LAB FORENSIC SCIENCE

Grade Level: 11-12

Credits: 2.5

BOARD OF EDUCATION ADOPTION DATE:

AUGUST 30, 2010

SUPPORTING RESOURCES AVAILABLE IN DISTRICT RESOURCE SHARING
APPENDIX A: ACCOMMODATIONS AND MODIFICATIONS
APPENDIX B: ASSESSMENT EVIDENCE
APPENDIX C: INTERDISCIPLINARY CONNECTIONS
**Course Philosophy**

Lab Forensic Science is the application of inquiry-based laboratory science skills to criminal and civil law. In criminal cases, forensic science examines physical evidence that can be used to establish connections between individuals and criminal events and circumstances. The application of the scientific method is essential to Forensic Science – observation, collection of data, classification of evidence, examining relationships, forming and testing hypotheses and drawing conclusions are useful for determining the evidential value of crime scene and related evidence. Students will learn to work in teams and utilize forensic science techniques, critical thinking skills, problem-solving skills, and technology in order to analyze crime scene evidence. The ultimate goal is to provide the students with 21st Century Learning skills and an overall view of Forensic Science which has been subject to increased interest and popularity in recent years.

**Course Description**

This half-year laboratory course for juniors and seniors provides an introduction to the field of forensic science. The course of study includes the applications of forensic science concepts (which involves biology, chemistry, and physics) to analyze and investigate evidence that may be discovered in a criminal investigation. Classroom activities include: laboratory investigations and activities, research projects, famous case studies, lab practicums, career exploration, and the infusion of technology throughout the scope of the course.
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<th>Relevant Standards</th>
<th>Enduring Understandings</th>
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<td>5.1.12 B1-4; C1-3; D1-3 8.1.12 F1-2 9.1.12 A1, A4 9.1.12 F2, F6</td>
<td>Forensic Science is the integration of core scientific disciplines.</td>
<td>How has Forensic Science developed over time due to advances in science, technology and society? How has science become integrated into the practice of law? How do fictitious portrayals of Forensic Science compare to real-world Forensic Science?</td>
<td>Pretest Student Survey Oral Questions and Discussion Anticipatory Set Questions Pretest Student Survey Oral Questions and Discussion Anticipatory Set Questions Pretest Student Survey Oral Questions and Discussion Anticipatory Set Questions Pretest Student Survey Oral Questions and Discussion Anticipatory Set Questions</td>
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<td>Forensic science involves a variety of careers.</td>
<td>What services does a crime lab provide to law enforcement personnel? Which professionals make up a crime scene unit? What contributions do the forensic scientists make to an investigation? What are the differences between perceived and actual roles of forensic scientists?</td>
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<td>Crime scenes must be processed in a procedural manner.</td>
<td>Why must a crime scene be secured and processed in a methodical and procedural manner? How is the location and handling of evidence essential to crime scene investigation?</td>
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<td>Evidence determines the method by which a crime has been committed.</td>
<td>How is evidence used to determine whether a crime has been committed? How are various types of evidence tested and analyzed? What is the value of different types of evidence?</td>
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<td>Unit Title</td>
<td>Unit Understandings and Goals</td>
<td>Recommended Duration</td>
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<tr>
<td>Unit #1: Introduction to Forensic Science</td>
<td>Forensic Science is the integration of core scientific disciplines. Forensic science involves a variety of careers. 1. Students will recognize the major contributors to the development of Forensic Science including the advancements in tools, techniques, and crime lab services. 2. Students will identify various specialty professions within the field of Forensic Science. 3. Students will explain the differences between the perceived and actual roles of a forensic scientist.</td>
<td>2 weeks</td>
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<td>Unit #2: Crime Scene Investigation and Evidence Collection</td>
<td>Crime scenes must be processed in a procedural manner. Evidence is needed to determine the method by which a crime has been committed. 1. Students will explain the procedures used to process a crime scene. 2. Students will explain the proper way to classify and process evidence.</td>
<td>3 weeks</td>
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<td>Unit #3: Fingerprints and other Pattern Evidence</td>
<td>Crime scenes must be processed in a procedural manner. Evidence is needed to determine the method by which a crime has been committed. 1. Students will identify patterns and characteristics of various types of pattern evidence. 2. Students will demonstrate various procedures used by the forensic scientist when collecting and preserving impression evidence. 3. Students will explain the importance of impression databases available to forensic scientists.</td>
<td>2 weeks</td>
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<td>Unit #4: Trace Evidence</td>
<td>Crime scenes must be processed in a procedural manner. Evidence is needed to determine the method by which a crime has been committed. 1. Students will identify trace evidence characteristics that are most useful in forensic comparisons. 2. Students will demonstrate procedures used by the forensic scientist when processing trace evidence. 3. Students will explain the importance of trace evidence databases available to forensic scientists.</td>
<td>2 weeks</td>
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| Unit #5: Document Examination                  | Crime scenes must be processed in a procedural manner. Evidence is needed to determine the method by which a crime has been committed.  
  1. Students will identify the characteristics of questioned documents that are most useful in forensic comparisons.  
  2. Students will demonstrate procedures used by forensic scientists to process questioned documents.  
  3. Students will explain the importance of evidence databases available to forensic scientists. | 2 weeks              |
| Unit #6: Serology and Blood Pattern Analysis   | Crime scenes must be processed in a procedural manner. Evidence is needed to determine the method by which a crime has been committed.  
  1. Students will identify characteristics of body fluids that are most useful in forensic comparisons.  
  2. Students will demonstrate procedures used by forensic scientists when processing blood evidence.  
  3. Students will explain the importance of evidence databases available to forensic scientists. | 2 weeks              |
| Unit #7: DNA                                  | Crime scenes must be processed in a procedural manner. Evidence is needed to determine the method by which a crime has been committed.  
  1. Students will identify the characteristics of DNA that is most useful in forensic comparisons.  
  2. Students will demonstrate procedures used by the forensic scientist when processing DNA evidence.  
  3. Students will explain the importance of DNA databases available to forensic scientists. | 2 weeks              |
| Unit #8: Forensic Pathology and Anthropology   | Crime scenes must be processed in a procedural manner. Evidence is needed to determine the method by which a crime has been committed.  
  1. Students will identify the characteristics of human remains that are most useful in forensic comparisons.  
  2. Students will demonstrate procedures used by the forensic scientist when processing human remains. | 2 weeks              |
### Freehold Regional High School District
#### Lab Forensic Science
#### Unit #1: Introduction to Forensic Science

