Forensics

<table>
<thead>
<tr>
<th>Course Outline</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Unit One</strong></td>
</tr>
<tr>
<td><strong>Unit Two</strong></td>
</tr>
<tr>
<td><strong>Unit Three</strong></td>
</tr>
<tr>
<td><strong>Unit Four</strong></td>
</tr>
<tr>
<td><strong>Unit Five</strong></td>
</tr>
<tr>
<td><strong>Unit Six</strong></td>
</tr>
<tr>
<td><strong>Unit Seven</strong></td>
</tr>
<tr>
<td><strong>Unit Eight</strong></td>
</tr>
<tr>
<td><strong>Unit Nine</strong></td>
</tr>
<tr>
<td><strong>Unit Ten</strong></td>
</tr>
<tr>
<td><strong>Unit Eleven</strong></td>
</tr>
</tbody>
</table>

School-wide Academic Expectations Addressed in Forensics:
- Problem Solving
- Collaboration

School-wide Social and Civic Expectations Addressed in Forensics:
- Honesty
- Responsibility
- Respect
- Safety

Common Core Standards Addressed in Forensics:
- Reading Standard for Science Literacy (RST): 2, 3, 4, 7, 8, 9
- Writing Standards for Science Literacy (WHST): 1, 2, 4, 9

NGSS Standards Addressed in Forensics:
- TBD
Unit 1: Introduction to Forensics

Introduction: Forensic science is the study and application of science to matters of law. It is multidisciplinary and a natural medium for student to practice science as inquiry.

CT State Standard(s):
Enrichment Content Standards: Motion & Forces and Conservation of Energy & Momentum

Common Core Standard(s):
- Reading Standard for Science Literacy (RST): 2, 3, 4, 7, 8, 9
- Writing Standards for Science Literacy (WHST): 1, 2, 4, 9

Essential Question(s):
What is the function of a crime lab?
What evidence can be presented in court?

Key Terms/Concepts: Criminalistics, Evidence, Probative Value, Frye Standard, Daubert Ruling

<table>
<thead>
<tr>
<th>Standard</th>
<th>LEARNING OBJECTIVES (Content and Skill)</th>
<th>INSTRUCTIONAL STRATEGIES</th>
<th>ASSESSMENT EVIDENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Describe how a crime lab works, including different jobs done by forensic scientists</td>
<td>• Power Point &amp; Class Discussion</td>
<td>Oral Discussion</td>
</tr>
<tr>
<td>2.</td>
<td>Outline the growth and development of forensic science through history</td>
<td>• Power Point &amp; Class Discussion</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Define federal rules of evidence, including Frye standard and Daubert ruling</td>
<td>• Power Point &amp; Class Discussion</td>
<td>Oral Discussion</td>
</tr>
<tr>
<td>4.</td>
<td>Describe the Locard principle</td>
<td>• Power Point &amp; Class Discussion</td>
<td>Oral Discussion</td>
</tr>
</tbody>
</table>


Suggested Technology: DVD player, Computer, Projector
Unit 2: Types of Evidence

Introduction: Evidence comes in all shapes and sizes. It is something that tends to establish or disprove a fact. Evidence can include documents, testimony, and other objects. This unit focuses on identifying types of evidence, determining probative value and how to collect evidence properly.

CT State Standard(s):
none

Common Core Standard(s):
· Reading Standard for Science Literacy (RST): 2, 3, 4, 7, 8, 9
· Writing Standards for Science Literacy (WHST): 1, 2, 4, 9

Essential Question(s):
What qualifies as evidence?
What are the different classifications of evidence?
How is evidence collected?

