

# Forensic Science Curriculum Maps

[Unit 1: Intro to Forensics](#)

[Unit 2: The Crime Scene](#)

[Unit 3: Prints and Impressions](#)

[Unit 4: Blood](#)

[Unit 5: Documents Analysis](#)

[Unit 6: Hairs and Fibers](#)

[Unit 7: Glass](#)

[Unit 8: Human Remains](#)

[Unit 9: DNA](#)

[Unit 10: Drugs and Toxicology](#)

[Unit 11: Ballistics](#)

<b>Grade:</b> 11 and 12 <b>Subject:</b> Forensic Science	<b>Unit 1: Intro to Forensics</b>
<b>Big Idea/Rationale</b>	Students will be introduced to Forensics science and the scope of the field. They will learn the basic history and development of key technological advances as well as the organization of crime labs in the US and around the world.
<b>Enduring Understanding (Mastery Objective)</b>	<ul style="list-style-type: none"> <li>• Various scientific processes and techniques are used in forensic science.</li> </ul>
<b>Essential Questions (Instructional Objective)</b>	<ul style="list-style-type: none"> <li>• Why is forensic science important in modern society?</li> <li>• How could forensic science impact your life?</li> </ul>
<b>Content (Subject Matter)</b>	<ul style="list-style-type: none"> <li>• Define forensic science and list the major disciplines it encompasses.</li> <li>• Recognize the major contributors to the development of forensic science.</li> <li>• Account for the rapid growth of forensic laboratories in the past forty years.</li> <li>• Describe the services of a typical comprehensive crime laboratory in the criminal justice system.</li> <li>• Compare and contrast the Frye and Daubert decisions relating to the admissibility of scientific evidence in the courtroom.</li> <li>• Explain the role and responsibilities of the expert witness.</li> <li>• List the specialized forensic services, aside from the crime laboratory, that are generally available to law enforcement personnel.</li> </ul>
<b>Skills/ Benchmarks (CCSS Standards)</b>	<ul style="list-style-type: none"> <li>• 5.1.12.A.1: Refine interrelationships among concepts and patterns of evidence found in different central scientific explanations.</li> <li>• 5.1.12.A.2: Develop and use mathematical, physical, and computational tools to build evidence-based models and to pose theories.</li> <li>• 5.1.12.A.3 Use scientific principles and theories to build and refine standards for data collection, posing controls, and presenting evidence.</li> <li>• 5.1.12.B.1: Design investigations, collect evidence, analyze data, and evaluate evidence to determine measures of central tendencies, causal/correlational relationships, and anomalous data.</li> <li>• 5.1.12.B.2: Build, refine, and represent evidence-based models using mathematical, physical, and computational tools.</li> <li>• 5.1.12.B.3: Revise predictions and explanations using evidence, and connect explanations/arguments to established scientific knowledge, models, and theories.</li> <li>• 5.1.12.B.4: Develop quality controls to examine data sets and to examine</li> </ul>

	<p>evidence as a means of generating and reviewing explanations.</p> <ul style="list-style-type: none"> <li>• 5.1.12.C.1: Reflect on and revise understandings as new evidence emerges.</li> <li>• 5.1.12.C.2: Use data representations and new models to revise predictions and explanations.</li> <li>• 5.1.12.C.3: Consider alternative theories to interpret and evaluate evidence-based arguments.</li> <li>• 5.1.12.D.1: Engage in multiple forms of discussion in order to process, make sense of, and learn from others' ideas, observations, and experiences.</li> <li>• 5.1.12.D.3: Demonstrate how to use scientific tools and instruments and knowledge of how to handle animals with respect for their safety and welfare.</li> </ul>
<b>Materials and Resources</b>	<ul style="list-style-type: none"> <li>• FACES CD</li> <li>• videotapes</li> </ul>
<b>Notes</b>	

<b>Grade:</b> 11 - 12 <b>Subject:</b> Forensic Science	<b>Unit 2: The Crime Scene</b>
<b>Big Idea/Rationale</b>	<p>This chapter introduces the crime scene, explaining the importance of securing the crime scene and obtaining evidence from it. The concept of physical evidence and how it relates to the crime scene is introduced. The procedures necessary to preserve and record the crime scene are introduced and also the methods for obtaining and securing physical evidence, including maintaining the chain of custody and submitting evidence to the lab.</p>
<b>Enduring Understanding (Mastery Objective)</b>	<ul style="list-style-type: none"> <li>• The procedures used by investigators to process a crime scene are essential to accurate outcomes.</li> <li>• Various technologies are used by forensic investigators to record a crime scene.</li> <li>• Processing and analysis of evidence must be done carefully to help investigators solve crimes.</li> </ul>
<b>Essential Questions (Instructional Objective)</b>	<ul style="list-style-type: none"> <li>• Is it important to closely follow procedures when processing a crime scene?</li> <li>• Why or why not?</li> <li>• How can careful analysis of physical evidence be helpful in solving a crime?</li> <li>• Why is it important for investigators to be accurate in their investigative techniques?</li> </ul>
<b>Content (Subject Matter)</b>	<ul style="list-style-type: none"> <li>• Review the common types of physical evidence encountered at crime scenes</li> <li>• Explain the difference between the identification and comparison of physical evidence</li> <li>• Define and contrast individual and class characteristics of physical evidence</li> <li>• Appreciate the value of class evidence as it relates to a criminal investigation</li> <li>• List and explain the function of national databases available to forensic scientists</li> <li>• Explain the purpose physical evidence plays in reconstructing the events surrounding the commission of a crime</li> </ul>
<b>Skills/ Benchmarks (CCSS Standards)</b>	<ul style="list-style-type: none"> <li>• 5.1.12.A.1: Refine interrelationships among concepts and patterns of evidence found in different central scientific explanations.</li> <li>• 5.1.12.A.2: Develop and use mathematical, physical, and computational tools to build evidence-based models and to pose theories.</li> <li>• 5.1.12.A.3 Use scientific principles and theories to build and refine standards for data collection, posing controls, and presenting evidence.</li> <li>• 5.1.12.B.1: Design investigations, collect evidence, analyze data, and</li> </ul>