**Enduring Understandings:** Forensic Science is the integration of core scientific disciplines.
Forensic science involves a variety of careers.

**Essential Questions:** How has Forensic Science developed over time due to advances in science, technology and society?
How has science become integrated into the practice of law? How do fictitious portrayals of Forensic Science compare to real-world Forensic Science? What services does a crime lab provide to law enforcement personnel? Which professionals make up a crime scene unit? What contributions do the forensic scientists make to an investigation? What are the differences between perceived and actual roles of forensic scientists?

**Unit Goals:** Students will recognize the major contributors to the development of Forensic Science including the advancements in tools, techniques, and crime lab services.
Students will identify various specialty professions within the field of Forensic Science.
Students will explain the differences between the perceived and actual roles of a forensic scientist.

**Duration of Unit:** 2 weeks
**NJCCCS:** 5.1.12 B1-4, C1-3, D1-3; 8.1.12 F1-2; 9.1.12 A1, A4; 9.1.12 F2, F6

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| What is forensic science and why has science become integrated into the practice of law? | Historical timeline of forensic science advancements and development of early crime labs
Locard’s Exchange Principle
Admissibility of evidence (Frye and Daubert decisions)
Role and responsibilities of the expert witness | Current textbook
Notes; Handouts
Internet; Mobile computer lab centers
Laboratory Tools and Safety Equipment
Video; Multimedia resources
Community resources; Guest Speakers
Current Event Articles | Class notes via lecture, PowerPoint, Smartboard, overhead projector, and class discussion
Hands-on lab activities and cooperative group work such as: create a ‘table for 2’ mini crime scene that tests student powers of observation and objectivity; use a white t-shirt and magnifying glass to demonstrate Locard’s Evidence Exchange Principle | Written tests and quizzes
Worksheets
Lab; Activity
Project assessments
Research activities such as famous case studies using trutv.com
Webquests |

| Who are the major contributors to the development of forensic science? | Historical timeline of forensic science advancements and development of early crime labs
Locard’s Exchange Principle
Admissibility of evidence (Frye and Daubert decisions)
Role and responsibilities of the expert witness | Current textbook
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Worksheets
Lab; Activity
Project assessments
Research activities such as “famous forensic scientists and their contributions” or “careers in forensic science” |
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| What are the various specialty fields included within the broad realm of forensic science? | Services of a typical comprehensive crime laboratory and comparison of modern labs due to demographics
Specialty areas: pathology, entomology, anthropology, toxicology, serology, medical examiner/coroner, botany, odontology, podiatry, psychiatry, engineering, and other expert fields relating to forensics | Current textbook
Notes; Handouts
Internet; Mobile computer lab centers
Laboratory Tools, Appropriate hands-on materials, Safety Equipment
Video; Multimedia resources
Community resources; Guest Speakers | Class notes via lecture, PowerPoint, Smartboard, overhead projector, and class discussion | Hands-on lab activities and cooperative group work such as: match forensic professionals to job descriptions |

| How do real world roles and responsibilities of forensic professionals compare to fictitious versions portrayed on film? | Actual versus fictitious examples
CSI Effect | Current textbook
Notes; Handouts
Internet; Mobile computer lab centers
Laboratory Tools and Safety Equipment
Video; Multimedia resources
Community resources; Guest Speakers
Current Event Articles | Class notes via lecture, PowerPoint, Smartboard, overhead projector, and class discussion | Hands-on lab activities and cooperative group work such as: student dissection of a fictitious portrayal of forensic professionals (such as seen on CSI) to highlight accuracy and embellishment as seen through their inexperienced eyes
Video such as: “Anderson Cooper 360 The CSI Effect” | Written tests and quizzes
Worksheets
Lab; Activity
Project assessments
Research activities such as “careers in forensic science” or “CSI inaccuracies or myths” or “CSI Effect examples”
Webquests such as: csitheexperience.org |

**Suggestions on how to differentiate in this unit:**
- Students with individual learning styles can be assisted through one-to-one teacher support, additional testing time, peer to peer coaching, and use of visual and auditory teaching methods
- A wide variety of assessments and strategies complement the individual learning experience.
Enduring Understandings: Crime scenes must be processed in a procedural manner.
Evidence is needed to determine the method by which a crime has been committed.

