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Subject Title : **Introduction to Forensics**

COURSE DESCRIPTION:

Introduction to Forensics **explores the various scientific applications forensic scientists use to solve problems. Students will assume the various roles of crime scene investigator, scientist, and medical examiner in order to collect and evaluate evidence in a problem solving environment. Students will focus on making connections between science and technology and their impact on our daily lives. The study of forensics utilizes scientific reasoning to explore the analysis of fingerprints, bodily fluids, DNA, firearms and ballistics, arson and explosives, natural and synthetic fibers, documents, glass fragments, and case studies.**

INTERDISCIPLINARY RELATIONSHIPS:

Forensics is a diverse field and rarely are forensic scientists "generalists" – people who specialize or are experts in ALL aspects of forensic science and forensic investigations. Forensic experts usually specialize in one or two branches of forensic investigations. The purpose of this course is to introduce students to the general branches of forensic investigations. Because forensic science is an applied scientific discipline, the student's success will require them to apply knowledge from many branches of science, including physics, chemistry, and biology, social science, including civics and the law, math, reading, writing, and communication.

The ultimate goal is for students to become confident that they can evaluate a solution to a complex, real-world situation/problem utilizing scientific knowledge, numerical data, evidence, prioritized criteria, and logical reasoning.

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Grade: **10-12** **Time Frame:**	**Subject:** **Introduction to Forensics and The Law**
CSDE/NGSS/CCSS Standard	**D INQ.1 –** ***Identify questions that can be answered through scientific investigation.*** **D INQ.10 –** ***Communicate about science in different formats, using relevant science vocabulary, supporting evidence and clear logic.*** **HS-ETS1 –** ***Engineering Design (NGSS)*** **RST.11-12.9 –** ***Synthesize information from a range of sources into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. (CCSS – ELA/Literacy)***
SHS Learning Expectations	**1. Students will think critically.** **2. Students will communicate effectively and creatively.** **3. Students will access, evaluate, and use information for a variety of tasks and purposes.**
Enduring Understanding	**Introduce students to the need and application of forensics as indicated by the history of crime and the solution of those crimes.**
Essential Questions	**How is scientific knowledge created and communicated?** **How did forensics become useful to humans?** **What is the history of forensic science?**
Priority Standards:	***See Standards above***
Performance Expectations (Student outcomes)	• **SWBAT DESCRIBE how the scientific method is used to solve forensic problems.** • **SWBAT DESCRIBE different jobs done by forensic scientists and the experts they consult.**

Strategies/Modes (examples)	**Materials/Resources (examples)**	**Assessments (examples)**
• **Cooperative group investigations/research** • **Virtual/Actual laboratory explorations** • **Powerpoint lecture/discussion (to be utilized as a review of the concepts cooperatively explored by the students)** • **Research/writing assignments.** • **Organization of a class/lab**	• **TEXTBOOK:** ***Forensic Science for High School,*** by Barbara Ball-Seslich and John Funkhouser. Kendall-Hunt Publisher, ©2009; **ISBN: 978-0-7575-4414-9** • **Projector for powerpoint/video clips/virtual investigations**	• **Cooperative case study analysis** • **Forensic Science Timeline Activity** • **Summative quiz/test** • **Abstract analysis of real-world case studies** • **Performance assessments** • **Benchmark Assessment**

notebook to be utilized throughout the semester course. • **Case Study Analysis** • **Checkpoint questions** • **Performance Assessments** • **Formative/Summative Assessments throughout unit**		