	<p>evaluate evidence to determine measures of central tendencies, causal/correlational relationships, and anomalous data.</p> <ul style="list-style-type: none"> <li>• 5.1.12.B.2: Build, refine, and represent evidence-based models using mathematical, physical, and computational tools.</li> <li>• 5.1.12.B.3: Revise predictions and explanations using evidence, and connect explanations/arguments to established scientific knowledge, models, and theories.</li> <li>• 5.1.12.B.4: Develop quality controls to examine data sets and to examine evidence as a means of generating and reviewing explanations.</li> <li>• 5.1.12.C.1: Reflect on and revise understandings as new evidence emerges.</li> <li>• 5.1.12.C.2: Use data representations and new models to revise predictions and explanations.</li> <li>• 5.1.12.C.3: Consider alternative theories to interpret and evaluate evidence-based arguments.</li> <li>• 5.1.12.D.1: Engage in multiple forms of discussion in order to process, make sense of, and learn from others' ideas, observations, and experiences.</li> <li>• 5.1.12.D.3: Demonstrate how to use scientific tools and instruments and knowledge of how to handle animals with respect for their safety and welfare.</li> </ul>
<p><b>Materials and Resources</b></p>	<p><b>Lab: Photography Lab</b></p> <ul style="list-style-type: none"> <li>• <b>Equipment:</b> <ul style="list-style-type: none"> <li>○ Cameras(phones)</li> <li>○ Angled rulers</li> <li>○ Crime tape</li> </ul> </li> </ul> <p><b>Lab: Sketching Lab</b></p> <ul style="list-style-type: none"> <li>• <b>Equipment:</b> <ul style="list-style-type: none"> <li>○ Graph paper</li> <li>○ Tape measures</li> <li>○ Rulers</li> <li>○ templates</li> </ul> </li> </ul> <p><b>Lab: Observation Lab</b></p> <ul style="list-style-type: none"> <li>• <b>Equipment:</b> <ul style="list-style-type: none"> <li>○ Crime tape</li> <li>○ 4 buckets containing evidence</li> </ul> </li> </ul> <p><b>Lab: Evidence Collection</b></p> <ul style="list-style-type: none"> <li>• <b>Equipment:</b> <ul style="list-style-type: none"> <li>○ Various collection containers/bags</li> <li>○ Tweezers</li> <li>○ Magnifying lenses</li> <li>○ Gloves</li> <li>○ Labels/seals</li> </ul> </li> </ul>

	<ul style="list-style-type: none"><li>○ Evidence collection log</li><li>● <b>Materials</b><ul style="list-style-type: none"><li>○ glass</li><li>○ blood</li><li>○ trace evidence</li></ul></li><li><b>Lab: Crime Scene Processing</b></li><li>● <b>Equipment:</b><ul style="list-style-type: none"><li>○ Various collection containers/bags</li><li>○ Tweezers</li><li>○ Gloves</li><li>○ Labels/seals</li><li>○ Evidence collection log</li><li>○ Photo log</li><li>○ Graph paper</li><li>○ Tape measures</li><li>○ Rulers</li><li>○ Templates</li><li>○ Big bags for evidence</li><li>○ Crime tape</li><li>○ Cameras</li><li>○ Angled rulers</li></ul></li><li>● <b>Materials</b><ul style="list-style-type: none"><li>○ glass</li><li>○ blood</li><li>○ trace evidence</li><li>○ crime scene stuff</li><li>○ videotapes</li></ul></li></ul>
<b>Notes</b>	

<p><b>Grade:</b> 11 - 12  <b>Subject:</b> Forensic Science</p>	<p><b>Unit 3: Prints and Impressions</b></p>
<p><b>Big Idea/Rationale</b></p>	<p>Students will be introduced to the importance of fingerprinting in forensic science. They will be given a complete overview of the history of fingerprinting including the early use of classification, as well as the adoption of fingerprinting as a standard forensic science tool. They will learn how to detect, develop and lift prints through various techniques. They will also learn how to analyze bite marks and footprints as well.</p>
<p><b>Enduring Understanding (Mastery Objective)</b></p>	<ul style="list-style-type: none"> <li>• Processing and analysis of evidence must be done carefully to help investigators solve crimes.</li> </ul>
<p><b>Essential Questions (Instructional Objective)</b></p>	<ul style="list-style-type: none"> <li>• How can careful analysis of physical evidence be helpful in solving a crime?</li> <li>• Why is it important for investigators to be accurate in their investigative techniques?</li> </ul>
<p><b>Content (Subject Matter)</b></p>	<ul style="list-style-type: none"> <li>• Recognize and understand the cuticle, cortex, and medulla areas of hair</li> <li>• List the three phases of hair growth</li> <li>• Appreciate the distinction between animal and human hairs</li> <li>• List hair features that are useful for the microscopic comparison of human hairs</li> <li>• Explain the proper collection of forensic hair evidence</li> <li>• Describe and understand the role of DNA typing in hair comparisons</li> <li>• Understand the differences between natural and manufactured fibers</li> <li>• List the properties of fibers that are most useful for forensic comparisons</li> <li>• Describe the proper collection of fiber evidence</li> </ul>
<p><b>Skills/ Benchmarks (CCSS Standards)</b></p>	<ul style="list-style-type: none"> <li>• <b>5.1.12.A.1:</b> Refine interrelationships among concepts and patterns of evidence found in different central scientific explanations.</li> <li>• <b>5.1.12.A.2:</b> Develop and use mathematical, physical, and computational tools to build evidence-based models and to pose theories.</li> <li>• <b>5.1.12.A.3</b> Use scientific principles and theories to build and refine standards for data collection, posing controls, and presenting evidence.</li> <li>• <b>5.1.12.B.1:</b> Design investigations, collect evidence, analyze data, and evaluate evidence to determine measures of central tendencies, causal/correlational relationships, and anomalous data.</li> <li>• <b>5.1.12.B.2:</b> Build, refine, and represent evidence-based models using mathematical, physical, and computational tools.</li> <li>• <b>5.1.12.B.3:</b> Revise predictions and explanations using evidence, and connect explanations/arguments to established scientific knowledge, models, and theories.</li> <li>• <b>5.1.12.B.4:</b> Develop quality controls to examine data sets and to</li> </ul>