Essential Questions:
Why must a crime scene be secured and processed in a methodical and procedural manner?
How is the location and handling of evidence essential to crime scene investigation?
How is evidence used to determine whether a crime has been committed?
What is the value of different types of evidence?

Unit Goals:
Students will explain the procedures used to process a crime scene.
Students will explain the proper way to classify and process evidence.

Duration of Unit: 3 weeks

NJCCCS: 5.1.12 A1-3, B1-4, C1-3, D1-3; 5.3.12 A1-6, B1-2, D1; 8.1.12 F1-2; 9.1.12 A1, A4; 9.1.12 F2, F6

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<td>What are the responsibilities of the first responder and scene technicians at a crime scene?</td>
<td>Steps in securing, preserving, and processing a crime scene</td>
<td>Current textbook Notes; Handouts Internet; Mobile computer lab centers Laboratory Tools, Appropriate hands-on materials, Safety Equipment Video; Multimedia resources Community resources; Guest Speakers</td>
<td>Class notes via lecture, PowerPoint, Smartboard, overhead projector, and class discussion Hands-on lab activities and cooperative group work such as: Create a crime scene for students to process, (indoor and/or outdoor) including take notes/description of scene, search/locate evidence, evidence marking, measurements, drawings, photography, sketches, evidence evaluation and/or collection</td>
<td>Written tests and quizzes Worksheets Lab / Activity Project assessments Research activities Webquest</td>
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<td>How do investigators systematically search for crime scene evidence?</td>
<td>Primary/Secondary crime scenes Staged crimes Search patterns</td>
<td>Current textbook Notes; Handouts Internet; Mobile computer lab centers</td>
<td>Class notes via lecture, PowerPoint, Smartboard, overhead projector, and class discussion Hands-on lab activities and cooperative group work such as: Create a crime scene for students to process, (indoor and/or outdoor) including take notes/description of scene, search/locate evidence, evidence marking, measurements, drawings, photography, sketches, evidence evaluation and/or collection</td>
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| What steps should be taken to thoroughly document, diagram, and reconstruct the crime scene? | Observations about crime scene environment  
Evidence marking  
Crime Scene and evidence Photography  
Crime scene sketches |  |  |
| How is evidence properly recognized, collected, and packaged? | Crime scene and evidence contamination  
Examples of evidence packaging materials  
Chain of custody |  |  |
| How is evidence classified? | Direct versus circumstantial   
Individual versus class  
Types of evidence (biological, chemical, etc.)  
Probative value  
Eyewitness testimony |  |  |

**Suggestions on how to differentiate in this unit:**

- Students with individual learning styles can be assisted through one-to-one teacher support, additional testing time, peer to peer coaching, and use of visual and auditory teaching methods
- A wide variety of assessments and strategies complement the individual learning experience.
Freehold Regional High School District  
Lab Forensic Science  
Unit #3: Fingerprints and Other Pattern Evidence

**Enduring Understandings:** Crime scenes must be processed in a procedural manner. 
Evidence is needed to determine the method by which a crime has been committed.

**Essential Questions:** How is the location and handling of evidence essential to crime scene investigation? How is evidence used to determine whether a crime has been committed? How are various types of evidence tested and analyzed? What is the value of different types of evidence?

**Unit Goals:** Students will identify patterns and characteristics of various types of pattern evidence. Students will demonstrate various procedures used by the forensic scientist when collecting and preserving impression evidence. Students will explain the importance of impression databases available to forensic scientists.