Key Terms/Concepts: Testimonial Evidence, Physical Evidence, Class v Individual Evidence, Chain of Custody, Methods of Collecting Evidence

<table>
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</thead>
<tbody>
<tr>
<td>1.</td>
<td>Explain the difference between indirect and direct evidence &amp; describe the value of such evidence in a court of law.</td>
<td>Power Point &amp; Class Discussion</td>
<td>Oral Discussion</td>
</tr>
<tr>
<td>2.</td>
<td>Describe what is meant by physical evidence and give examples.</td>
<td>Power Point &amp; Class Discussion</td>
<td>Oral Discussion</td>
</tr>
<tr>
<td>3.</td>
<td>Distinguish between individual and class evidence.</td>
<td>Activity – Can This Evidence be Individualized?</td>
<td>Performance Task</td>
</tr>
<tr>
<td>4.</td>
<td>Determine the significance of class evidence.</td>
<td>Power Point &amp; Class Discussion</td>
<td>Oral Discussion</td>
</tr>
<tr>
<td>5.</td>
<td>Observe methods of collecting evidence.</td>
<td>Power point</td>
<td>Oral Discussion</td>
</tr>
<tr>
<td>6.</td>
<td>Identify and apply proper procedures for collecting and recording evidence</td>
<td>Evidence collection activity – Crime Scene</td>
<td>Performance Task</td>
</tr>
<tr>
<td>7.</td>
<td>Prepare a sketch of crime scene</td>
<td>Activity – create sketch of crime scene using measurements &amp; notes taken during evidence collection</td>
<td>Embedded Task</td>
</tr>
<tr>
<td>8.</td>
<td>Analyze three crime scene scenarios for errors in procedure</td>
<td>Group Activity &amp; Class Discussion</td>
<td>Oral Discussion Summative Assessment/Test</td>
</tr>
</tbody>
</table>


Suggested Technology: DVD player, Computer, Projector
Unit 3: Fingerprints and Other Prints

Introduction: Fingerprints identification is now standard practice in law enforcement. All fingerprints can be classified into three basic patterns, whorls, loops and arches. In addition to fingerprints, this unit addresses other prints such as teeth marks and tool marks.

CT State Standard(s):
Enrichment Content Standards: Genetics, Evolution, Organic Chemistry & Biochemistry, and Motion & Force,

Common Core Standard(s):
- Reading Standard for Science Literacy (RST): 2, 3, 4, 7, 8, 9
- Writing Standards for Science Literacy (WHST): 1, 2, 4, 9

Essential Question(s):
- What are the three basic types of fingerprints?
- How are fingerprints individualized?
- What other types of prints can be used as evidence?
- What methods can be used to enhance prints?

Key Terms/Concepts: Types of Fingerprints, Ridge Classification, Plastic, Visible, and Latent Prints, AFIS

<table>
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<tr>
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<th>ASSESSMENT EVIDENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Genetics, Evolution</td>
<td>1. Describe three basic types of fingerprints.</td>
<td>• Power Point, Notes &amp; Discussion</td>
<td>Oral Discussion</td>
</tr>
<tr>
<td></td>
<td>2. Explain why fingerprints are individual evidence.</td>
<td>• Video - Dead Reckoning, Fingerprinting a Killer (History Channel)</td>
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<td></td>
<td>3. Compare and contrast latent, plastic, and visible prints.</td>
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<td></td>
<td>4. Explain how technology has made fingerprint identification easier.</td>
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<tr>
<td>Evolution</td>
<td>5. Produce a readable, inked set of fingerprints.</td>
<td>• Lab – Flinn Fingerprinting Kit</td>
<td>Performance Task and Constructed Response</td>
</tr>
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<td></td>
<td>6. Identify general ridge patterns and apply Henry-FBI classification.</td>
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<td></td>
<td>7. Identify friction ridge characteristics and compare fingerprints with at least 10 points of comparison.</td>
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<tr>
<td>Organic Chemistry and Biochemistry</td>
<td>8. Perform dusting and lifting of prints.</td>
<td>• Lab – Dusting Method &amp; Chemical Methods</td>
<td>Embedded Assessment</td>
</tr>
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<td></td>
<td>9. Use chemical methods to develop prints.</td>
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<tr>
<td>Motion and Force</td>
<td>10. Prepare and preserve prints of lips and ears.</td>
<td>• Lab – Clay &amp; Plaster Models</td>
<td>Embedded Task</td>
</tr>
<tr>
<td></td>
<td>11. Prepare mold and model of teeth marks.</td>
<td>• Activity – Analysis of Foot Prints</td>
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<td></td>
<td>12. Compare and contrast shoe prints.</td>
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<td></td>
<td>13. Analyze shoe prints to solve crime scenario</td>
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</tbody>
</table>
| Motion and Forces | 14. Prepare & preserve prints of tools.  
15. Analyze tool marks to solve crime scenario.  
16. Communicate and defend a scientific argument. | • Lab – Tool Marks Lab | Embedded Task Summative Assessment/Test |