	<p>examine evidence as a means of generating and reviewing explanations.</p> <ul style="list-style-type: none"> <li>• <b>5.1.12.C.1:</b> Reflect on and revise understandings as new evidence emerges.</li> <li>• <b>5.1.12.C.2:</b> Use data representations and new models to revise predictions and explanations.</li> <li>• <b>5.1.12.C.3:</b> Consider alternative theories to interpret and evaluate evidence-based arguments.</li> <li>• <b>5.1.12.D.1:</b> Engage in multiple forms of discussion in order to process, make sense of, and learn from others' ideas, observations, and experiences.</li> <li>• <b>5.1.12.D.3:</b> Demonstrate how to use scientific tools and instruments and knowledge of how to handle animals with respect for their safety and welfare.</li> </ul>
<p><b>Materials and Resources</b></p>	<p><b>Videotapes</b></p> <p><b>Lab: Print Portfolios</b></p> <ul style="list-style-type: none"> <li>• <b>Equipment:</b> <ul style="list-style-type: none"> <li>○ Powders (black, magnetic, white, fluorescent)</li> <li>○ Brushes/wands</li> <li>○ Cardboard bottom</li> <li>○ Lots of Cut up index cards</li> <li>○ Black paper</li> <li>○ Tape</li> <li>○ Portfolio folders</li> <li>○ HINGELIFTERS</li> <li>○ Metal tray on hotplate with foil hood</li> <li>○ Swabs (ninhydrin, silver nitrate, starch)</li> <li>○ Small beakers for iodine</li> <li>○ Black lights</li> </ul> </li> <li>• <b>Materials</b> <ul style="list-style-type: none"> <li>○ ninhydrin solution in flasks</li> <li>○ iodine crystals on cardboard circles</li> <li>○ silver nitrate solution in flasks</li> <li>○ starch solution in flasks</li> </ul> </li> </ul> <p><b>Lab: Teeth Molds</b></p> <ul style="list-style-type: none"> <li>• <b>Equipment:</b> <ul style="list-style-type: none"> <li>○ Transparency paper cut</li> <li>○ Markers for tracing</li> <li>○ Clipboard with sheet for names</li> <li>○ Bag to store molds</li> </ul> </li> <li>• <b>Materials</b> <ul style="list-style-type: none"> <li>○ Bite mark kits</li> </ul> </li> </ul> <p><b>Lab: Shoe Casts</b></p> <ul style="list-style-type: none"> <li>• <b>Equipment:</b> <ul style="list-style-type: none"> <li>○ 600 mL beakers for mixing</li> </ul> </li> </ul>



	<ul style="list-style-type: none"><li>○ box tops</li><li>○ (small garbage bags)</li><li>○ metal spoons</li><li>○ measuring cups</li><li>○ toothbrushes</li><li>● <b>Materials:</b><ul style="list-style-type: none"><li>○ Plaster of Paris</li><li>○ Sand</li><li>○ Hardening spray</li><li>○ <i>note: do outside!!!</i></li></ul></li></ul>
<b>Notes</b>	

<b>Grade:</b> 11 - 12 <b>Subject:</b> Forensic Science	<b>Unit 4: Blood</b>
<b>Big Idea/Rationale</b>	<p>Students will be introduced to the principles of blood types, DNA, and heredity. They will describe the nature of blood, including antigens, antibodies as well as blood typing. They will also learn about blood tests used to identify blood and differentiate between animal and human blood. Students will also be introduced to features of bloodstain formation, including texture and angle of impact as well as spray patterns.</p>
<b>Enduring Understanding (Mastery Objective)</b>	<ul style="list-style-type: none"> <li>• Blood and body fluids can be used to identify an individual.</li> <li>• Processing and analysis of evidence must be done carefully to help investigators solve crimes.</li> </ul>
<b>Essential Questions (Instructional Objective)</b>	<ul style="list-style-type: none"> <li>• What information can be gained about an individual from analyzing their blood?</li> <li>• How can careful analysis of physical evidence be helpful in solving a crime?</li> <li>• Why is it important for investigators to be accurate in their investigative techniques?</li> </ul>
<b>Content (Subject Matter)</b>	<ul style="list-style-type: none"> <li>• List the A-B-O antigens and antibodies found in the blood for each of the four blood types: A, B, AB, and O</li> <li>• Understand and describe how whole blood is typed</li> <li>• List and describe forensic tests used to characterize a stain as blood</li> <li>• Understand the concept of antigen–antibody interactions and how it is applied to species identification and drug identification</li> <li>• Explain the differences between monoclonal and polyclonal antibodies</li> <li>• Contrast chromosomes and genes</li> <li>• Learn how the Punnett square is used to determine the genotypes and phenotypes of offspring</li> <li>• List the laboratory tests necessary to characterize seminal stains</li> <li>• Explain how suspect blood and semen stains are to be properly preserved for laboratory examination</li> <li>• Describe the proper collection of physical evidence in a rape investigation</li> <li>• Recognize and understand the cuticle, cortex, and medulla areas of hair</li> <li>• List the three phases of hair growth</li> <li>• Appreciate the distinction between animal and human hairs</li> <li>• List hair features that are useful for the microscopic comparison of human hairs</li> <li>• Explain the proper collection of forensic hair evidence</li> <li>• Describe and understand the role of DNA typing in hair comparisons</li> <li>• Understand the differences between natural and manufactured fibers</li> </ul>

	<ul style="list-style-type: none"> <li>• List the properties of fibers that are most useful for forensic comparisons</li> <li>• Describe the proper collection of fiber evidence</li> </ul>
<b>Skills/ Benchmarks (CCSS Standards)</b>	<ul style="list-style-type: none"> <li>• 5.1.12.A.1: Refine interrelationships among concepts and patterns of evidence found in different central scientific explanations.</li> <li>• 5.1.12.A.2: Develop and use mathematical, physical, and computational tools to build evidence-based models and to pose theories.</li> <li>• 5.1.12.A.3 Use scientific principles and theories to build and refine standards for data collection, posing controls, and presenting evidence.</li> <li>• 5.1.12.B.1: Design investigations, collect evidence, analyze data, and evaluate evidence to determine measures of central tendencies, causal/correlational relationships, and anomalous data.</li> <li>• 5.1.12.B.2: Build, refine, and represent evidence-based models using mathematical, physical, and computational tools.</li> <li>• 5.1.12.B.3: Revise predictions and explanations using evidence, and connect explanations/arguments to established scientific knowledge, models, and theories.</li> <li>• 5.1.12.B.4: Develop quality controls to examine data sets and to examine evidence as a means of generating and reviewing explanations.</li> <li>• 5.1.12.C.1: Reflect on and revise understandings as new evidence emerges.</li> <li>• 5.1.12.C.2: Use data representations and new models to revise predictions and explanations.</li> <li>• 5.1.12.C.3: Consider alternative theories to interpret and evaluate evidence-based arguments.</li> <li>• 5.1.12.D.1: Engage in multiple forms of discussion in order to process, make sense of, and learn from others' ideas, observations, and experiences.</li> <li>• 5.1.12.D.3: Demonstrate how to use scientific tools and instruments and knowledge of how to handle animals with respect for their safety and welfare.</li> </ul>
<b>Materials and Resources</b>	<p><b>Videotapes</b></p> <p><b>Lab: Blood Typing</b></p> <ul style="list-style-type: none"> <li>• <b>Equipment:</b> <ul style="list-style-type: none"> <li>○ toothpicks</li> <li>○ type well plates</li> <li>○ test tube racks</li> <li>○ disposable pipets</li> <li>○ blood containers</li> </ul> </li> <li>• <b>Materials</b> <ul style="list-style-type: none"> <li>○ 4 different blood samples</li> </ul> </li> </ul> <p><b>Lab: Blood Key Chain</b></p> <ul style="list-style-type: none"> <li>• <b>Equipment:</b> <ul style="list-style-type: none"> <li>○ 9 index cards</li> </ul> </li> </ul>

