabilities of everyday objects allow for innovative technological approaches to climate protection.</i></p>
	<p>Global and Cultural Awareness: Solutions to the problems faced by a global society require the contribution of individuals with different points of view and experiences.</p>	<p><i>9.4.12.GCA.1: Collaborate with individuals to analyze a variety of potential solutions to climate change effects and determine why some solutions (e.g., political, economic, cultural) may work better than others (e.g., SL.11-12.1., HS-ETS1-1, HS-ETS1-2, HS-ETS1-4, 6.3.12.GeoGI.1, 7.1.IH.IPERS.6, 7.1.IL.IPERS.7, 8.2.12.ETW.3).</i></p>
	<p>Information and Media Literacy: Advanced search techniques can be used with digital and media resources to locate information and to check the credibility and the expertise of sources to answer questions, solve problems, and inform the decision-making.</p>	<p><i>9.4.12.IML.1: Compare search browsers and recognize features that allow for filtering of information.</i></p> <p><i>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 (e.g., NJSLA.W8, Social Studies Practice: Gathering and Evaluating Sources).</i></p>

	<p>Information and Media Literacy: Digital tools such as artificial intelligence, image enhancement and analysis, and sophisticated computer modeling and simulation create new types of information that may have profound effects on society. These new types of information must be evaluated carefully</p>	<p><i>9.4.12.IML.3: Analyze data using tools and models to make valid and reliable claims, or to determine optimal design solutions (e.g., S-ID.B.6a., 8.1.12.DA.5, 7.1.IH.IPRET.8)</i></p> <p><i>9.4.12.IML.4: Assess and critique the appropriateness and impact of existing data visualizations for an intended audience (e.g., S-ID.B.6b, HS-LS2-4).</i></p>
	<p>Information and Media Literacy: In order for members of our society to participate productively, information needs to be shared accurately and ethically.</p>	<p><i>9.4.12.IML.5: Evaluate, synthesize, and apply information on climate change from various sources appropriately (e.g., 2.1.12.CHSS.6, S.IC.B.4, S.IC.B.6, 8.1.12.DA.1, 6.1.12.GeoHE.14.a, 7.1.AL.PRSNT.2).</i></p> <p><i>9.4.12.IML.6: Use various types of media to produce and store information on climate change for different purposes and audiences with sensitivity to cultural, gender, and age diversity (e.g., NJLSA.SL5).</i></p>
	<p>Information and Media Literacy: Accurate information may help in making valuable and ethical choices.</p>	<p><i>9.4.12.IML.7: Develop an argument to support a claim regarding a current workplace or societal/ethical issue such as climate change (e.g., NJLSA.W1, 7.1.AL.PRSNT.4).</i></p>
1-9	<p>Information and Media Literacy: Media have embedded values and points of view.</p>	<p><i>9.4.12.IML.8: Evaluate media sources for point of view, bias, and motivations (e.g., NJLSA.R6, 7.1.AL.IPRET.6).</i></p> <p><i>9.4.12.IML.9: Analyze the decisions creators make to reveal explicit and implicit messages within information and media (e.g., 1.5.12acc.C2a, 7.1.IL.IPRET.4).</i></p>
1-9	<p>Technology Literacy: Digital tools differ in features, capacities, and styles. Knowledge of different digital tools is helpful in selecting the best tool for a given task.</p>	<p><i>9.4.12.TL.1: Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specific task (e.g., W.11-12.6).</i></p> <p><i>9.4.12.TL.2: Generate data using formula-based calculations in a spreadsheet and draw conclusions about the data.</i></p>

	<p>Technology Literacy: Collaborative digital tools can be used to access, record and share different viewpoints and to collect and tabulate the views of groups of people.</p>	<p>9.4.12.TL.3: Analyze the effectiveness of the process and quality of collaborative environments. 9.4.12.TL.4: Collaborate in online learning communities or social networks or virtual worlds to analyze and propose a resolution to a real-world problem (e.g., 7.1.AL.IPERS.6).</p>
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Interdisciplinary Connections (2020 NJSL)

List any other content standards addressed as well as appropriate units. All arts integration connections may be listed within this chart.