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Grade: **10-12** **Time Frame:**	**Subject:** **Types of Evidence**
CSDE/NGSS/CCSS Standard	**D INQ.1 –** ***Identify questions that can be answered through scientific investigation.*** **D INQ.10 –** ***Communicate about science in different formats, using relevant science vocabulary, supporting evidence and clear logic.*** **HS-ETS1-3. –** ***Engineering Design: Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, and reliability…as well as possible social, cultural, and environmental impacts. (NGSS)*** **RST.11-12.7 –** ***Integrate and evaluate multiple sources of information presented in diverse formats in order to address a question or solve a problem. (CCSS – ELA/Literacy)*** **RST.11-12.9 –** ***Synthesize information from a range of sources into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. (CCSS – ELA/Literacy)***
SHS Learning Expectations	**1. Students will think critically.** **2. Students will communicate effectively and creatively.** **3. Students will access, evaluate, and use information for a variety of tasks and purposes.**
Enduring Understanding	**The main goal of the forensic scientist is to find a unique source for the evidence.**
Essential Questions	**What is the value of indirect and direct evidence in a court of law?** **What are the limitations of eyewitness accounts?** **What can physical evidence prove in a court of law?**
Priority Standards::	***See Standards above***
Performance Expectations (Student outcomes)	• **SWBAT EXPLAIN the difference between indirect and direct evidence.** • **SWBAT DESCRIBE what is meant by physical evidence and give examples.** • **SWBAT DISTINGUISH individual evidence from class evidence.** • **SWBAT DETERMINE the significance of class evidence.**

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Strategies/Modes (examples)	Materials/Resources (examples)	Assessments (examples)
• **Cooperative group investigations/research** • **Virtual/Actual laboratory explorations** • **Powerpoint lecture/discussion (to be utilized as a review of the concepts cooperatively explored by the students)** • **Research/writing assignments.** • **Organization of a class/lab notebook to be utilized throughout the semester course.** • **Case Study Analysis** • **Checkpoint questions** • **Performance Assessments** • **Formative/Summative Assessments throughout unit**	• **TEXTBOOK: *Forensic Science for High School,*** by Barbara Ball-Seslich and John Funkhouser. Kendall-Hunt Publisher, ©2009; **ISBN: 978-0-7575-4414-9** • **Projector for powerpoint/video clips/virtual investigations** • **Access to www.iqbiometrix.com** • **Examples of individual and class evidence for lab activity.**	• **Cooperative case study analysis** • **Investigation analysis/reports (both individual and cooperative)** • **Summative quiz/test** • **Abstract analysis of real-world case studies** • **Performance assessments** • **Benchmark Assessment**

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Grade: **10-12** **Time Frame:**	**Subject:** **The Crime Scene**
CSDE/NGSS/CCSS Standard	**D INQ.1 –** ***Identify questions that can be answered through scientific investigation.*** **D INQ. 4 –** ***Design and conduct appropriate types of scientific investigations to answer different questions.*** **D INQ. 6. –** ***Use appropriate tools and techniques to make observations and gather data.*** **D INQ. 7. –** ***Assess the reliability of the data that was generated in the investigation.*** **D INQ.** ***9. –*** ***Articulate conclusions and explanations based on research data, and assess results based on the design of the investigation.*** **D INQ.10 –** ***Communicate about science in different formats, using relevant science vocabulary, supporting evidence and clear logic.*** **HS-ETS1-3. –** ***Engineering Design: Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, and reliability…as well as possible social, cultural, and environmental impacts. (NGSS)*** **RST.11-12.7 –** ***Integrate and evaluate multiple sources of information presented in diverse formats in order to address a question or solve a problem. (CCSS – ELA/Literacy)*** **RST.11-12.9 –** ***Synthesize information from a range of sources into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. (CCSS - ELA/Literacy)***
SHS Learning Expectations	**1. Students will think critically.** **2. Students will communicate effectively and creatively.** **3. Students will access, evaluate, and use information for a variety of tasks and purposes.**
Enduring Understanding	**Information/evidence from a crime scene must be collected in a careful, systemic, scientific, and legal way.**
Essential Questions	**What are the steps to take when processing a crime scene?** **What type of packaging should be used for various types of evidence?** **Why should the chain of custody (of evidence) be preserved?**
Priority Standards::	***See Standards above***

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Performance Expectations (Student outcomes)	• **SWBAT ISOLATE, RECORD, and SEARCH for evidence at a mock crime scene.** • **SWBAT COLLECT and PACKAGE evidence at a mock crime scene using proper forensic procedure.**