**Duration of Unit:** 2 weeks

**NJCCCS:** 5.1.12 A1-3, B1-4, C1-3, D1-3; 8.1.12 F1-2; 9.1.12 A1, A4; 9.1.12 F2, F6

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| How is a fingerprint created? | Physical development and structure of human fingerprints  
Secretions that make a fingerprint on surfaces  
Class versus individual evidence  
Fingerprints do not change over time; altering or disguising fingerprints | Current textbook  
Notes; Handouts  
Internet; Mobile computer lab centers  
Laboratory Tools, Appropriate hands-on materials, Safety Equipment  
Video; Multimedia resources  
Community resources; Guest Speakers  
Current Event Articles | Class notes via lecture, PowerPoint, Smartboard, overhead projector, and class discussion  
Hands-on lab activities and cooperative group work such as: create fingerprints on various surfaces and compare | Written tests; quizzes  
Worksheets  
Lab / Activity  
Research activities such as John Dillinger  
Webquest |
| What are the three major fingerprint patterns and their respective sub-classes? | Loop, whorl, arch characteristics  
Common ridge characteristics (minutiae) | Current textbook  
Notes; Handouts  
Internet; Mobile computer lab centers  
Laboratory Tools, Appropriate hands-on materials, Safety Equipment  
Video; Multimedia resources  
Community resources; Guest Speakers  
Current Event Articles | Class notes via lecture, PowerPoint, Smartboard, overhead projector, and class discussion  
Hands-on lab activities and cooperative group work such as: ink transfer a print onto a balloon and enlarge to view ridge characteristics; identify various fingerprint examples by pattern | Written tests and quizzes  
Worksheets  
Lab / Activity  
Project assessments  
Research activities such as sciencespot.net  
Famous Case Study to research such as: The Night Stalker (Richard Ramirez)  
Webquests |
| What are the three basic types of fingerprint impressions? | Latent, patent (visible), plastic | Current textbook  
Notes; Handouts  
Internet; Mobile computer lab centers  
Laboratory Tools, Appropriate hands-on materials, Safety Equipment  
Video; Multimedia resources  
Community resources; Guest Speakers  
Current Event Articles | Class notes via lecture, PowerPoint, Smartboard, overhead projector, and class discussion  
Hands-on lab activities and cooperative group work such as: ink transfer or pencil smudge method to create a ten card; teacher demo or student creation of latent, patent, and plastic prints for comparison | Written tests and quizzes  
Worksheets  
Lab / Activity  
Project assessments  
Research activities such as sciencespot.net  
Famous Case Study to research such as: The Night Stalker (Richard Ramirez)  
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<td>What methods are used to locate, collect or develop fingerprints?</td>
<td>Techniques used to collect fingerprint exemplars  Latent print techniques: powders, iodine, ninhydrin, cyanoacrylate (super glue), silver nitrate, etc.</td>
<td>Class notes via lecture, PowerPoint, Smartboard, overhead projector, and class discussion  Hands-on lab activities and cooperative group work such as: inking and rolling of prints and identification of ridge patterns; press a hand to plain white paper and then dust to determine if student is a ‘secretor’ or not; dusting and lifting prints from various surfaces  Teacher Demo such as: print rolling, dusting and lifting techniques</td>
<td>Written tests and quizzes  Worksheets  Lab / Activity  Project assessments  Research activities such as the Assassination of Martin Luther King, Jr.  Webquests</td>
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<td>What methods are used to compare and store fingerprint records?</td>
<td>Bertillion System of Classification (Biometrics)  AFIS and IAFIS  Criteria for inclusion in databases</td>
<td>Class notes via lecture, PowerPoint, Smartboard, overhead projector, and class discussion  Hands-on lab activities and cooperative group work such as: students create a “Bertillion Measurement Card”</td>
<td>Written tests and quizzes  Worksheets  Lab / Activity  Project assessments  Research activities  Webquests</td>
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<td>What are other types of pattern evidence?</td>
<td>Types: shoe prints, foot prints, lip prints, palm prints, bite marks, tool marks, tire marks, firearms(ballistics), voice prints, etc.  Casting, comparison microscopy  Other impression databases</td>
<td>Class notes via lecture, PowerPoint, Smartboard, overhead projector, and class discussion  Hands-on lab activities and cooperative group work such as: use of baby powder to create and evaluate 2D shoe prints; casting/evaluation of impression evidence in 3D using dental stone/”dough” etc.; comparison of tool marks made in hobby candle wax blocks by ‘unknown’ tools to a set of ‘known’ tools; fracture matching under stereoscope</td>
<td>Written tests and quizzes  Worksheets  Lab / Activity  Project assessments  Research activities  Famous Case Study to research such as: Ted Bundy; The Beltway Snipers  Webquests</td>
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<td>How are other types of pattern evidence analyzed and preserved and what do they reveal?</td>
<td>Types: shoe prints, foot prints, lip prints, palm prints, bite marks, tool marks, tire marks, firearms(ballistics), voice prints, etc.  Casting, comparison microscopy  Other impression databases</td>
<td>Class notes via lecture, PowerPoint, Smartboard, overhead projector, and class discussion  Hands-on lab activities and cooperative group work such as: use of baby powder to create and evaluate 2D shoe prints; casting/evaluation of impression evidence in 3D using dental stone/”dough” etc.; comparison of tool marks made in hobby candle wax blocks by ‘unknown’ tools to a set of ‘known’ tools; fracture matching under stereoscope</td>
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**Suggestions on how to differentiate in this unit:**

- Students with individual learning styles can be assisted through one-to-one teacher support, additional testing time, peer to peer coaching, and use of visual and auditory teaching methods
- A wide variety of assessments and strategies complement the individual learning experience.
Enduring Understandings: Crime scenes must be processed in a procedural manner.
   Evidence is needed to determine the method by which a crime has been committed.

Essential Questions: How is the location and handling of evidence essential to crime scene investigation?
   How is evidence used to determine whether a crime has been committed?
   How are various types of evidence tested and analyzed?
   What is the value of different types of evidence?

Unit Goals: Students will identify trace evidence characteristics that are most useful in forensic comparisons.
   Students will demonstrate procedures used by the forensic scientist when processing trace evidence.
   Students will explain the importance of trace evidence databases available to forensic scientists.