Visual & Performing Arts Integration (Standard 1) List appropriate units below for which standards (1.1 through 1.5) may be addressed

Unit Addressed	Artistic Process	Anchor Standard
1	Creating	<p>Anchor Standard 1: Generating and conceptualizing ideas. Anchor Standard 2: Organizing and developing ideas. Anchor Standard 3: Refining and completing products.</p>
1	Connecting	<p>Anchor Standard 10: Synthesizing and relating knowledge and personal experiences to create products. Anchor Standard 11: Relating artistic ideas and works within societal, cultural, and historical contexts to deepen understanding.</p>
1	Performing/ Presenting/ Producing	<p>Anchor Standard 4: Selecting, analyzing, and interpreting work. Anchor Standard 5: Developing and refining techniques and models or steps needed to create products. Anchor Standard 6: Conveying meaning through art.</p>
	Responding	<p>Anchor Standard 7: Perceiving and analyzing products. Anchor Standard 8: Applying criteria to evaluate products. Anchor Standard 9: Interpreting intent and meaning.</p>

Other Interdisciplinary Content Standards

List appropriate units below for any other content/standards that may be addressed

Unit Addressed	Content / Standard #	Standard Description
Unit 1,5,6,7	<i>Math / MP.2</i>	<i>Reason abstractly and quantitatively.</i>
Unit 1,2,3,5,7	<i>Math / MP.4</i>	<i>Model with mathematics.</i>
Unit 1	<i>Math / HSA-SSE.A.1</i>	<i>Interpret expressions that represent a quantity in terms of its context.</i>
Unit 1	<i>Math / HSA-SSE.B.3</i>	<i>Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.</i>
Unit 1	<i>Math / HSA.CED.A.4</i>	<i>Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. (HS-PS4-1),(HS-PS4-3)</i>
Unit 2	<i>Math / HSF-IF.C.7</i>	<i>Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. (HS-LS1-4)</i>
Unit 2	<i>Math / HSF-BF.A.1</i>	<i>Write a function that describes a relationship between two quantities. (HS-LS1-4)</i>
Unit 3,4,7,8	<i>Math / HSN-Q.A.1</i>	<i>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.</i>
Unit 3,4,5,6,7	<i>Math / HSN-Q.A.2</i>	<i>Define appropriate quantities for the purpose of descriptive modeling.</i>
Unit 3,4,5,6,7,8	<i>Math / HSN-Q.A.3</i>	<i>Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.</i>

Pacing Guide (All Dates are approximate based on the school calendar)

Unit/ Topic	Month (w/Approx number of Teaching Days)
<p>Unit 1: Introduction to Forensic Science Recognize the major contributors to the development of forensic science The Crime Scene: Proper procedure for conducting a systematic search of crime scenes for physical evidence</p>	<p>September (~19 days)</p>
<p>Physical Evidence: Demonstrate multiple ways to collect forensic evidence while preserving the crime scene</p>	
<p>Unit 2: Death Investigation Describe the role of a forensic pathologist Anthropology in death investigation Forensic entomology in death investigation</p>	<p>October (~19 days)</p>
<p>Distinguish cause and manner of death Chemical and Physical changes helpful for estimating time of death</p>	
<p>Unit 3: Properties of Matter and the Analysis of Glass Define and distinguish between physical and chemical properties of matter Explore methods forensic scientist use to analyze glass</p>	<p>November (~16 days)</p>
<p>Unit 4: Drugs and Toxicology Name and classify commonly abused drugs Learn the physical effects that toxins have on the body Understand the challenges facing toxicologist such as small samples to work with and different ways that the body metabolizes drugs and toxins</p>	<p>December (~15 days)</p>
<p>Unit 5: Biological Evidence Microscope Determine what type of microscope should be used for different types of evidence Serology: Learn the anatomy and physiology of blood and its importance in forensic science.</p>	<p>January (~18 days)</p>
<p>DNA: The Indispensable Forensic Science Tool Learn lab tests used to match DNA with an individual: PCR testing, RFLPs and STRs Crime-Scene Reconstruction: Bloodstain Pattern Analysis Methods to determine how various blood pattern types are created and which features can be used to aid in reconstructing events at a crime scene</p>	<p>February (~18 days)</p>
<p>Unit 6: Trace Evidence Trace Evidence I: Hairs and Fibers Hair morphology and properties of trace evidence that is most useful to forensic science Trace Evidence II: Metals, Paint and Soil Learn what is important to forensic scientists when classifying and identify this type of trace evidence</p>	<p>March (~15-20 days)</p>
<p>Unit 7: Forensic Investigation of Fires and Explosions Forensic Aspects of Fire Investigation Conditions necessary to initiate and sustain combustion Forensic Investigation of Explosions Describe common commercial and homemade explosives</p>	<p>April (~15-20 days)</p>
<p>Unit 8: Fingerprints and other Impressions Fingerprints Ridge characteristics of a fingerprint and the three major fingerprint patterns Understand forensics biometric technology Understand the importance of individual characteristics when comparing tool marks, footwear, guns, bite marks and tire impressions Research final project topic & case studies</p>	<p>May (~18 days)</p>