Suggested Technology: DVD player, Computer, Projector, Dissecting Scopes
# Unit 4: Hair & Fibers

**Introduction:** Hair and fibers are two types of evidence found at most crime scenes. By themselves, hair or fibers usually cannot link an individual to a crime, but as circumstantial evidence, they are vital in solving a crime.

**CT State Standard(s):**
Enrichment Content Standards: Genetics, Evolution, Physiology, Standard 9.4, Standard 9.5, Standard 9.6, and Heat & Thermodynamics

**Common Core Standard(s):**
- Reading Standard for Science Literacy (RST): 2, 3, 4, 7, 8, 9
- Writing Standards for Science Literacy (WHST): 1, 2, 4, 9

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<th>ASSESSMENT EVIDENCE</th>
</tr>
</thead>
</table>
| Genetics, Evolution, Physiology | 1. Describe structure of hair.  
2. Compare & contrast human & animal hair.  
3. Identify characteristics of hair that are important for forensics analysis. | • Power Point, Notes & Discussion  | Oral Discussion       |
| Evolution, Genetics       | 4. Prepare mold of hair cuticles.  
5. Create slides of various human hairs.  
6. Observe prepared slides and record observations. | • Lab - Cuticle Molding  
• Lab – Prepare Slides  
• Lab – Human Hair | Embedded Assessment |
| Physiology                | 7. Compare & contrast various animal hairs.  
8. Observe prepared slides and record observations. | • Lab – Animal vs Human Hair | Performance Task      |
| Physiology                | 9. Observe hair in different phases.  
10. Observe hair with root.  
11. Observe & identify cut hair. | • Lab – Various Human Hair | Performance Task      |
| 9.6                       | 12. Distinguish & identify different types of fibers visually.  
14. Identify fiber types using visual and chemical analysis. | • Power Point, Notes & Discussion | Oral Response         |
| 9.6                       | 15. Prepare slides, observe, & identify different types of fibers visually. | • Lab – Fiber Type Comparison | Performance Task      |
17. Identify known samples based on odor, appearance, or residue.  
18. Identify unknown sample based on burn test. | • Lab – Burn Test & Thermo-decomposition | Performance Task      |
| 9.4                       | 19. Distinguish & identify different types of fibers based on various chemical tests.  
20. Identify known samples based on reaction to various chemicals.  
21. Identify unknown sample based on chemical analysis. | • Lab – Chemical Test of Fibers | Performance Task      |
### Essential Question(s):
- What are the characteristics of hair that make it useful for forensics analysis?
- How is human hair different from animal hair/fur?

### Key Terms/Concepts:
- Locard Exchange Principle
- Cuticle
- Cortex
- Medulla
- Questioned v Exemplar
- Fiber
- Warp
- Weft
- Blend
- Polymer

### Suggested Resources:

### Suggested Technology:
- DVD player
- Computer
- Projector
- Dissecting Scopes
- Microscopes

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<table>
<thead>
<tr>
<th>22.</th>
<th>Activity – Simulated Crime Scene</th>
</tr>
</thead>
<tbody>
<tr>
<td>23.</td>
<td>Performance Task and Constructed Response</td>
</tr>
</tbody>
</table>

22. Apply knowledge and skills of fibers & hair to solve a crime scenario.
23. Communicate and defend a scientific argument.
Unit 5: Blood

Introduction: The shape and location of bloodstains provide clues about where the victim/suspect was and when the crime took place. Blood also reveals the presence of disease, drugs, or alcohol, and is can be used to determine the identity of the victim/suspect through DNA analysis. (*Forensics for Dummies*).