Duration of Unit: 2 weeks

NJCCCS: 5.1.12 A1-3, B1-4, C1-3, D1-3; 8.1.12 F1-2; 9.1.12 A1, A4; 9.1.12 F2, F6

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<td>What is the structure of hair?</td>
<td>Morphology: cuticle, cortex, medulla, cortical fusi, ovoid bodies, root, follicle, pigment granules, follicular tag</td>
<td>Current textbook, Notes; Handouts, Internet, Mobile computer lab centers, Laboratory Tools, Appropriate hands-on materials, Safety Equipment, Video; Multimedia resources, Community resources; Guest Speakers, Current Event Articles</td>
<td>Class notes via lecture, PowerPoint, Smartboard, overhead projector, and class discussion</td>
<td>Written tests and quizzes, Worksheets, Lab / Activity</td>
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<td>What key pieces of information can be obtained from microscopic examination of hair?</td>
<td>Human versus animal species determination, Race determination, Origin of location on the body, Manner of removal, DNA and toxicology analysis, Hair comparisons / collection of controls, Probative value of hair evidence</td>
<td>Current textbook, Notes; Handouts, Internet, Mobile computer lab centers, Laboratory Tools, Appropriate hands-on materials, Safety Equipment, Video; Multimedia resources, Community resources; Guest Speakers, Current Event Articles</td>
<td>Class notes via lecture, PowerPoint, Smartboard, overhead projector, and class discussion</td>
<td>Hands-on lab activities and cooperative group work such as: microscopic examination of human hair, other animal species hair, clear nail polish to cast human hair scale patterns</td>
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| How can different types of fibers be distinguished and identified? | Synthetic versus natural fibers  
Test methods used for identification  
Probative value of fiber evidence | Class notes via lecture, PowerPoint, Smartboard, overhead projector, and class discussion  
Hands-on lab activities and cooperative group work such as: microscopic examination/comparison of natural and synthetic fibers; students collect and examine fibers from a “crime scene” for comparison using a microscope | Written tests and quizzes  
Worksheets  
Lab / Activity  
Project assessments  
Research activities  
Famous Case Study to research such as: Wayne Williams (Atlanta Child Murders); Jeffrey MacDonald  
Webquests (sciencespot.net) |
| How are other types of trace evidence collected, analyzed and used in an investigation? | Examples may include: soil/dust, plant material, paint, glass, metal  
Notes; Handouts  
Internet; Mobile computer lab centers  
Laboratory Tools, Appropriate hands-on materials, Safety Equipment  
Video; Multimedia resources  
Community resources; Guest Speakers  
Current Event Articles | Class notes via lecture, PowerPoint, Smartboard, overhead projector, and class discussion  
Hands-on lab activities and cooperative group work such as: microscopic examination of soil types/plant material/dust/metal/glass etc.; students collect and examine other types of trace evidence from a “crime scene” for comparison using a microscope; fracture matching using stereoscopes | Written tests and quizzes  
Worksheets  
Lab / Activity  
Project assessments  
Research activities  
Webquests |

**Suggestions on how to differentiate in this unit:**

- Students with individual learning styles can be assisted through one-to-one teacher support, additional testing time, peer to peer coaching, and use of visual and auditory teaching methods
- A wide variety of assessments and strategies complement the individual learning experience.
### Enduring Understandings:
Crime scenes must be processed in a procedural manner.
- Evidence is needed to determine the method by which a crime has been committed.

### Essential Questions:
- How is the location and handling of evidence essential to crime scene investigation?
- How is evidence used to determine whether a crime has been committed?
- How are various types of evidence tested and analyzed?
- What is the value of different types of evidence?

### Unit Goals:
- Students will identify the characteristics of questioned documents that are most useful in forensic comparisons.
- Students will demonstrate procedures used by forensic scientists to process questioned documents.
- Students will explain the importance of evidence databases available to forensic scientists.

### Duration of Unit:
2 weeks

### NJCCCS:
- 5.1.12 A1-3, B1-4, C1-3, D1-3
- 8.1.12 F1-2
- 9.1.12 A1, A4
- 9.1.12 F2

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<th>Guiding / Topical Questions</th>
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<th>Instructional Resources and Materials</th>
<th>Teaching Strategies</th>
<th>Assessment Strategies</th>
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</thead>
<tbody>
<tr>
<td>Define “questioned document” and give examples.</td>
<td>Questioned document (types): letters/notes, contracts, wills, identity theft (checks, passports, licenses, birth/death cert., and credit cards), autographs, diaries, artwork, paper money, etc.</td>
<td>Current textbook Notes; Handouts Internet; Mobile computer lab centers Laboratory Tools, Appropriate hands-on materials, Safety Equipment Video; Multimedia resources Community resources; Guest Speakers Current Event Articles</td>
<td>Class notes via lecture, PowerPoint, Smartboard, overhead projector, and class discussion Hands-on lab activities and cooperative group work such as: self-evaluation of student created writing sample; evaluation of student created writing sample exemplars in order to match to unknowns (word lists or paragraphs); determine the author of a secret admirer letter written using ‘disguised’ writing; ink chromatography; test grades of paper for starch content; microscopic examination of currency and/or license security features</td>
<td>Written tests and quizzes Worksheets Lab / Activity Project assessments Research activities Webquests</td>
</tr>
<tr>
<td>What are the common individual characteristics associated with handwriting?</td>
<td>Use of handwriting exemplars when analyzing documents Handwriting analysis: line quality, spacing, size consistency, pen lifts, connecting letters, pen pressure, slant, line habits, embellishments, diacritics, etc.</td>
<td>Current textbook Notes; Handouts Internet; Mobile computer lab centers Laboratory Tools, Appropriate hands-on materials, Safety Equipment</td>
<td>Class notes via lecture, PowerPoint, Smartboard, overhead projector, and class discussion Hands-on lab activities and cooperative group work such as: self-evaluation of student created writing sample; evaluation of student created writing sample exemplars in order to match to unknowns (word lists or paragraphs); determine the author of a secret admirer letter written using ‘disguised’ writing; ink chromatography; test grades of paper for starch content</td>
<td>Written tests and quizzes Worksheets Lab / Activity Project assessments Research activities Famous Case Study to research such</td>
</tr>
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</table>
### Guiding / Topical Questions