Unit 9: Digital Forensics

Mobile Device Forensics

Describe procedures for preserving evidence on a mobile device

Types of evidence that can be found on mobile devices

Final Project Presentations

June
(~15 days)

Units Scope and Sequence

Unit 1: An Introduction to Forensic Science

Step 1 – Desired Results: What do I want my students to learn?

Standards

[NJSLs](#) - List standards that are addressed in this unit

HS-PS4-2. Evaluate questions about the advantages of using a digital transmission and storage of information.

HS-LS3-3. Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.

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-ETS1-4. Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.

NJSLs - Technology Integration Standards

NJSLs - College and Career Ready Practices

NJSLs - Interdisciplinary Standards

Unit Big Ideas:

(What Fundamental Concepts Should be Learned during this Unit?)

- Recognize how modern science has changed forensic science and how modern times have changed the types of crimes committed.
- Understand the importance of conducting a systematic search of a crime scene, collecting physical evidence and preserving it properly.

Objectives

Students will be able to...

Chapter 1: Introduction

- Define forensic science
- Bertillon's identification system and Locard's exchange principle
- Describe five major science groups used in forensics

Chapter 2: The Crime Scene

- Proper procedure for conducting a systematic search of crime scenes for physical evidence
- Demonstrate proper technique for packaging common types of physical evidence
- Measure and record Anthropometric Measurements
- Create a 3D model of a crime scene

Chapter 3: Physical Evidence

- Review the common types of physical evidence found at crime scenes
- Explain the difference between the identification and comparison of physical evidence
- Explain the function of national databases available to forensic scientists

Unit 2 : Death Investigation

Step 1 – Desired Results: What do I want my students to learn?

Standards

[NJSLS](#) - List standards that are addressed in this unit

HS-PS4-2. Evaluate questions about the advantages of using a digital transmission and storage of information.

HS-LS3-3. Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.

HS-LS1-2. Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.

HS-LS1-4. Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.

HS-LS2-3. Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.

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Unit Big Ideas:

(What Fundamental Concepts Should be Learned during this Unit?)

- Understand the role of a forensic pathologist and the phases of an autopsy to determine the manner and cause of death.
- Understand the role of the forensic anthropologist in death investigation
- Describe the role of forensic entomology in a death investigation

Objectives

Students will be able to...

- Identify skulls, pelvic bones, femur, tibia, fibula, humerus, radius and ulna
- Explain the job description and contribution to a crime scene that are made by forensic pathologists, entomologist and anthropologists
- Determine the height of a person by measuring long bones of their skeletal remains by using the math proper equations
- Describe how forensic entomologists determine PMI
- Explain the sequence pattern of insects that appear on a decomposing body and factors that may affect the sequencing

Unit 3: Properties of Matter and the Analysis of Glass

Step 1 – Desired Results: What do I want my students to learn?

Standards

[NJSLs](#) - List standards that are addressed in this unit

HS-PS1-1. Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms.

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-PS1-3. Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles.

HS-PS1-4. Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy.

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Unit Big Ideas: (What Fundamental Concepts Should be Learned during this Unit?)

- Recognize the importance of having knowledge of physical and chemical properties of matter especially when comparing evidence.
- Understand that different types of glass break differently due to its composition
- Look at glass fractures to determine entrance and exit bullet holes in glass. Understand how to analyze which bullet holes preceded the other by looking at the radial and concentric fractures.

Objectives

Students will be able to...