Strategies/Modes (examples)	**Materials/Resources (examples)**	**Assessments (examples)**
• **Cooperative group investigations/research** • **Virtual/Actual laboratory explorations** • **Powerpoint lecture/discussion (to be utilized as a review of the concepts cooperatively explored by the students)** • **Research/writing assignments.** • **Organization of a class/lab notebook to be utilized throughout the semester course.** • **Case Study Analysis** • **Checkpoint questions** • **Performance Assessments** • **Formative/Summative Assessments throughout unit**	• **TEXTBOOK: *Forensic Science for High School,*** by Barbara Ball-Seslich and John Funkhouser. Kendall-Hunt Publisher, ©2009; **ISBN: 978-0-7575-4414-9** • **Projector for powerpoint/video clips/virtual investigations** • **Crime Scene Sketch KIT** • **Crime Scene evaluation equipment (Forensic Supply Kit – Flinn Scientific AP7197)**	• **Cooperative case study analysis** • **Investigation analysis reports/individual and cooperative** • **Summative quiz/test** • **Abstract analysis of real-world case studies** • **Performance assessments** • **Benchmark Assessment**

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Grade: **10-12** **Time Frame:**	**Subject:** **FINGERPRINTS**
CSDE/NGSS/CCSS Standard	**D INQ.1 –** ***Identify questions that can be answered through scientific investigation.*** **D INQ. 4 –** ***Design and conduct appropriate types of scientific investigations to answer different questions.*** **D INQ. 6. –** ***Use appropriate tools and techniques to make observations and gather data.*** **D INQ. 7. –** ***Assess the reliability of the data that was generated in the investigation.*** **D INQ.** ***9. –*** ***Articulate conclusions and explanations based on research data, and assess results based on the design of the investigation.*** **D INQ.10 –** ***Communicate about science in different formats, using relevant science vocabulary, supporting evidence and clear logic.*** **HS-ETS1-3. –** ***Engineering Design: Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, and reliability…as well as possible social, cultural, and environmental impacts. (NGSS)*** **RST.11-12.7 –** ***Integrate and evaluate multiple sources of information presented in diverse formats in order to address a question or solve a problem. (CCSS – ELA/Literacy)*** **RST.11-12.9 –** ***Synthesize information from a range of sources into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. (CCSS - ELA/Literacy)***
SHS Learning Expectations	**1. Students will think critically.** **2. Students will communicate effectively and creatively.** **3. Students will access, evaluate, and use information for a variety of tasks and purposes.**
Enduring Understanding	**Information/evidence from a crime scene must be collected in a careful, systemic, scientific, and legal way.**
Essential Questions	**Why are fingerprints individual evidence?** **How are fingerprints used to solve crimes?**
Priority Standards:	***See Standards above***
Performance Expectations (Student outcomes)	• **SWBAT DEFINE the three basic properties that allow individual identification by fingerprints.** • **SWBAT OBTAIN an inked, readable fingerprint for each finger.** • **SWBAT RECOGNIZE and CLASSIFY the three general ridge patterns.**

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	• **SWBAT IDENTIFY and COMPARE two fingerprints with at least 10 points of identification.** • **SWBAT IDENTIFY questions and concepts that guide scientific investigations.**

Strategies/Modes (examples)	**Materials/Resources (examples)**	**Assessments (examples)**
• **Cooperative group investigations/research** • **Virtual/Actual laboratory explorations** • **Powerpoint lecture/discussion (to be utilized as a review of the concepts cooperatively explored by the students)** • **Research/writing assignments.** • **Organization of a class/lab notebook to be utilized throughout the semester course.** • **Case Study Analysis** • **Checkpoint questions** • **Performance Assessments** • **Formative/Summative Assessments throughout unit**	• **TEXTBOOK: *Forensic Science for High School,*** by Barbara Ball-Seslich and John Funkhouser. Kendall-Hunt Publisher, ©2009; **ISBN: 978-0-7575-4414-9** • **Projector for powerpoint/video clips/virtual investigations** • **Fingerprint Lab Kits/Materials (ink pads, fingerprint cards, black light, fluorescent fingerprint powder, hinge lifts)** • **Developing Latent Fingerprint Lab Kits** • **Computer Access**	• **Cooperative case study analysis** • **Investigation analysis reports/individual and cooperative** • **Summative quiz/test** • **Fingerprint portfolio project** • **Abstract analysis of real-world case studies** • **Performance assessments** • **Benchmark Assessment**