	<ul style="list-style-type: none"><li>○ clipboard</li><li>○ paper protractor</li><li>○ tape</li><li>○ newspaper</li><li>● <b>Materials</b><ul style="list-style-type: none"><li>○ bottle of fake blood</li></ul></li></ul> <p><b>Lab: Murder Mystery 2 – iPad Theft and Assault</b></p> <ul style="list-style-type: none"><li>● <b>Equipment:</b><ul style="list-style-type: none"><li>○ Magnetic Dust and brush</li><li>○ Hinge lifters</li><li>○ Gloves</li><li>○ Meter sticks</li><li>○ magnifiers</li><li>○ tweezers</li><li>○ blood typing kit</li><li>○ rulers</li></ul></li><li>● <b>Materials</b><ul style="list-style-type: none"><li>○ fingerprints on acetate sheets</li><li>○ blood drops on glass (acetate) and floor</li><li>○ blood spatter pattern on paper on floor</li><li>○ ransom note</li></ul></li></ul>
<b>Notes</b>	

<b>Grade:</b> 11 - 12 <b>Subject:</b> Forensic Science	<b>Unit 5: Document Analysis</b>
<b>Big Idea/Rationale</b>	Students will be introduced to document examination and its importance in solving crimes. They will be given a detailed look at conducting handwriting comparisons, including looking for style, variations in handwriting, and the importance of exemplars.
<b>Enduring Understanding (Mastery Objective)</b>	The examination of questioned documents consists of the analysis and comparison of questioned handwriting, hand printing, typewriting, commercial printing, photocopies, papers, inks, and other documentary evidence with known material in order to establish the authenticity of the contested material as well as the detection of alterations.
<b>Essential Questions (Instructional Objective)</b>	How can forensic document examiners help attorneys and law enforcement officers?
<b>Content (Subject Matter)</b>	<ul style="list-style-type: none"> <li>• Define the term questioned document</li> <li>• Know what common individual characteristics are associated with handwriting</li> <li>• List some important guidelines for the collection of known writings for comparison to a questioned document</li> <li>• Recognize some of the class and individual characteristics of printers and photocopiers</li> <li>• List some of the techniques document examiners use to uncover alterations, erasures, obliterations, and variations in pen inks</li> </ul>
<b>Skills/ Benchmarks (CCSS Standards)</b>	<ul style="list-style-type: none"> <li>• 5.1.12.A.1: Refine interrelationships among concepts and patterns of evidence found in different central scientific explanations.</li> <li>• 5.1.12.A.2: Develop and use mathematical, physical, and computational tools to build evidence-based models and to pose theories.</li> <li>• 5.1.12.A.3 Use scientific principles and theories to build and refine standards for data collection, posing controls, and presenting evidence.</li> <li>• 5.1.12.B.1: Design investigations, collect evidence, analyze data, and evaluate evidence to determine measures of central tendencies, causal/correlational relationships, and anomalous data.</li> <li>• 5.1.12.B.2: Build, refine, and represent evidence-based models using mathematical, physical, and computational tools.</li> <li>• 5.1.12.B.3: Revise predictions and explanations using evidence, and connect explanations/arguments to established scientific knowledge, models, and theories.</li> <li>• 5.1.12.B.4: Develop quality controls to examine data sets and to examine evidence as a means of generating and reviewing explanations.</li> <li>• 5.1.12.C.1: Reflect on and revise understandings as new evidence</li> </ul>

	<p>emerges.</p> <ul style="list-style-type: none"> <li>• 5.1.12.C.2: Use data representations and new models to revise predictions and explanations.</li> <li>• 5.1.12.C.3: Consider alternative theories to interpret and evaluate evidence-based arguments.</li> <li>• 5.1.12.D.1: Engage in multiple forms of discussion in order to process, make sense of, and learn from others' ideas, observations, and experiences.</li> <li>• 5.1.12.D.3: Demonstrate how to use scientific tools and instruments and knowledge of how to handle animals with respect for their safety and welfare.</li> </ul>
<b>Materials and Resources</b>	Videotapes- Catch Me If You Can
<b>Notes</b>	