<table>
<thead>
<tr>
<th>What are the techniques that document examiners use to identify a forgery?</th>
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<tbody>
<tr>
<td>Forgery and fraudulence</td>
</tr>
<tr>
<td>Comparisons: ink, paper, typescript (photocopiers, printers, fax, typewriters)</td>
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<tr>
<td>Uncovering alterations, erasures, obliterations, impressions, and variations in a questioned document</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>What databases are available for comparison and storage of questioned document information?</th>
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<tbody>
<tr>
<td>Databases: FISH, ink</td>
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<tr>
<th>What are features of paper currency that are used to detect counterfeit bills?</th>
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<tbody>
<tr>
<td>Security features in money</td>
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<tr>
<td>Current textbook</td>
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<tr>
<td>Notes; Handouts</td>
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<tr>
<td>Internet; Mobile computer lab centers</td>
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<tr>
<td>Laboratory Tools, Appropriate hands-on materials, Safety Equipment</td>
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<tr>
<td>Video; Multimedia resources</td>
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<tr>
<td>Community resources; Guest Speakers</td>
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<tr>
<td>Current Event Articles</td>
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</tbody>
</table>

### Instructional Resources and Materials

<table>
<thead>
<tr>
<th>Teaching Strategies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class notes via lecture, PowerPoint, Smartboard, overhead projector, and class discussion</td>
</tr>
<tr>
<td>Hands-on lab activities and cooperative group work such as: examination of currency and/or license security features using a microscope and a black light; test real and “counterfeit” bills using an iodine security pen</td>
</tr>
</tbody>
</table>

### Assessment Strategies

<table>
<thead>
<tr>
<th>Written tests and quizzes</th>
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<tbody>
<tr>
<td>Worksheets</td>
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<tr>
<td>Lab / Activity</td>
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<tr>
<td>Project assessments</td>
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<tr>
<td>Research activities such as: <a href="http://www.ustreas.gov/topics/currency">www.ustreas.gov/topics/currency</a> or <a href="http://www.treas.gov/education">www.treas.gov/education</a> or moneyfactory.gov</td>
</tr>
<tr>
<td>Webquests</td>
</tr>
</tbody>
</table>

### Suggestions on how to differentiate in this unit:

- Students with individual learning styles can be assisted through one-to-one teacher support, additional testing time, peer to peer coaching, and use of visual and auditory teaching methods
- A wide variety of assessments and strategies complement the individual learning experience.
Freehold Regional High School District
Lab Forensic Science
Unit #6: Serology and Blood Pattern Analysis

**Enduring Understandings:** Crime scenes must be processed in a procedural manner.
Evidence is needed to determine the method by which a crime has been committed.

**Essential Questions:**
- How is the location and handling of evidence essential to crime scene investigation?
- How is evidence used to determine whether a crime has been committed?
- How are various types of evidence tested and analyzed?
- What is the value of different types of evidence?

**Unit Goals:**
- Students will identify characteristics of body fluids that are most useful in forensic comparisons.
- Students will demonstrate procedures used by forensic scientists when processing blood evidence.
- Students will explain the importance of evidence databases available to forensic scientists.