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Grade: 10-12 Time Frame:	Subject: HAIR
CSDE/NGSS/CCSS Standard	D INQ.1 – *Identify questions that can be answered through scientific investigation.* D INQ 3 - *Formulate a testable hypothesis and demonstrate logical connections between scientific concepts guiding the hypothesis and the design of the experiment.* D INQ. 4 – *Design and conduct appropriate types of scientific investigations to answer different questions.* D INQ. 6. – *Use appropriate tools and techniques to make observations and gather data.* D INQ. 7. – *Assess the reliability of the data that was generated in the investigation.* D INQ. *9.* – *Articulate conclusions and explanations based on research data, and assess results based on the design of the investigation.* D INQ.10 – *Communicate about science in different formats, using relevant science vocabulary, supporting evidence and clear logic.* HS-ETS1-3. – *Engineering Design: Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, and reliability…as well as possible social, cultural, and environmental impacts. (NGSS)* RST.11-12.7 – *Integrate and evaluate multiple sources of information presented in diverse formats in order to address a question or solve a problem. (CCSS – ELA/Literacy)* RST.11-12.9 – *Synthesize information from a range of sources into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. (CCSS - ELA/Literacy)*
SHS Learning Expectations	1. Students will think critically. 2. Students will communicate effectively and creatively. 3. Students will access, evaluate, and use information for a variety of tasks and purposes.
Enduring Understanding	Information/evidence from a crime scene must be collected in a careful, systemic, scientific, and legal way.
Essential Questions	How/why can hair be used as evidence to make interpretations and inferences in a crime?
Priority Standards::	*See Standards above*
Performance Expectations (Student outcomes)	• SWBAT use a compound microscope to analyze various hair samples. • SWBAT DESCRIBE the structure of hair. • SWBAT DIFFERENTIATE between human and animal hair. • SWBAT IDENTIFY characteristics of hair that are important for forensic analysis.

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Strategies/Modes (examples)	Materials/Resources (examples)	Assessments (examples)
• **Cooperative group investigations/research** • **Virtual/Actual laboratory explorations** • **Powerpoint lecture/discussion (to be utilized as a review of the concepts cooperatively explored by the students)** • **Research/writing assignments.** • **Organization of a class/lab notebook to be utilized throughout the semester course.** • **Case Study Analysis** • **Checkpoint questions** • **Performance Assessments** • **Formative/Summative Assessments throughout unit**	• **TEXTBOOK: *Forensic Science for High School,*** by Barbara Ball-Seslich and John Funkhouser. Kendall-Hunt Publisher, ©2009; **ISBN: 978-0-7575-4414-9** • **Projector for powerpoint/video clips/virtual investigations** • **Human and animal hair samples** • **Lyle and Louise Hair and Fiber Analysis kit** • **Computer Access for background information**	• **Cooperative case study analysis** • **Student designed lab investigations** • **Investigation analysis reports/individual and cooperative** • **Summative quiz/test** • **Abstract analysis of real-world case studies** • **Performance assessments** • **Benchmark Assessment**