<b>Grade:</b> 11 - 12 <b>Subject:</b> Forensic Science	<b>Unit 6: Hairs and Fibers</b>
<b>Big Idea/Rationale</b>	Students will be introduced the use of trace evidence in forensic science. They will be provided with a close look at the morphology of hair and how to collect and use it. They will also be given an overview of fiber examination, including a survey of the various types of fibers as well as a guide to the identification and comparison of manufactured fibers.
<b>Enduring Understanding (Mastery Objective)</b>	Processing and analysis of evidence must be done carefully to help investigators solve crimes.
<b>Essential Questions (Instructional Objective)</b>	<ul style="list-style-type: none"> <li>• How can careful analysis of physical evidence be helpful in solving a crime?</li> <li>• Why is it important for investigators to be accurate in their investigative techniques?</li> </ul>
<b>Content (Subject Matter)</b>	<ul style="list-style-type: none"> <li>• Recognize and understand the cuticle, cortex, and medulla areas of hair</li> <li>• List the three phases of hair growth</li> <li>• Appreciate the distinction between animal and human hairs</li> <li>• List hair features that are useful for the microscopic comparison of human hairs</li> <li>• Explain the proper collection of forensic hair evidence</li> <li>• Describe and understand the role of DNA typing in hair comparisons</li> <li>• Understand the differences between natural and manufactured fibers</li> <li>• List the properties of fibers that are most useful for forensic comparisons</li> <li>• Describe the proper collection of fiber evidence</li> </ul>
<b>Skills/ Benchmarks (CCSS Standards)</b>	<ul style="list-style-type: none"> <li>• 5.1.12.A.1: Refine interrelationships among concepts and patterns of evidence found in different central scientific explanations.</li> <li>• 5.1.12.A.2: Develop and use mathematical, physical, and computational tools to build evidence-based models and to pose theories.</li> <li>• 5.1.12.A.3 Use scientific principles and theories to build and refine standards for data collection, posing controls, and presenting evidence.</li> <li>• 5.1.12.B.1: Design investigations, collect evidence, analyze data, and evaluate evidence to determine measures of central tendencies, causal/correlational relationships, and anomalous data.</li> <li>• 5.1.12.B.2: Build, refine, and represent evidence-based models using mathematical, physical, and computational tools.</li> <li>• 5.1.12.B.3: Revise predictions and explanations using evidence, and connect explanations/arguments to established scientific knowledge, models, and theories.</li> <li>• 5.1.12.B.4: Develop quality controls to examine data sets and to examine evidence as a means of generating and reviewing explanations.</li> </ul>

	<ul style="list-style-type: none"> <li>• 5.1.12.C.1: Reflect on and revise understandings as new evidence emerges.</li> <li>• 5.1.12.C.2: Use data representations and new models to revise predictions and explanations.</li> <li>• 5.1.12.C.3: Consider alternative theories to interpret and evaluate evidence-based arguments.</li> <li>• 5.1.12.D.1: Engage in multiple forms of discussion in order to process, make sense of, and learn from others' ideas, observations, and experiences.</li> <li>• 5.1.12.D.3: Demonstrate how to use scientific tools and instruments and knowledge of how to handle animals with respect for their safety and welfare.</li> </ul>
<b>Materials and Resources</b>	<b>Videotapes</b> <b>Lab: Hair Lab</b> <ul style="list-style-type: none"> <li>• <b>Equipment:</b> <ul style="list-style-type: none"> <li>○ Microscope</li> <li>○ Slides</li> <li>○ Cover slips</li> <li>○ ruler</li> <li>○ magnifier</li> <li>○ nail polish</li> </ul> </li> <li>• <b>Materials</b> <ul style="list-style-type: none"> <li>○ hair</li> </ul> </li> </ul> <b>Lab: Fiber Lab</b> <ul style="list-style-type: none"> <li>• <b>Equipment:</b> <ul style="list-style-type: none"> <li>○ Microscope</li> <li>○ Slides</li> <li>○ Cover slips</li> <li>○ candle</li> <li>○ tweezers</li> <li>○ matches</li> </ul> </li> <li>• <b>Materials</b> <ul style="list-style-type: none"> <li>○ 6 fibers</li> <li>○ 6 unknown fibers</li> </ul> </li> </ul>
<b>Notes</b>	



<b>Grade:</b> 11 - 12 <b>Subject:</b> Forensic Science	<b>Unit 7: Glass</b>
<b>Big Idea/Rationale</b>	<p>Students will be introduced to the properties of matter and analysis of glass. They will distinguish between physical properties and chemical properties. They will also learn about waves and light and how it can be used to determine refractive indices. They will also learn how density, refractive index, and the classification of glass samples can help in forensic analysis.</p>
<b>Enduring Understanding (Mastery Objective)</b>	<ul style="list-style-type: none"> <li>• The chemical composition of glass varies depending on its purpose,</li> <li>• Differences in glass composition can help identify its source.</li> <li>• The bending of light can be measured and differs depending on the medium through which it passes.</li> </ul>
<b>Essential Questions (Instructional Objective)</b>	<ul style="list-style-type: none"> <li>• What role can glass identification play in forensic science investigations?</li> </ul>
<b>Content (Subject Matter)</b>	<ul style="list-style-type: none"> <li>• Define and distinguish the physical and chemical properties of matter</li> <li>• Understand how to use the basic units of the metric system</li> <li>• Define and distinguish elements and compounds</li> <li>• Contrast the differences between a solid, liquid, and gas</li> <li>• Understand the differences between the wave and particle theories of light</li> <li>• Define and understand the properties of density and refractive index</li> <li>• Understand and explain the dispersion of light through a prism</li> <li>• Describe the electromagnetic spectrum</li> <li>• List and explain forensic methods for comparing glass fragments</li> <li>• Understand how to examine glass fractures to determine the direction of impact for a projectile</li> <li>• Describe the proper collection of glass evidence</li> </ul>
<b>Skills/ Benchmarks (CCSS Standards)</b>	<ul style="list-style-type: none"> <li>• 5.1.12.A.1: Refine interrelationships among concepts and patterns of evidence found in different central scientific explanations.</li> <li>• 5.1.12.A.2: Develop and use mathematical, physical, and computational tools to build evidence-based models and to pose theories.</li> <li>• 5.1.12.A.3 Use scientific principles and theories to build and refine standards for data collection, posing controls, and presenting evidence.</li> <li>• 5.1.12.B.1: Design investigations, collect evidence, analyze data, and evaluate evidence to determine measures of central tendencies, causal/correlational relationships, and anomalous data.</li> <li>• 5.1.12.B.2: Build, refine, and represent evidence-based models using mathematical, physical, and computational tools.</li> <li>• 5.1.12.B.3: Revise predictions and explanations using evidence, and</li> </ul>