**Duration of Unit:** 2 weeks

**NJCCCS:** 5.1.12 A1-3, B1-4, C1-3, D1-3; 5.2.12.E1-3; 8.1.12 F1-2; 9.1.12 A1, A4; 9.1.12 F2, F6

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<th>Assessment Strategies</th>
</tr>
</thead>
<tbody>
<tr>
<td>What is the composition of blood and the functions of the blood components?</td>
<td>Plasma, platelets, white blood cells, red blood cells</td>
<td>Current textbook; Notes; Handouts</td>
<td>Class notes via lecture, PowerPoint, Smartboard, overhead projector, and class discussion</td>
<td>Written tests and quizzes</td>
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<td></td>
<td>ABO blood types and probability of each, Rh factor</td>
<td>Internet; Mobile computer lab centers</td>
<td>Hands-on lab activities and cooperative group work such as: blood typing using simulated blood; microscopic examination of blood from various species</td>
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<td></td>
<td>Human versus other animal species blood characteristics</td>
<td>Laboratory Tools, Appropriate hands-on materials, Safety Equipment</td>
<td>Teacher Demo such as: presumptive and/or confirmatory blood testing (examples: Kastle-Meyer Test, Hemastix, Luminol/ALS)</td>
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<td>Secretors</td>
<td>Video; Multimedia resources</td>
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<td>Community resources; Guest Speakers</td>
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</thead>
<tbody>
<tr>
<td>What information can be obtained from serological screening and testing?</td>
<td>Blood, saliva, semen, and other body fluids</td>
<td>Current textbook</td>
<td>Class notes via lecture, PowerPoint, Smartboard, overhead projector, and class discussion</td>
<td>Written tests and quizzes</td>
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<td>DNA analysis using body fluids; Toxicology; Paternity Testing; Blood typing; Blood borne diseases</td>
<td>Notes; Handouts</td>
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<td>Presumptive tests used to characterize a stain as blood (may include): Kastle-Meyer Test, Leuco-Malachite Green, Luminol, Hemastix</td>
<td>Internet; Mobile computer lab centers</td>
<td>Hands-on lab activities and cooperative group work such as: blood typing using simulated blood; microscopic examination of blood from various species</td>
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<td>Confirmatory testing for heme / species blood (may include): Precipitin Test, Takayama Crystals, Teichmann Test</td>
<td>Laboratory Tools, Appropriate hands-on materials, Safety Equipment</td>
<td>Teacher Demo such as: presumptive and/or confirmatory blood testing (examples: Kastle-Meyer Test, Hemastix, Luminol/ALS)</td>
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<td>Video; Multimedia resources</td>
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<td>Community resources; Guest Speakers</td>
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<td>How can blood spatter patterns be used to reconstruct a crime scene?</td>
<td>Explore blood stain patterns as a function of velocity, direction, and height of fall:  - high, medium, and low velocity spatter  - passive, transfer, arterial, cast-off, expired, blow-back, forward spatter  - shapes of blood drops  - effect of height on blood drops  - angle of impact  - examination of directionality of blood  - area of convergence, point of origin</td>
<td>Class notes via lecture, PowerPoint, Smartboard, overhead projector, and class discussion  Hands-on lab activities and cooperative group work such as: blood spatter samples using simulated blood - evaluation and/or creation (impact angle, height, velocity), blood stringing; ‘spatter head’ kit  Teacher Demo such as: blood spatter patterns</td>
<td>Written tests and quizzes  Worksheets  Lab / Activity  Project assessments  Research activities  Famous Case Studies to research such as: Dr. Sam Sheppard; Shasta Groene (C’ouere d’Alene, ID)  Webquests</td>
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**Suggestions on how to differentiate in this unit:**
- Students with individual learning styles can be assisted through one-to-one teacher support, additional testing time, peer to peer coaching, and use of visual and auditory teaching methods
- A wide variety of assessments and strategies complement the individual learning experience.
**Freehold Regional High School District**  
Lab Forensic Science  
Unit #7: DNA

**Enduring Understandings:** Crime scenes must be processed in a procedural manner.  
Evidence is needed to determine the method by which a crime has been committed.

**Essential Questions:**  
How is the location and handling of evidence essential to crime scene investigation?  
How is evidence used to determine whether a crime has been committed?  
How are various types of evidence tested and analyzed?  
What is the value of different types of evidence?  

**Unit Goals:** Students will identify the characteristics of DNA that is most useful in forensic comparisons.  
Students will demonstrate procedures used by the forensic scientist when processing DNA evidence.  
Students will explain the importance of DNA databases available to forensic scientists.  

**Duration of Unit:** 2 weeks  
**NJCCCS:** 5.1.12 A1-3, B1-4, C1-3, D1-3; 8.1.12 F1-2; 9.1.12 A1, A4; 9.1.12 F2, F6

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</thead>
</table>
| How is crime scene evidence collected and processed to obtain DNA for analysis? | Structure and function of DNA  
Nuclear versus mitochondrial DNA  
Sources of DNA  
Collection and preservation of DNA evidence  
Prevention of DNA contamination  
DNA typing and probability: PCR, gel electrophoresis, STR, RFLP | Current textbook  
Notes; Handouts  
Internet; Mobile computer lab centers  
Laboratory Tools, Appropriate hands-on materials, Safety Equipment  
Video; Multimedia resources  
Community resources; Guest Speakers | Class notes via lecture, PowerPoint, Smartboard, overhead projector, and class discussion  
Hands-on lab activities, cooperative group work, or teacher demo: (activities such as) create a model of DNA; gel electrophoresis; RFLP simulation, isolation of DNA from liver, onion, strawberries, banana, etc. | Written tests and quizzes  
Worksheets  
Lab / Activity  
Project assessments  
Research activities  
Webquests such as: www.pbs.org/wgbh/nova/shepard/labwave.html (make a DNA profile) |
| How is DNA evidence compared for matching? | DNA profile, DNA fingerprint  
Database: CODIS | Current textbook  
Notes; Handouts  
Internet; Mobile computer lab centers  
Laboratory Tools, Appropriate hands-on materials, Safety Equipment  
Video; Multimedia resources  
Community resources; Guest Speakers | Class notes via lecture, PowerPoint, Smartboard, overhead projector, and class discussion  
Hands-on lab activities, cooperative group work, or teacher demo: (activities such as) gel electrophoresis; RFLP simulation; comparison of DNA profiles; isolation of DNA from liver, onion, strawberries, banana, etc. | Written tests and quizzes  
Worksheets  
Lab / Activity  
Project assessments  
Research activities such as: identification of remains from the World Trade Center, Hurricane Katrina, tsunami etc.  
Webquests such as: www.pbs.org/wgbh/nova/shepard/labwave.html (make a DNA profile) |
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<tr>
<td>What are the applications of DNA fingerprinting?</td>
<td>Applications: identity potential suspects and victims of crime, paternity testing, identification of victims of mass disasters, exonerate the wrongfully convicted, match organ donors</td>
<td>Class notes via lecture, PowerPoint, Smartboard, overhead projector, and class discussion</td>
<td>Hands-on lab activities, cooperative group work, or teacher demos (activities such as) gel electrophoresis; comparison of DNA profiles from crime scene evidence, for missing children, or paternity; RFLP simulation; DNA fingerprinting simulation activity using dyes</td>
<td>Written tests and quizzes</td>
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<td>Worksheets</td>
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<td>Lab / Activity</td>
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<td>Project assessments</td>
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<td>Research activities such as projectinnocence.com or pbs.org (“Justice Delayed”) or sciencespot.net</td>
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<td>Famous Case Study to research such as: The Green River Killer (Gary Rideway)</td>
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<td>Webquests such as: “Virtual DNA Extraction” <a href="http://learn.genetics.utah.edu/content/labs/extraction/">http://learn.genetics.utah.edu/content/labs/extraction/</a></td>
</tr>
</tbody>
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**Suggestions on how to differentiate in this unit:**