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Grade: **10-12** **Time Frame:**	**Subject:** **FIBERS**
CSDE/NGSS/CCSS Standard	**D INQ.1 –** ***Identify questions that can be answered through scientific investigation.*** **D INQ 3 -** ***Formulate a testable hypothesis and demonstrate logical connections between scientific concepts guiding the hypothesis and the design of the experiment.*** **D INQ. 4 –** ***Design and conduct appropriate types of scientific investigations to answer different questions.*** **D INQ. 6. –** ***Use appropriate tools and techniques to make observations and gather data.*** **D INQ. 7. –** ***Assess the reliability of the data that was generated in the investigation.*** **D INQ.** ***9. – Articulate conclusions and explanations based on research data, and assess results based on the design of the investigation.*** **D INQ.10 –** ***Communicate about science in different formats, using relevant science vocabulary, supporting evidence and clear logic.*** **HS-ETS1-3. –** ***Engineering Design: Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, and reliability…as well as possible social, cultural, and environmental impacts. (NGSS)*** **RST.11-12.7 –** ***Integrate and evaluate multiple sources of information presented in diverse formats in order to address a question or solve a problem. (CCSS – ELA/Literacy)*** **RST.11-12.9 –** ***Synthesize information from a range of sources into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. (CCSS - ELA/Literacy)*** **HSS-IC.B.4-** ***Use data from a sample survey to estimate a population mean or proportion; develop a margin of error through the use of simulation models for random sampling. (CCSS – Math)***
SHS Learning Expectations	**1. Students will think critically.** **2. Students will communicate effectively and creatively.** **3. Students will access, evaluate, and use information for a variety of tasks and purposes.**
Enduring Understanding	**Information/evidence from a crime scene must be collected in a careful, systemic, scientific, and legal way.**
Essential Questions	**How can fibers be used as circumstantial evidence to link the victim, suspect, and crime scene.** **Why are statistics important in determining the value of evidence?**
Priority Standards:	***See Standards above***
Performance Expectations (Student outcomes)	• **SWBAT SAMPLE populations using statistical analysis.** • **SWBAT DISTINGUISH and IDENTIFY different types of fibers.** • **SWBAT USE technology and mathematics to improve investigations and communications.**

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Strategies/Modes (examples)	Materials/Resources (examples)	Assessments (examples)
• **Cooperative group investigations/research** • **Virtual/Actual laboratory explorations** • **Powerpoint lecture/discussion (to be utilized as a review of the concepts cooperatively explored by the students)** • **Research/writing assignments.** • **Organization of a class/lab notebook to be utilized throughout the semester course.** • **Case Study Analysis** • **Checkpoint questions** • **Performance Assessments** • **Formative/Summative Assessments throughout unit**	• **TEXTBOOK: *Forensic Science for High School,*** by Barbara Ball-Seslich and John Funkhouser. Kendall-Hunt Publisher, ©2009; **ISBN: 978-0-7575-4414-9** • **Projector for powerpoint/video clips/virtual investigations** • **Lyle and Louise Hair and Fiber Analysis lab Kit** • **Samples of various fibers**	• **Cooperative case study analysis** • **Investigation analysis reports/individual and cooperative** • **Summative quiz/test** • **Abstract analysis of real-world case studies** • **Performance assessments** • **Benchmark Assessment**

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Grade: **10-12** **Time Frame:**	**Subject:** **DRUGS/TOXICOLOGY**
CSDE/NGSS/CCSS Standard	**D INQ.1 –** ***Identify questions that can be answered through scientific investigation.*** **D INQ 3 -** ***Formulate a testable hypothesis and demonstrate logical connections between scientific concepts guiding the hypothesis and the design of the experiment.*** **D INQ. 4 –** ***Design and conduct appropriate types of scientific investigations to answer different questions.*** **D INQ. 6. –** ***Use appropriate tools and techniques to make observations and gather data.*** **D INQ. 7. –** ***Assess the reliability of the data that was generated in the investigation.*** **D INQ.** ***9. –*** ***Articulate conclusions and explanations based on research data, and assess results based on the design of the investigation.*** **D INQ.10 –** ***Communicate about science in different formats, using relevant science vocabulary, supporting evidence and clear logic.*** **HS-ETS1-3. –** ***Engineering Design: Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, and reliability…as well as possible social, cultural, and environmental impacts. (NGSS)*** **RST.11-12.7 –** ***Integrate and evaluate multiple sources of information presented in diverse formats in order to address a question or solve a problem. (CCSS – ELA/Literacy)*** **RST.11-12.9 –** ***Synthesize information from a range of sources into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. (CCSS - ELA/Literacy)*** **HSS-IC.B.4-** ***Use data from a sample survey to estimate a population mean or proportion; develop a margin of error through the use of simulation models for random sampling. (CCSS – Math)***
SHS Learning Expectations	**1. Students will think critically.** **2. Students will communicate effectively and creatively.** **3. Students will access, evaluate, and use information for a variety of tasks and purposes.**
Enduring Understanding	**Information/evidence from a crime scene must be collected in a careful, systemic, scientific, and legal way.**
Essential Questions	**What is the difference between qualitative and quantitative analysis?** **What are the dangers of using prescription drugs, controlled substances, over-the-counter medication and alcohol?** **How is known data used to determine and compare qualities of unknown data?** **How can drug evidence be used to make interpretations and inferences?**
Priority Standards:	***See Standards above***