	<p>connect explanations/arguments to established scientific knowledge, models, and theories.</p> <ul style="list-style-type: none"> <li>• 5.1.12.B.4: Develop quality controls to examine data sets and to examine evidence as a means of generating and reviewing explanations.</li> <li>• 5.1.12.C.1: Reflect on and revise understandings as new evidence emerges.</li> <li>• 5.1.12.C.2: Use data representations and new models to revise predictions and explanations.</li> <li>• 5.1.12.C.3: Consider alternative theories to interpret and evaluate evidence-based arguments.</li> <li>• 5.1.12.D.1: Engage in multiple forms of discussion in order to process, make sense of, and learn from others' ideas, observations, and experiences.</li> <li>• 5.1.12.D.3: Demonstrate how to use scientific tools and instruments and knowledge of how to handle animals with respect for their safety and welfare.</li> </ul>
<p><b>Materials and Resources</b></p>	<p><b>Videotapes</b></p> <p><b>Lab: Glass lab pt 1</b></p> <ul style="list-style-type: none"> <li>• <b>Equipment:</b> <ul style="list-style-type: none"> <li>○ magnifier</li> <li>○ Hammer</li> <li>○ Masking tape</li> <li>○ 2 plastic bags</li> <li>○ tweezers</li> <li>○ black construction paper</li> </ul> </li> <li>• <b>Materials</b> <ul style="list-style-type: none"> <li>○ small glass</li> <li>○ large glass</li> <li>○ cardboard</li> <li>○ foam</li> <li>○ nail</li> </ul> </li> </ul> <p><b>Lab: Glass lab pt 2</b></p> <ul style="list-style-type: none"> <li>• <b>Equipment:</b> <ul style="list-style-type: none"> <li>○ 10 mL grad cylinder</li> <li>○ balance</li> <li>○ tweezers</li> <li>○ well plate</li> </ul> </li> <li>• <b>Materials</b> <ul style="list-style-type: none"> <li>○ lead crystal fragments</li> <li>○ tempered fragments</li> <li>○ window fragments</li> <li>○ Pyrex fragments</li> </ul> </li> </ul> <p><b>Lab: Glass lab pt 3</b></p> <ul style="list-style-type: none"> <li>• <b>Equipment:</b></li> </ul>

	<ul style="list-style-type: none"> <li>○ Laser pointer</li> <li>○ ½ circle petri dish</li> <li>○ sharp pencil</li> <li>○ ruler</li> <li>○ protractor</li> <li>● <b>Materials</b> <ul style="list-style-type: none"> <li>● refractive index sheets (3)</li> <li>● clove oil</li> <li>● vegetable oil</li> <li>● water</li> <li>● <i>note: use only 1 or 2 dishes for clove oil—set stations for each liquid</i></li> </ul> </li> </ul> <p><b>Lab: Glass lab pt 4</b></p> <ul style="list-style-type: none"> <li>● <b>Equipment:</b> <ul style="list-style-type: none"> <li>○ 3 100 mL beakers</li> <li>○ tweezers</li> <li>○ magnifier</li> <li>○ white paper</li> <li>○ paper towels</li> </ul> </li> <li>● <b>Materials</b> <ul style="list-style-type: none"> <li>○ lead crystal chunk</li> <li>○ tempered chunk</li> <li>○ window chunk</li> <li>○ Pyrex chunk</li> <li>○ vegetable oil</li> <li>○ clove oil</li> <li>○ <i>note: set stations for liquids</i></li> </ul> </li> </ul>
<b>Notes</b>	

<b>Grade:</b> 11 - 12 <b>Subject:</b> Forensic Science	<b>Unit 8: Human Remains</b>
<b>Big Idea/Rationale</b>	Students will be introduced to the role of the pathologist and anthropologist in determining the cause of death and identify of victims.
<b>Enduring Understanding (Mastery Objective)</b>	<ul style="list-style-type: none"> <li>• The procedures used by investigators to process a crime scene are essential to accurate outcomes.</li> <li>• Various technologies are used by forensic investigators to record a crime scene.</li> </ul>
<b>Essential Questions (Instructional Objective)</b>	Is it important to closely follow procedures when processing a crime scene? Why or why not?
<b>Content (Subject Matter)</b>	Understand the contributions the forensic pathologist, entomologist, and anthropologist can make to a homicide investigation.
<b>Skills/ Benchmarks (CCSS Standards)</b>	<ul style="list-style-type: none"> <li>• 5.1.12.A.1: Refine interrelationships among concepts and patterns of evidence found in different central scientific explanations.</li> <li>• 5.1.12.A.2: Develop and use mathematical, physical, and computational tools to build evidence-based models and to pose theories.</li> <li>• 5.1.12.A.3 Use scientific principles and theories to build and refine standards for data collection, posing controls, and presenting evidence.</li> <li>• 5.1.12.B.1: Design investigations, collect evidence, analyze data, and evaluate evidence to determine measures of central tendencies, causal/correlational relationships, and anomalous data.</li> <li>• 5.1.12.B.2: Build, refine, and represent evidence-based models using mathematical, physical, and computational tools.</li> <li>• 5.1.12.B.3: Revise predictions and explanations using evidence, and connect explanations/arguments to established scientific knowledge, models, and theories.</li> <li>• 5.1.12.B.4: Develop quality controls to examine data sets and to examine evidence as a means of generating and reviewing explanations.</li> <li>• 5.1.12.C.1: Reflect on and revise understandings as new evidence emerges.</li> <li>• 5.1.12.C.2: Use data representations and new models to revise predictions and explanations.</li> <li>• 5.1.12.C.3: Consider alternative theories to interpret and evaluate evidence-based arguments.</li> <li>• 5.1.12.D.1: Engage in multiple forms of discussion in order to process, make sense of, and learn from others' ideas, observations, and experiences.</li> <li>• 5.1.12.D.3: Demonstrate how to use scientific tools and instruments and knowledge of how to handle animals with respect for their safety and</li> </ul>

	welfare.
<b>Materials and Resources</b>	<p><b>Videotapes</b></p> <p><b>Lab: No Bones About It</b></p> <ul style="list-style-type: none"> <li>• <b>Equipment:</b> <ul style="list-style-type: none"> <li>○ Ruler</li> <li>○ Meter stick</li> <li>○ Sharp pencil</li> </ul> </li> <li>• <b>Materials</b> <ul style="list-style-type: none"> <li>○ graph paper</li> </ul> </li> </ul> <p><b>Lab: Sherlock Bones</b></p> <ul style="list-style-type: none"> <li>• <b>Equipment:</b> <ul style="list-style-type: none"> <li>○ Calipers</li> <li>○ Large caliper</li> <li>○ Protractor</li> <li>○ Small ruler</li> </ul> </li> <li>• <b>Materials</b> <ul style="list-style-type: none"> <li>○ packets</li> <li>○ various bones</li> </ul> </li> </ul>
<b>Notes</b>	