CT State Standard(s):
Enrichment Content Standards: Genetics, Evolution, and Motion and Forces.

Common Core Standard(s):
· Reading Standard for Science Literacy (RST): 2, 3, 4, 7, 8, 9
· Writing Standards for Science Literacy (WHST): 1, 2, 4, 9

Essential Question(s):
Is it blood? Is it animal or human blood?
If human, what is the blood type?
How can blood evidence be used in solving a crime?

Key Terms/Concepts: Presumptive Test, Chemiluminescence, Precipitin Test, Antibodies, Antigens, Agglutination, Serology, Arterial Spurting, Swipe, Wipe

<table>
<thead>
<tr>
<th>Standard</th>
<th>LEARNING OBJECTIVES (Content and Skill)</th>
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<th>ASSESSMENT EVIDENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Genetics, Evolution</td>
<td>1. Determine whether a stain is blood. Determine whether a bloodstain is human or animal. 2. Determine blood type.</td>
<td>• Lab – Blood Typing  • Lab – Is the Sample Blood?  • Video – Dead Reckoning <em>Blood Spatter</em> (History Channel)</td>
<td>Performance Task and Constructed Response</td>
</tr>
<tr>
<td>Motion and Forces</td>
<td>3. Explore bloodstain patterns as a function of velocity, direction, and height of fall.</td>
<td>• Practice Problems  • Lab – Angle of Impact, Height &amp; Velocity</td>
<td>Embedded Assessment</td>
</tr>
<tr>
<td>Motion and Forces</td>
<td>4. Use technology and mathematics to improve investigations and communication. 5. Communicate and defend a scientific argument.</td>
<td>• Lecture, Notes &amp; Discussion  • Practice Problems – determining height of wound using  • Lab – Left-handed v Right-handed</td>
<td>Oral Assessment  Performance Task  Oral Assessment  Summative Assessment</td>
</tr>
</tbody>
</table>


Suggested Technology: DVD player, Computer, Projector
Unit 6: DNA Analysis

Introduction: DNA “fingerprinting” is a common way to identify people by their unique genetic codes. It is currently used to identify the perpetrator in a crime, to identify fathers in paternity cases, and to identify unknown remains in mass disasters and other situations (Forensic Science for High Schools).

CT State Standard(s):
Enrichment Content Standards: Genetics, Evolution, Electric & Magnetic Phenomena, and Organic and Biochemistry,

Common Core Standard(s):
· Reading Standard for Science Literacy (RST): 2, 3, 4, 7, 8, 9
· Writing Standards for Science Literacy (WHST): 1, 2, 4, 9

Essential Question(s):
What is the structure of DNA?
What techniques are used to test DNA?
How is DNA used to solve crimes?

Key Terms/Concepts: Chromosome, DNA, Gene, Electrophoresis, Restriction Enzyme, Probe, Polymerase Chain Reaction, CODIS, Human Genome Project

<table>
<thead>
<tr>
<th>Standard</th>
<th>LEARNING OBJECTIVES (Content and Skill)</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Genetics, Evolution, Electric and Magnetic Phenomena</td>
<td>1. Describe the structure and function of DNA. 2. Explain how DNA is used in crime scene analysis. 3. Outline the procedures of RFLP, PCR, and STRs to analyze DNA.</td>
<td>● Power Point, Notes &amp; Discussion  ● Activity – Electrophoresis Simulation  ○ <a href="http://learn.genetics.utah.edu/content/labs/gel/">http://learn.genetics.utah.edu/content/labs/gel/</a>  ○ <a href="http://www.pbs.org/wgbh/nova/education/body/create-dna-fingerprint.html">http://www.pbs.org/wgbh/nova/education/body/create-dna-fingerprint.html</a></td>
<td>Oral Response Performance Task</td>
</tr>
<tr>
<td>Genetics, Organic Chemistry and Biochemistry</td>
<td>4. Isolate and extract DNA from cells.</td>
<td>● Lab – Isolation of Pea DNA  ● Lab – Isolation of Cheek DNA</td>
<td>Performance Task</td>
</tr>
<tr>
<td>Genetics</td>
<td>5. Analyze STRs and determine familial lines. 6. Communicate and defend a scientific argument. 7. Investigate the various applications of DNA analysis to situations other than criminal.</td>
<td>● Practice Problems  ● Analysis of STR from crime scene</td>
<td>Embedded Task</td>
</tr>
</tbody>
</table>