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Performance Expectations (Student outcomes)	• **SWBAT chemically identify illicit drug types.** • **SWBAT CLASSIFY the types of illicit drugs and their negative effects.** • **SWBAT DISCUSS the federal penalties for possession and use of controlled substances.** • **SWBAT EXPLAIN the need for confirmatory tests.** • **SWBAT DISCUSS the connection of blood alcohol levels to the law, incapacity, and test results.** • **SWBAT perform a series of tests to determine the physical and chemical characteristics of several unknown powders and then use that information to identify an unknown substance.**

Strategies/Modes (examples)	**Materials/Resources (examples)**	**Assessments (examples)**
• **Cooperative group investigations/research** • **Virtual/Actual laboratory explorations** • **Powerpoint lecture/discussion (to be utilized as a review of the concepts cooperatively explored by the students)** • **Research/writing assignments.** • **Organization of a class/lab notebook to be utilized throughout the semester course.** • **Case Study Analysis** • **Checkpoint questions** • **Performance Assessments** • **Formative/Summative Assessments throughout unit**	• **TEXTBOOK: *Forensic Science for High School,*** by Barbara Ball-Seslich and John Funkhouser. Kendall-Hunt Publisher, ©2009; **ISBN: 978-0-7575-4414-9** • **Projector for powerpoint/video clips/virtual investigations** • **Drug Test and Analysis Lab** • **WHITE POWDERS: A Lab on Standardized Tests Used to Identify Unknown Substances**	• **Cooperative case study analysis** • **Investigation analysis reports/individual and cooperative** • **Determine the BAC of various individuals based upon consumption versus time and body type** • **Summative quiz/test** • **Abstract analysis of real-world case studies** • **Performance assessments** • **Benchmark Assessment**

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Grade: **10-12** **Time Frame:**	**Subject:** **Serology (Blood typing and pattern analysis)**
CSDE/NGSS/CCSS Standard	**D INQ.1 –** ***Identify questions that can be answered through scientific investigation.*** **D INQ 3 -** ***Formulate a testable hypothesis and demonstrate logical connections between scientific concepts guiding the hypothesis and the design of the experiment.*** **D INQ. 4 –** ***Design and conduct appropriate types of scientific investigations to answer different questions.*** **D INQ. 6. –** ***Use appropriate tools and techniques to make observations and gather data.*** **D INQ. 7. –** ***Assess the reliability of the data that was generated in the investigation.*** **D INQ.** ***9. –*** ***Articulate conclusions and explanations based on research data, and assess results based on the design of the investigation.*** **D INQ.10 –** ***Communicate about science in different formats, using relevant science vocabulary, supporting evidence and clear logic.*** **HS-ETS1-3. –** ***Engineering Design: Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, and reliability…as well as possible social, cultural, and environmental impacts. (NGSS)*** **RST.11-12.7 –** ***Integrate and evaluate multiple sources of information presented in diverse formats in order to address a question or solve a problem. (CCSS – ELA/Literacy)*** **RST.11-12.9 –** ***Synthesize information from a range of sources into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. (CCSS - ELA/Literacy)***
SHS Learning Expectations	**1. Students will think critically.** **2. Students will communicate effectively and creatively.** **3. Students will access, evaluate, and use information for a variety of tasks and purposes.**
Enduring Understanding	**Information/evidence from a crime scene must be collected in a careful, systemic, scientific, and legal way.**
Essential Questions	**1. How can blood evidence be used to make interpretations and inferences?** **2. How is known data used to determine and compare the qualities of unknown data?**

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Priority Standards:	***See Standards above***
Performance Expectations (Student outcomes)	• **SWBAT determine whether a stain is blood.** • **SWBAT determine the blood type of a simulated blood stain/sample using the ABO/Rh system.** • **SWBAT EXPLORE bloodstain patterns as a function of velocity, direction, and height of fall.** • **SWBAT use blood spatter evidence to recreate the events at a crime scene.**