<b>Grade:</b> 11 - 12 <b>Subject:</b> Forensic Science	<b>Unit 9: DNA</b>
<b>Big Idea/Rationale</b>	Students will be introduced to DNA and its use as a tool for forensic science. They will be provided the bases for understanding DNA and how it replicates, including PCR. They will also be provided in depth coverage of DNA typing with tandem repeats as well as mitochondrial DNA.
<b>Enduring Understanding (Mastery Objective)</b>	The ability to collect and analyze DNA has improved the success of forensic scientists in solving crimes.
<b>Essential Questions (Instructional Objective)</b>	In what ways has modern biotechnology impacted the field of forensic science?
<b>Content (Subject Matter)</b>	<ul style="list-style-type: none"> <li>• Name the parts of a nucleotide and explain how they are linked together to form DNA</li> <li>• Understand the concept of base pairing as it relates to the double-helix structure of DNA</li> <li>• Contrast DNA strands that code for the production of proteins with strands that contain repeating base sequences</li> <li>• Explain the technology of polymerase chain reaction (PCR) and how it applies to forensic DNA typing</li> <li>• Contrast the newest DNA-typing technique, short tandem repeats (STRs), with previous DNA-typing technologies</li> <li>• Describe the difference between nuclear and mitochondrial DNA</li> <li>• Understand the use of DNA computerized databases in criminal investigation</li> <li>• List the necessary procedures for the proper preservation of bloodstained evidence for laboratory DNA analysis</li> </ul>
<b>Skills/ Benchmarks (CCSS Standards)</b>	<ul style="list-style-type: none"> <li>• 5.1.12.A.1: Refine interrelationships among concepts and patterns of evidence found in different central scientific explanations.</li> <li>• 5.1.12.A.2: Develop and use mathematical, physical, and computational tools to build evidence-based models and to pose theories.</li> <li>• 5.1.12.A.3 Use scientific principles and theories to build and refine standards for data collection, posing controls, and presenting evidence.</li> <li>• 5.1.12.B.1: Design investigations, collect evidence, analyze data, and evaluate evidence to determine measures of central tendencies, causal/correlational relationships, and anomalous data.</li> <li>• 5.1.12.B.2: Build, refine, and represent evidence-based models using mathematical, physical, and computational tools.</li> <li>• 5.1.12.B.3: Revise predictions and explanations using evidence, and connect explanations/arguments to established scientific knowledge,</li> </ul>

	<p>models, and theories.</p> <ul style="list-style-type: none"> <li>• 5.1.12.B.4: Develop quality controls to examine data sets and to examine evidence as a means of generating and reviewing explanations.</li> <li>• 5.1.12.C.1: Reflect on and revise understandings as new evidence emerges.</li> <li>• 5.1.12.C.2: Use data representations and new models to revise predictions and explanations.</li> <li>• 5.1.12.C.3: Consider alternative theories to interpret and evaluate evidence-based arguments.</li> <li>• 5.1.12.D.1: Engage in multiple forms of discussion in order to process, make sense of, and learn from others' ideas, observations, and experiences.</li> <li>• 5.1.12.D.3: Demonstrate how to use scientific tools and instruments and knowledge of how to handle animals with respect for their safety and welfare.</li> </ul>
<p><b>Materials and Resources</b></p>	<p><b>Videotapes</b></p> <p><b>Lab: DNA Extraction lab</b></p> <ul style="list-style-type: none"> <li>• <b>Equipment:</b> <ul style="list-style-type: none"> <li>○ dixie cup</li> <li>○ test tube</li> <li>○ test tube rack</li> <li>○ pipets</li> <li>○ stirring rod</li> <li>○ stopper</li> <li>○ microfuge tube</li> </ul> </li> <li>• <b>Materials</b> <ul style="list-style-type: none"> <li>○ 8% sodium chloride solution</li> <li>○ ethyl alcohol (cold)</li> <li>○ Palmolive soap</li> <li>○ bottle water</li> </ul> </li> </ul> <p><b>Lab: Electrophoresis lab</b></p> <ul style="list-style-type: none"> <li>• <b>Equipment:</b> <ul style="list-style-type: none"> <li>○ Electrophoresis box</li> <li>○ Power supply</li> <li>○ Gel holders</li> <li>○ Combs</li> <li>○ Micropipets</li> <li>○ Tips</li> </ul> </li> <li>• <b>Materials</b> <ul style="list-style-type: none"> <li>○ stain</li> <li>○ 0.8% agarose gel prepared in advance</li> <li>○ DNA samples</li> <li>○ practice samples</li> <li>○ buffer solution</li> </ul> </li> </ul>

<b>Notes</b>	
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<b>Grade:</b> 11 – 12 <b>Subject:</b> Forensic Science	<b>Unit 10: Drugs and Toxicology</b>
<b>Big Idea/Rationale</b>	Students will be introduced to drugs and their role in criminal activity and forensic investigations. They will be provided a solid method for detecting and identifying various drugs as evidence. They will learn about dependence as well as classifications of drugs and poisons, and ways to analyze them with color tests, chromatography, spectrophotometry, and mass spectrometry.
<b>Enduring Understanding (Mastery Objective)</b>	Forensic scientist’s ability to identify drugs can help solve crimes.
<b>Essential Questions (Instructional Objective)</b>	<ul style="list-style-type: none"> <li>• What types of drugs are typically found at a crime scene and why?</li> <li>• How are drugs produced and why are they typically linked to crime?</li> <li>• How can we classify drugs according to their origins?</li> <li>• Why is classifying drugs important in forensic science?</li> </ul>
<b>Content (Subject Matter)</b>	<ul style="list-style-type: none"> <li>• Compare and contrast psychological and physical dependence</li> <li>• Name and classify the commonly abused drugs</li> <li>• Describe the laboratory tests normally used to perform a routine drug identification analysis</li> <li>• Describe and explain the process of chromatography</li> <li>• Explain the difference between thin-layer chromatography and gas chromatography</li> <li>• Describe the utility of ultraviolet and infrared spectroscopy for the identification of organic compounds</li> <li>• Describe the concept and utility of mass spectrometry for identification analysis</li> <li>• Understand the proper collection and preservation of drug evidence</li> </ul>
<b>Skills/ Benchmarks (CCSS Standards)</b>	<ul style="list-style-type: none"> <li>• 5.1.12.A.1: Refine interrelationships among concepts and patterns of evidence found in different central scientific explanations.</li> <li>• 5.1.12.A.2: Develop and use mathematical, physical, and computational tools to build evidence-based models and to pose theories.</li> <li>• 5.1.12.A.3 Use scientific principles and theories to build and refine standards for data collection, posing controls, and presenting evidence.</li> <li>• 5.1.12.B.1: Design investigations, collect evidence, analyze data, and evaluate evidence to determine measures of central tendencies, causal/correlational relationships, and anomalous data.</li> <li>• 5.1.12.B.2: Build, refine, and represent evidence-based models using mathematical, physical, and computational tools.</li> <li>• 5.1.12.B.3: Revise predictions and explanations using evidence, and connect explanations/arguments to established scientific knowledge, models, and theories.</li> </ul>