Suggested Technology: DVD player, Computer, Projector, Electrophoresis Equipment
Unit 7: Human Remains

Introduction: Anthropologists can use bones to determine whether remains are human; to determine the gender, age and sometimes the race of a victim. Analysis of the skeleton can estimate height and may be used to determine when and how death occurred.

CT State Standard(s):
Enrichment Content Standards: Genetics, Evolution, and Physiology

Common Core Standard(s):
- Reading Standard for Science Literacy (RST): 2, 3, 4, 7, 8, 9
- Writing Standards for Science Literacy (WHST): 1, 2, 4, 9

Essential Question(s):
What are the bones in the human body?
How can bones be used to determine sex, age, and sometimes race?
How is anthropology used to solve crimes and identify remains from other situations?

Key Terms/Concepts: Osteology, Sex Determination, Differences in Skull Features, Determining Age, Facial Reconstruction, Cause of Death & Bone Anomalies.

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>Genetics, Evolution</td>
<td>1. Determine how anthropologists can use bones to determine sex, age, sometimes race.</td>
<td>• Power Point, Notes &amp; Discussion</td>
<td>Oral Response</td>
</tr>
<tr>
<td></td>
<td>2. To estimate height and to determine when death may have occurred.</td>
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</tr>
<tr>
<td>Physiology</td>
<td>3. Identify bones in the human body.</td>
<td>• On-line interactive</td>
<td>Embedded Task</td>
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<td></td>
<td></td>
<td>• Label bones on a skeleton</td>
<td></td>
</tr>
<tr>
<td>Physiology</td>
<td>4. Identify sex, age, &amp; race of assorted bones.</td>
<td>• Lab – Human Remains (Sherlock Bones – WARD Scientific)</td>
<td>Performance Task and Constructed Response</td>
</tr>
<tr>
<td>Physiology</td>
<td>5. Explore process of facial reconstruction.</td>
<td>• Article</td>
<td>Embedded Task</td>
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<td></td>
<td></td>
<td>• On-line interactive</td>
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Suggested Technology: DVD player, Computer, Projector
Unit 8: Soil Analysis

Introduction: Soil is not simply dirt; it is a complex mixture of minerals, plants, and animal matter. It may contain fabricated products such as glass, paint, concrete and other materials. The content of soils vary greatly from one region or locale to another. *(Forensics for Dummies)*, thus providing useful evidence in solving a crime.

CT State Standard(s):
Enrichment Content Standards: Dynamic Earth Processes and standard 9.4

Common Core Standard(s):
· Reading Standard for Science Literacy (RST): 2, 3, 4, 7, 8, 9
· Writing Standards for Science Literacy (WHST): 1, 2, 4, 9

Essential Question(s):
How do soils differ?
How can soils be used as evidence?

Key Terms/Concepts: Soil Types, Topography, Forensic Geology

<table>
<thead>
<tr>
<th>Standard</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Dynamic Earth Processes</td>
<td>1. Describe why soils are class evidence and when soils can be used as circumstantial evidence.</td>
<td>● Power Point, Notes &amp; Discussion</td>
<td>Oral Response</td>
</tr>
<tr>
<td>Dynamic Earth Processes</td>
<td>2. Identify soil’s common constituents and relate soil types to the environment.</td>
<td>● Lab – microscopic analysis of various soil types</td>
<td>Performance Task</td>
</tr>
<tr>
<td>9.4</td>
<td>3. Carryout tests of general appearance, color, acidity particle size, density and rate of settling.</td>
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<td>Performance Task</td>
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<tr>
<td></td>
<td>4. Communicate and defend a scientific argument.</td>
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<td></td>
<td>5. Interpret a topographical map.</td>
<td>● Lab – Where is Alice Springs?</td>
<td>Performance Task and Constructed Response</td>
</tr>
<tr>
<td></td>
<td>6. Communicate and defend scientific argument.</td>
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Suggested Technology: DVD player, Computer, Projector, Dissecting Scopes, Microscopes
Unit 9: Glass

Introduction: This unit investigates how glass can be used as evidence. Glass is a very common material in our environment and may be used by investigators to place a suspect at a scene, prove a witness statement, or re-create a sequence of events.