Strategies/Modes (examples)	**Materials/Resources (examples)**	**Assessments (examples)**
• **Cooperative group investigations/research** • **Virtual/Actual laboratory explorations** • **Powerpoint lecture/discussion (to be utilized as a review of the concepts cooperatively explored by the students)** • **Research/writing assignments.** • **Organization of a class/lab notebook to be utilized throughout the semester course.** • **Case Study Analysis** • **Checkpoint questions** • **Performance Assessments** • **Formative/Summative Assessments throughout unit**	• **TEXTBOOK: *Forensic Science for High School,*** by Barbara Ball-Seslich and John Funkhouser. Kendall-Hunt Publisher, ©2009; **ISBN: 978-0-7575-4414-9** • **Projector for powerpoint/video clips/virtual investigations** • **A Presumptive Test for Blood Lab** • **Blood Typing Lab Kits** • **Butcher paper/rulers/string/simulated blood for blood spatter analysis** • **Simulated blood** • **Blood spatter evidence samples** • **Online blood typing labs/computer access**	• **Cooperative case study analysis** • **Student designed lab investigations** • **Investigation analysis reports/individual and cooperative** • **Summative quiz/test** • **Abstract analysis of real-world case studies** • **Performance assessments** • **Benchmark Assessment**

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Grade: **10-12** **Time Frame:**	**Subject:** **DNA Fingerprinting/Analysis**
CSDE/NGSS/CCSS Standard	**D INQ.1 –** ***Identify questions that can be answered through scientific investigation.*** **D INQ 3 -** ***Formulate a testable hypothesis and demonstrate logical connections between scientific concepts guiding the hypothesis and the design of the experiment.*** **D INQ. 4 –** ***Design and conduct appropriate types of scientific investigations to answer different questions.*** **D INQ. 6. –** ***Use appropriate tools and techniques to make observations and gather data.*** **D INQ. 7. –** ***Assess the reliability of the data that was generated in the investigation.*** **D INQ.** ***9. – Articulate conclusions and explanations based on research data, and assess results based on the design of the investigation.*** **D INQ.10 –** ***Communicate about science in different formats, using relevant science vocabulary, supporting evidence and clear logic.*** **HS-ETS1-3. –** ***Engineering Design: Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, and reliability…as well as possible social, cultural, and environmental impacts. (NGSS)*** **RST.11-12.7 –** ***Integrate and evaluate multiple sources of information presented in diverse formats in order to address a question or solve a problem. (CCSS – ELA/Literacy)*** **RST.11-12.9 –** ***Synthesize information from a range of sources into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. (CCSS - ELA/Literacy)***
SHS Learning Expectations	**4. Students will think critically.** **5. Students will communicate effectively and creatively.** **6. Students will access, evaluate, and use information for a variety of tasks and purposes.**
Enduring Understanding	**Information/evidence from a crime scene must be collected in a careful, systemic, scientific, and legal way in order to be used to make interpretations and inferences.**
Essential Questions	**What is DNA and how is it used in forensic investigations?** **How is DNA collected, preserved, analyzed and used to identify an individual?**
Priority Standards:	***See Standards above***
Performance Expectations (Student outcomes)	• **SWBAT identify the important structures of DNA** • **SWBAT identify the basic function of DNA in the human body** • **SWBAT isolate and extract DNA from cells.** • **SWBAT evaluate how gel electrophoresis separates DNA fragments and interpret results from gel electrophoresis** • **SWBAT identify the main uses and importance of using mitochondrial DNA.**