- Define and distinguish between physical and chemical properties
- Determine the entrance and exit of a bullet hole in glass
- Determine which bullet holes preceded the other by looking at the radial and concentric fractures
- Know the basic composition of glass and how it breaks
- Understand the methods forensic scientists use to analyze glass

Unit 4: Drugs and Toxicology

Step 1 – Desired Results: What do I want my students to learn?

Standards

[NJSLs](#) - List standards that are addressed in this unit

HS-PS1-1. Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms.

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-PS1-3. Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles.

HS-PS1-4. Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy.

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-PS1-6. Refine the design of a chemical system by specifying a change in conditions that would produce increased amounts of products at equilibrium.

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Unit Big Ideas:

(What Fundamental Concepts Should be Learned during this Unit?)

- Drugs and toxins cause specific signs and symptoms in victims. How do you identify drugs and toxins and what is the probative value of the different tests?

Objectives

Students will be able to...

Chapter 6: Drugs

- Explain the difference between physical and psychological drug dependence
- Distinguish between narcotics, depressants, stimulants and hallucinogens
- Understand common tests that are used to analyze drugs in a forensic laboratory
- Discuss drug-control laws and the five schedules of drug classification

Chapter 7: Toxicology

- Explain how alcohol is absorbed and transported through the body via the bloodstream
- Understand the process of how alcohol is excreted via a person's breath
- Describe the techniques used by forensic toxicologists use to isolate and identify drugs
- Recognize the significance of finding a drug in human tissue and organs
- Understand the challenges facing toxicologist-small samples/different metabolisms

Unit 5: Biological Evidence

Step 1 – Desired Results: What do I want my students to learn?

Standards

[NJSLS](#) - List standards that are addressed in this unit

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-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-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-PS2-3. Apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision.

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Unit Big Ideas:

(What Fundamental Concepts Should be Learned during this Unit?)

- Specific blood types can be associated with individuals and can be used as class evidence.
- Recognized advances in DNA testing have replaced blood typing as the preferred testing method which can be used as individualized evidence.
- Unmatched DNA can be used to create a suspect's phenotype
- Bloodstains and spatters can be analyzed to reconstruct a crime scene and interpret the events that produced the bleeding.
- Additional bodily fluids can be collected and analyzed as a source of evidence

Objectives

Students will be able to...

Chapter 8: Microscope

- Identify the parts of a compound microscope
- Name different types of microscopes used in forensic science
- Discuss how palynology is used to link a crime scene and a person or object

Chapter 9: Serology

- Understand the concept of the antigen – antibody interaction and its application to species identification and drug identification
- Contrast chromosomes and genes including Punnett squares, genotypes and phenotypes of offspring.
- List and understand how whole blood is typed
- List and describe forensic tests used to characterize a stain as blood

Chapter 10: DNA: The Indispensable Forensic Science Tool

- Explain the structure of a DNA molecule
- Discuss lab tests used to match DNA with an individual: PCR testing, RFLP's and STRs
- Explain the difference between mitochondrial DNA and nuclear DNA
- List proper procedures for collection and preservation of biological evidence for DNA analysis

Chapter 11: Crime-Scene Reconstruction: Bloodstain Pattern Analysis

- Demonstrate how texture, directionality, and angle of impact affect the shape of an individual bloodstain
- Calculate the angle of impact of a blood stain by using dimensions, formulas and scientific calculator
- Explain the string method for determining area of origin for a bloodstain pattern
- Discuss methods to determine how various blood pattern types are created and which features can be used to aid in reconstructing events at a crime scene

Unit 6: Trace Evidence

Step 1 – Desired Results: What do I want my students to learn?

Standards

[NJSL](#) - List standards that are addressed in this unit

HS-PS1-1. Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms.

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-PS1-3. Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles.

HS-LS3-3. Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population. [

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**Unit Big Ideas:
(What Fundamental Concepts Should be Learned during this Unit?)**

- According to Locard's Principle, evidence is present at any crime scene which can help to determine whether a crime has been committed.
- Being able to recognize what is evidence is an invaluable skill.
- Trace elements, metals, soil samples, paint samples, glass fragments, hair and fibers can all be used as evidence to identify suspects in a crime
- What value should be placed on trace evidence such as hair and fibers?

Objectives

Students will be able to...