CT State Standard(s): Waves

Common Core Standard(s):
- Reading Standard for Science Literacy (RST): 2, 3, 4, 7, 8, 9
- Writing Standards for Science Literacy (WHST): 1, 2, 4, 9

Essential Question(s):
- How do glass samples differ?
- How can glass be used as evidence?

Key Terms/Concepts: Reflection, Refraction, Refractive Index, Conchoidal Fracture,

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<thead>
<tr>
<th>Standard</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Waves</td>
<td>1. Describe the nature of glass and how glass can be used as evidence.</td>
<td>• Power Point, Notes &amp; Discussion</td>
<td>Oral Response</td>
</tr>
</tbody>
</table>
|          | 2. Observe various sample of class describe all physical properties and predict origin or use. | • Activity – Observations of Different Types of Glass  
• Lab – Characterization of Glass  
• Lab – Determining Refractive Index | Performance Task |
|          | 3. Analyze glass fracture patterns. | • Demonstration  
• Crime Scene Analysis Activity | Summative Assessment |


Suggested Technology: DVD player, Computer, Projector
Unit 10: Document and Handwriting Analysis

Introduction: The examination of questioned documents cover many areas of investigation, including verifying handwriting, and signatures; authenticating documents; characterizing papers, pigments and inks used in writing. This area has been expanded to include computer forensics.

CT State Standard(s):
Enrichment Content Standards: Reaction Rates

Common Core Standard(s):
- Reading Standard for Science Literacy (RST): 2, 3, 4, 7, 8, 9
- Writing Standards for Science Literacy (WHST): 1, 2, 4, 9

Essential Question(s):
How is handwriting analysis used as evidence?
What other types of evidence can be analyzes under the category of document analysis?

Key Terms/Concepts: Forgery, Diacritics, Obliteration, Indentation, Chromatography, Counterfeiting

<table>
<thead>
<tr>
<th>Standard</th>
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<th>ASSESSMENT EVIDENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Explain how handwriting can be individualized.</td>
<td>Lecture, Notes &amp; Discussion</td>
<td>Oral Response</td>
</tr>
<tr>
<td>2.</td>
<td>Determine what types of evidence can be submitted for document analysis</td>
<td>Class Activity – Matching Handwriting</td>
<td>Performance Task</td>
</tr>
<tr>
<td>4.</td>
<td>Design &amp; conduct and experiment using paper chromatography to determine which pen altered a note.</td>
<td>Lecture, Notes &amp; Discussion</td>
<td>Oral Response</td>
</tr>
</tbody>
</table>


Suggested Technology: DVD player, Computer, Projector
Unit 11: Firearms and Ballistics

Introduction: Unfortunately, it is a fact that guns commonly are used in criminal activities. Forensic firearms examiners are specifically trained to analyze weapons, bullets, and ballistic (Forensics for Dummies). This unit offers an overview of these three topics.

CT State Standard(s):
Enrichment Content Standards: Motion & Forces, Conservation of Energy & Momentum, and Chemical Bonds

Common Core Standard(s):
• Reading Standard for Science Literacy (RST): 2, 3, 4, 7, 8, 9

Essential Question(s):
• How is a bullet matched to a crime?
• How is a bullet matched to a specific gun?
• How are crimes involving guns investigated?

Key Terms/Concepts: Bullet, Cartridge, Land & Grooves, Rifling, Reconstruction

Suggested Technology: DVD player, Computer, Projector

Updated April 10, 2017