- Students with individual learning styles can be assisted through one-to-one teacher support, additional testing time, peer to peer coaching, and use of visual and auditory teaching methods
- A wide variety of assessments and strategies complement the individual learning experience.
Enduring Understandings: Crime scenes must be processed in a procedural manner. Evidence is needed to determine the method by which a crime has been committed.

Essential Questions: How is the location and handling of evidence essential to crime scene investigation? How is evidence used to determine whether a crime has been committed? How are various types of evidence tested and analyzed? What is the value of different types of evidence?

Unit Goals: Students will identify the characteristics of human remains that are most useful in forensic comparisons. Students will demonstrate procedures used by the forensic scientist when processing human remains.

Duration of Unit: 2 weeks

NJCCCS: 5.1.12 A1-3, B1-4, C1-3, D1-3; 8.1.12 F1-2; 9.1.12 A1, A4; 9.1.12 F2, F6

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<tbody>
<tr>
<td>How are the manner, mechanism, cause, and time of death determined?</td>
<td>Responsibilities of the Medical Examiner/Forensic Pathologist, Forensic Toxicologist, Forensic Entomologist</td>
<td>Current textbook</td>
<td>Class notes via lecture, PowerPoint, Smartboard, overhead projector, and class discussion</td>
<td>Written tests and quizzes</td>
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<td>Autopsy procedure and report</td>
<td>Notes; Handouts</td>
<td>Video such as: Dr. Baden video series “Autopsy”</td>
<td>Lab / Activity</td>
</tr>
<tr>
<td></td>
<td>Manners, causes and mechanisms of death</td>
<td>Internet; Mobile computer lab centers</td>
<td>Hands-on activities and cooperative group work such as: comparison of insect larvae/adult species using a stereomicroscope; comparison of “stomach contents” from different “victims”; calculating time of death using rigor, algor, and livor mortis data</td>
<td>Project assessments</td>
</tr>
<tr>
<td></td>
<td>Time of death: rigor mortis, livor mortis, algor mortis, stages of human decomposition, changes of the eye, stomach contents, insect activity</td>
<td>Laboratory Tools, Appropriate hands-on materials, Safety Equipment</td>
<td>Famous Case Study to research such as: John Wayne Gacy, Webquests such as: <a href="http://www.hbo.com/autopsy">www.hbo.com/autopsy</a></td>
<td>Research activities such as “The Body Farm” and Dr. Bill Bass</td>
</tr>
</tbody>
</table>

What can be determined by analyzing skeletal remains? | Skeletal development and bone structure | Current textbook | Class notes via lecture, PowerPoint, Smartboard, overhead projector, and class discussion | Written tests and quizzes |
| | Forensic Anthropology: age, gender, race, height determination, facial reconstruction, skeletal trauma analysis, DNA evidence | Notes; Handouts | Hands-on lab activities and cooperative group work such as: determine sex, race, age, and height of unidentified skeletal remains (source a forensic supply company for a bone evaluation kit, like WARD’s activity called ‘Sherlock Bones’) | Lab / Activity |
| | | Internet; Mobile computer lab centers | | Project assessments |
| | | Laboratory Tools, Appropriate hands-on materials, Safety Equipment | | Research activities such as: the work of Clyde Snow, Famous Case Study to research such as: The Romanovs |
| | | Video; Multimedia resources | | Webquests |
| | | Community resources; Guest Speakers | | |
| | | Current Event Articles | | |

Suggestions on how to differentiate in this unit:
- Students with individual learning styles can be assisted through one-to-one teacher support, additional testing time, peer to peer coaching, and use of visual and auditory teaching methods
- A wide variety of assessments and strategies complement the individual learning experience.
1. Web resources:
   a. trutv.com
   b. school.cengage.com/forensicscience
   c. prenhall.forensics.com
   d. projectinnocence.com
   e. sciencespot.net
   f. pbs.org
   g. investigationdiscovery.com/investigation/forensics/forensics
   h. fbi.gov
   i. High School Teachers of Forensic Science (www.HSTOFS.org)
   j. www.forensicdentistryonline.com/
   k. eskeletons.org
   l. forensicartist.com/index.html

2. Text resources:
   a. Forensics for Dummies by Douglas P. Lyle
   b. Forensic DNA Typing: Biology, Technology and Genetics of STR Markers by John M. Butler