Chapter 12: Trace Evidence I: Hairs and Fibers

- Explain the morphology of hair- cuticle, cortex, and medulla
- Identify the three basic patterns of the hair cuticle
- Identify the difference between human and animal hair
- Explain the significance of hair to a forensic scientist
- Understand the difference between natural and manufactured fibers
- Discuss properties of fibers that are most useful to forensic science

Chapter 13: Trace Evidence II: Metals, Paint and Soil

- Explain neutron activation analysis
- Classify paint by examining layers and other advanced testing methods
- Describe proper collection and preservation of paint evidence
- Discuss important forensic properties found in soil

Unit 7: Forensic Investigation of Fires and Explosives

Step 1 – Desired Results: What do I want my students to learn?

Standards

[NJSLs](#) - List standards that are addressed in this unit

HS-PS3-1. Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known.

HS-PS3-2. Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motions of particles (objects) and energy associated with the relative position of particles (objects).

HS-PS1-1. Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms.

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-PS1-3. Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles.

HS-PS1-4. Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy.

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-PS1-6. Refine the design of a chemical system by specifying a change in conditions that would produce increased amounts of products at equilibrium.

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Unit Big Ideas:

(What Fundamental Concepts Should be Learned during this Unit?)

- How do you collect physical evidence from an extremely destructive crime scene?
- Technological advancements in the detection of bomb residuals and accelerants
- What evidence and patterns are left behind in arson cases?

Objectives

Students will be able to...

Chapter 14: Forensic Aspects of Fire Investigation

- List conditions necessary to initiate and sustain combustion
- Recognize the signs of an accelerant-initiated fire
- Describe how to collect physical evidence at the scene of suspected arson
- Describe laboratory procedures used to detect and identify hydrocarbon residues

Chapter 15: Forensic Investigation of Explosions

- Common commercial and homemade explosives are used in crimes
- Describe how to collect physical evidence at the scene of an explosion
- Describe laboratory procedures used to detect and identify explosive residues
- Understand how laws have changed in response to terrorism

Unit 8: Fingerprints and Impression Analysis

Step 1 – Desired Results: What do I want my students to learn?

Standards

[NJSL](#) - List standards that are addressed in this unit

HS-PS4-2. Evaluate questions about the advantages of using a digital transmission and storage of information.

HS-LS3-3. Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.

HS-PS1-3. Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles.

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Unit Big Ideas:

(What Fundamental Concepts Should be Learned during this Unit?)

- A fingerprint is an individual characteristic that is not duplicated from person to person and remains unchanged during a person's lifetime. Are there any limitations to using fingerprints as individual evidence?
- Objects have distinguishing physical characteristics that can be identified in an impression. Do these distinguishing characteristics have the ability to change class evidence to individual?
- Are some of these methods now considered unreliable?

Objectives

Students will be able to...

Chapter 16: Fingerprints

- Identify the common ridge characteristics of a fingerprint
- Identify three major fingerprint patterns
- Distinguish between visible, plastic and latent fingerprints

- Practice techniques used by forensics to preserve a developed latent print
- Explain the scope of the FBI's Next Generation Identification System

Chapter 17: Firearms, Tool Marks and Other Impressions

- Recognize the class and individual characteristics of bullets and cartridge cases
- Understand the use of the comparison microscope to compare bullets and cartridge cases
- Discuss the NIBIN database
- Explain the procedure for determining how far from a target a weapon was fired
- Understand the importance of individual characteristics when comparing tool marks, footwear and tire impressions
- Identify types of human teeth
- Read and measure bite mark impressions
- Begin research for final projects

Unit 9: Digital Forensics

Step 1 – Desired Results: What do I want my students to learn?

Standards

[NJSLs](#) - List standards that are addressed in this unit

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.

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**Unit Big Ideas:
 (What Fundamental Concepts Should be Learned during this Unit?)**

- What types of evidence can a mobile phone give investigators?
- Why are mobile devices so different in the amount of information investigators can obtain?
- How can a mobile phone help find a victim's location?
- What evidence could be extracted from my own phone?

Objectives

Students will be able to...

- Students will understand the challenges and limitations of cellular phones as evidence
- Students will research their own phone's capabilities as evidence in an investigation
- Present final projects

Please contact the Content Supervisor for any questions.