

| Enduring Understanding # 1: Scientific inquiry affords all learners opportunities to make observations, pose questions, develop hypotheses, design and conduct investigations, and analyze data to draw conclusions.   |  |   |   |   |
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| Forensic Science Benchmarks  |  |   |   |   |
| Students will understand:  | Essential Questions  | Students will know the/that   | Students will be able to  | Notes   |
| 1.1 The ability to supply to the criminal justice system, accurate and objective information that reflects the events that occurred at a crime is an essential skill for the forensic scientist.   | -As the accused, can I be sure that my trial is based on accurate, precise, complete, scientific evidence?<br>-What skills does an investigator need to solve a crime?   | -Define and contrast individual and class evidence.<br>-Distinguish between presumptive and confirmatory testing of evidence.<br>-The purpose physical evidence plays in reconstructing the events surrounding the commission of a crime.   | -Formulate question, develop hypothesis and conduct scientific investigations.<br>-Calculate the “value” of class evidence as it relates to a criminal investigation.<br>-Recognize, identify and individualize evidence.   |   |
| 1.2 Forensic investigation requires strict protocols from trained professionals for securing crime scenes and gathering, processing and analyzing evidence of a crime.<br><br>1.3 Forensic Science is not based upon assumptions and instinct; rather, it is substantiated by valid, reproducible evidence leading to logical conclusions. | -What are the procedures for preserving crime scenes and gathering evidence, and why?<br><br>-Are the results of all forensic tests admissible in court?<br><br>-How does a forensic scientist detect trace evidence at a crime scene? | -Define and identify the significance of the concept of chain of custody.<br><br>-Rules of procedure and evidence are designed to maximize reliability and efficiency.<br><br>-Responsibilities of the first police officer who arrives at a crime scene.<br><br>-Steps to be taken to thoroughly record a crime scene.<br><br>-What I see on TV is not real. | -Model the roles and/or duties required of crime scene investigators.<br>-Model proper procedure for processing a crime scene.<br>-Collect and package evidence using proper forensic procedures.<br>-Analyze evidence in a manner which meets the guidelines of the <i>Frey Standard</i> and/or the <i>Daubert Ruling</i> .<br>-Design and set up a realistic crime scene using the knowledge and techniques throughout the year.<br>-Use findings from collected evidence to accurately reconstruct a crime scene.<br>-Investigate a realistic crime scene following correct crime scene investigation procedures.<br>-Correctly document all aspects of the crime scene investigation process.<br>-Prepare and present oral and written scientific reports which defend the results of processed evidence.<br>- Conduct labs and analyze data.<br>-Properly handle evidence without altering or destroying the evidence.<br>-Communicate results through written and oral reports. | Create a cold case.<br><br>Process at least one mock crime scene following ALL accepted procedures. |

Enduring Understanding # 2: Exploring systems, order, and organizations in our natural and designed world are integral to understanding the scientific disciplines and their interdependence.

### Forensic Science Benchmarks

| Students will understand:   | Essential Questions   | Students will know the/that  | Students will be able to   | Notes                       |
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| 2.1 Fingerprint evidence is unique and individual evidence.                   | -How do we know that all fingerprints are unique?<br>-Do identical twins have identical fingerprints?   | -The process of human fingerprint analysis by describing how individual human fingerprints are made and/or collected, as well as identifying basic fingerprint ridge patterns.                         | -Individualize a fingerprint using accepted forensic science techniques.<br>-Include and exclude suspects based using the three major patterns and all subclasses.<br>-Properly process and collect latent fingerprints using accepted techniques. | 8-12 minutiae               |
| 2.2 Documents, when analyzed can often lead investigators to a single person. | -How can ransom notes or suicide letters be helpful to forensic scientists?   | -Common individual characteristics are associated with handwriting.  | -Conduct document analysis techniques such as handwriting analysis and chromatography of inks as they are used to analyze questioned documents.  | Document Examination        |
| 2.3 Impressions can lead forensic scientists to a specific individual.        | -How do scientists know that the shoe that made a footwear impression was my shoe, not one like mine?<br>-How can scientists tell that a specific tool created a mark, not one like it? | -Forensic Significance of class and individual characteristics used to compare tool marks, footwear and tire impressions.<br>-Footwear and tool impressions can be both class and individual evidence. | -Distinguish among similar tools and tool marks in order to individualize one particular tool.<br>-Demonstrate an understanding of how footwear evidence is compared and analyzed.   | Tool and other impressions. |

### Forensic Science Benchmarks

| Students will understand: | Essential Questions   | Students will know the/that  | Students will be able to   | Notes   |
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|                           | -All blood looks the same, how do they know it is my blood not my relative's blood? | -Outline the four basic human blood types and identify the significance of the Rh factor in human blood types.<br>-The basic biochemistry and immunology of the ABO blood group system.<br>-Explain the steps involved in the identification of an unknown blood sample through the process of blood sample testing. | -Perform testing to distinguish blood from other types of stains.<br>-Perform an experiment that identifies the four basic blood types.<br>-Identify various unknown blood samples.<br>-Outline the basic molecular structure and function of the DNA molecule.<br><br>-Discriminate between mitochondrial and nuclear DNA profiling and the | Presumptive blood tests<br><br>Blood Typing<br><br>DNA fingerprint analysis |