	<ul style="list-style-type: none"> <li>• 5.1.12.B.4: Develop quality controls to examine data sets and to examine evidence as a means of generating and reviewing explanations.</li> <li>• 5.1.12.C.1: Reflect on and revise understandings as new evidence emerges.</li> <li>• 5.1.12.C.2: Use data representations and new models to revise predictions and explanations.</li> <li>• 5.1.12.C.3: Consider alternative theories to interpret and evaluate evidence-based arguments.</li> <li>• 5.1.12.D.1: Engage in multiple forms of discussion in order to process, make sense of, and learn from others' ideas, observations, and experiences.</li> <li>• 5.1.12.D.3: Demonstrate how to use scientific tools and instruments and knowledge of how to handle animals with respect for their safety and welfare.</li> </ul>
<b>Materials and Resources</b>	<p><b>Videotapes</b></p> <p><b>Lab: Identification of an Unknown Substance II (Flinn) lab</b></p> <ul style="list-style-type: none"> <li>• <b>Equipment</b> <ul style="list-style-type: none"> <li>○ Development jar with lid</li> <li>○ TLC plate, 4x2</li> <li>○ Microcapillary tubes, 4</li> <li>○ UV light source</li> <li>○ Ruler</li> <li>○ Pencil</li> </ul> </li> <li>• <b>Materials</b> <ul style="list-style-type: none"> <li>○ Aspirin solution, 6-10 drops</li> <li>○ Acetaminophen solution, 6-10 drops</li> <li>○ Caffeine solution, 6-10 drops</li> <li>○ "Unknown" solution</li> <li>○ Ethyl acetate, 25 mL</li> <li>○ <i>Note: For setup - beaker with ruler, pencil, cap tubes, sample of each drug in tube for each group + jar with TLC plates inside</i></li> </ul> </li> </ul> <p><b>Lab: presumptive drug lab</b></p> <ul style="list-style-type: none"> <li>• <b>Equipment</b> <ul style="list-style-type: none"> <li>○ Kemtec</li> <li>○ Did not do last year.</li> </ul> </li> </ul>
<b>Notes</b>	

<b>Grade:</b> 11 - 12 <b>Subject:</b> Forensic Science	<b>Unit 11: Ballistics</b>
<b>Big Idea/Rationale</b>	Students will be introduced to the importance of firearm examination, and the role that it plays in forensic science. We will discuss bullet and cartridge comparisons and ballistic fingerprinting. They will also be introduced to gunpowder residues and how to test for them.
<b>Enduring Understanding (Mastery Objective)</b>	Forensic Firearm Identification is a discipline of forensic science which has as its primary concern to determine if a bullet, cartridge case, or other ammunition component was fired by a particular firearm.
<b>Essential Questions (Instructional Objective)</b>	What is forensic firearm identification?
<b>Content (Subject Matter)</b>	<ul style="list-style-type: none"> <li>• Describe techniques for rifling a barrel</li> <li>• Recognize the class and individual characteristics of bullets and cartridge cases</li> <li>• Understand the use of the comparison microscope to compare bullets and cartridge cases</li> <li>• Explain the concept of the NIBIN database</li> <li>• Explain the procedure for determining how far a weapon was fired from a target</li> <li>• Identify the laboratory tests for determining whether an individual has fired a weapon</li> <li>• Explain the forensic significance of class and individual characteristics to the comparison of toolmark, footwear, and tire impressions</li> <li>• List some common field reagents used to enhance bloody footprints</li> </ul>
<b>Skills/ Benchmarks (CCSS Standards)</b>	<ul style="list-style-type: none"> <li>• 5.1.12.A.1: Refine interrelationships among concepts and patterns of evidence found in different central scientific explanations.</li> <li>• 5.1.12.A.2: Develop and use mathematical, physical, and computational tools to build evidence-based models and to pose theories.</li> <li>• 5.1.12.A.3 Use scientific principles and theories to build and refine standards for data collection, posing controls, and presenting evidence.</li> <li>• 5.1.12.B.1: Design investigations, collect evidence, analyze data, and evaluate evidence to determine measures of central tendencies, causal/correlational relationships, and anomalous data.</li> <li>• 5.1.12.B.2: Build, refine, and represent evidence-based models using mathematical, physical, and computational tools.</li> <li>• 5.1.12.B.3: Revise predictions and explanations using evidence, and connect explanations/arguments to established scientific knowledge, models, and theories.</li> <li>• 5.1.12.B.4: Develop quality controls to examine data sets and to</li> </ul>

	<p>examine evidence as a means of generating and reviewing explanations.</p> <ul style="list-style-type: none"> <li>• 5.1.12.C.1: Reflect on and revise understandings as new evidence emerges.</li> <li>• 5.1.12.C.2: Use data representations and new models to revise predictions and explanations.</li> <li>• 5.1.12.C.3: Consider alternative theories to interpret and evaluate evidence-based arguments.</li> <li>• 5.1.12.D.1: Engage in multiple forms of discussion in order to process, make sense of, and learn from others' ideas, observations, and experiences.</li> <li>• 5.1.12.D.3: Demonstrate how to use scientific tools and instruments and knowledge of how to handle animals with respect for their safety and welfare.</li> </ul>
<p><b>Materials and Resources</b></p>	<p><b>Videotapes</b>  <b>Lab: Online Bullet Matching</b></p> <ul style="list-style-type: none"> <li>• <b>Equipment:</b> <ul style="list-style-type: none"> <li>○ <a href="http://www.firearmsid.com">www.firearmsid.com</a></li> </ul> </li> </ul>
<p><b>Notes</b></p>	