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| <p>2.4 Nuclear DNA is unique and individual evidence, blood as a whole is not.</p> |  | <p>-Different types of DNA (nuclear and mitochondrial) exist and have different uses in forensic science.</p>   | <p>information provided by each method.<br/>         -Identify the steps involved in the creation of a DNA print.<br/>         -Analyze a DNA fingerprint in order to individualize a DNA fingerprint to a person.<br/>         -Create and compare DNA profiles of individuals in a hypothetical crime.</p>  |                               |
| <p>2.5 Blood can be useful to reconstruct a crime scene.</p>                       | <p>-How can a Forensic Scientist reconstruct a crime scene when they weren't there when it happened?</p> | <p>-Understand how blood patterns can be used as evidence at the crime scene.<br/>         -Height affects the size of a blood drop.<br/>         -When blood drops hit a surface at an angle, it leaves a pattern which can be analyzed mathematically to determine the angle at which the blood hit the surface.<br/>         -Blood behaves differently when it hits different surfaces.<br/>         -Blood behaves differently when it hits a surface at different velocities.</p> | <p>-Create blood spatter patterns that represent the following:</p> <ul style="list-style-type: none"> <li>• Various heights</li> <li>• Various angles</li> <li>• Various speeds</li> </ul> <p>-Interpret the significance of various basic types of blood spatter/stain evidence.<br/>         -Determine such properties as height, angle, and origin by examining blood spatter evidence.<br/>         -Calculate the angle of impact for a variety of given samples.<br/>         -Determine relative velocity of blood spatter pattern.<br/>         -Reconstruct the events leading to the creation of the blood spatter pattern.</p> | <p>Blood Spatter Analysis</p> |
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## Forensic Science Benchmarks

| Students will understand:  | Essential Questions   | Students will know the/that   | Students will be able to  | Notes              |
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| 2.6 Drugs, even those legally obtained can be involved with crimes and crime scenes and forensic scientists are able to identify these.<br><br>2.7 Toxicologists detect and identify drugs and poisons in body fluids, tissues and organs. | -How do forensic scientists know that substances are actually drugs?<br><br>-How can a forensic scientist know what killed Heath Ledger, Anna Nichole Smith and others with similar situations? | -Commonly abused drugs.<br>-Difference between a presumptive and confirmatory test.<br>-Laboratory tests that are normally used to perform routine drug identification analysis.<br><br>-Understand quantitative data associated with toxicology. | -Chemically identify illicit drug types.<br><br>-Analyze IR, UV-VIS spectroscopy, and GC-MS, and explain how they are used in forensic science<br>-Interpret data with graphs.  | Drugs & Toxicology |
| 2.8 Hair samples are common pieces of trace evidence and can be of assistance.   | -How can a forensic scientist use hair and fiber to help them solve a crime?  | -Unique (microscopic) characteristics that distinguish human hair from animal hair.<br>-Difference between natural and manufactured fibers.   | -Perform microscopic analysis of hair, determining its origin, and all other identifiable characteristics.<br><br>-Perform burn tests and chemical tests on a variety of fibers in order to classify and identify them. | Hair and Fibers    |

Enduring Understanding # 3: Both contemporary and historical scientific understandings inform technological, ethical, cultural and life decisions.

## Forensic Science Benchmarks

| Students will understand:  | Essential Questions  | Students will know the/that  | Students will be able to   | Notes |
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| 3.1 Historically, forensic science is a relatively new science.  | -When did forensic science begin and how did it develop into an important component of criminal investigation? | -Techniques used in the past are still useful today.                                   | -Summarize the historical impact of scientific and technological advances in the area of forensic science.                             |       |
| 3.2 Science, with new discoveries and developments in technology, impacts everyday life, including solving crimes. | -How have forensic science advancements affected the rights of individuals?                                    | -Forensic science is used to solve crimes and what scientific limitations still exist. | -Suggest alternative ways of explaining data and criticize arguments in which data, explanations or conclusions are represented as the |       |

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|  |  |   | only ones worthy of consideration.  |  |
| 3.3 Forensic Science is a relatively new science and is constantly evolving.         | -How can individuals be wrongly convicted?                                       | -Understand how technology has revolutionized forensic science.<br><br>-Accused individuals and wrongly imprisoned individuals can be exonerated with scientific results. | -Name discoveries and critical individuals involved in forensic science.<br><br>-Analyze how forensic science has changed the quality of life in the United States. |  |
| 3.4 The ability to make GOOD observations is the foundation of all forensic science. | -Where is the skill of observation used in Montana, outside of forensic science? | -Native Americans use (d) observations in daily life.<br>-Footwear/impression analysis may be a modern form of Native American tracking.                                  |   |  |