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Strategies/Modes (examples)	Materials/Resources (examples)	Assessments (examples)
• **Cooperative group investigations/research** • **Virtual/Actual laboratory explorations** • **Powerpoint lecture/discussion (to be utilized as a review of the concepts cooperatively explored by the students)** • **Research/writing assignments.** • **Organization of a class/lab notebook to be utilized throughout the semester course.** • **Case Study Analysis** • **Checkpoint questions** • **Performance Assessments** • **Formative/Summative Assessments throughout unit**	• **TEXTBOOK: *Forensic Science for High School,*** by Barbara Ball-Seslich and John Funkhouser. Kendall-Hunt Publisher, ©2009; **ISBN: 978-0-7575-4414-9** • **Projector for powerpoint/video clips/virtual investigations** • **DNA Extraction Lab Kits (or materials commonly used to extract DNA - meat tenderizer, cheesecloth, alcohol)** • **Strawberries, onions, peas, bananas - something to extract the DNA from** • **Computer Access for virtual gel electrophoresis labs** • **CUT and PASTE DNA fingerprinting labs (i.e Case of the Crown Jewels or Who Stole the Cheese?)**	• **Cooperative case study analysis** • **Student designed lab investigations** • **Investigation analysis reports/individual and cooperative** • **Summative quiz/test** • **Abstract analysis of real-world case studies** • **Performance assessments** • **Benchmark Assessment**

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Grade: **10-12** **Time Frame:**	**Subject:** **Additional Trace Evidence (Soil, Glass, Bones, Ballistics, Handwriting Analysis) Analysis (if time allows)**
CSDE/NGSS/CCSS Standard	**D INQ.1 –** ***Identify questions that can be answered through scientific investigation.*** **D INQ 3 -** ***Formulate a testable hypothesis and demonstrate logical connections between scientific concepts guiding the hypothesis and the design of the experiment.*** **D INQ. 4 –** ***Design and conduct appropriate types of scientific investigations to answer different questions.*** **D INQ. 6. –** ***Use appropriate tools and techniques to make observations and gather data.*** **D INQ. 7. –** ***Assess the reliability of the data that was generated in the investigation.*** **D INQ.** ***9. – Articulate conclusions and explanations based on research data, and assess results based on the design of the investigation.*** **D INQ.10 –** ***Communicate about science in different formats, using relevant science vocabulary, supporting evidence and clear logic.*** **HS-ETS1-3. –** ***Engineering Design: Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, and reliability…as well as possible social, cultural, and environmental impacts. (NGSS)*** **RST.11-12.7 –** ***Integrate and evaluate multiple sources of information presented in diverse formats in order to address a question or solve a problem. (CCSS – ELA/Literacy)*** **RST.11-12.9 –** ***Synthesize information from a range of sources into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. (CCSS - ELA/Literacy)***
SHS Learning Expectations	**7. Students will think critically.** **8. Students will communicate effectively and creatively.** **9. Students will access, evaluate, and use information for a variety of tasks and purposes.**
Enduring Understanding	**Information/evidence from a crime scene must be collected in a careful, systemic, scientific, and legal way.**
Essential Questions	**How can evidence be used to make interpretations and inferences?** **How is known data used to determine and compare the qualities of unknown data?**
Priority Standards:	***See Standards above***
Performance Expectations (Student outcomes)	• **SWBAT outline the tests completed by scientists for soil evidence in the laboratory.** • **SWBAT elaborate on how forensic scientists use glass evidence to help solve crimes** • **SWBAT analyze glass evidence to characterize and identify the sources of the glass** • **SWBAT explain the use of forensic entomology in determining times of death/solving crimes.** • **SWBAT identify common insects associated with decomposition of a body over time.** • **SWBAT outline the questions forensic anthropologists can usually answer at the end of their**

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	investigation and testing of remains. • **SWBAT analyze human bones to help determine the height, age, race and sex of the human.** • **SWBAT identify and explain the differences between the different types of firearms used in our society.** • **SWBAT differentiate among different types of ammunition used in crimes.** • **SWBAT interpret if a shoeprint or footwear mark and tire marks came from a known shoe using impression evidence techniques.** • **SWBAT analyze handwriting samples to determine if they match and/or were forged.**

Strategies/Modes (examples)	**Materials/Resources (examples)**	**Assessments (examples)**
• **Cooperative group investigations/research** • **Virtual/Actual laboratory explorations** • **Powerpoint lecture/discussion (to be utilized as a review of the concepts cooperatively explored by the students)** • **Research/writing assignments.** • **Organization of a class/lab notebook to be utilized throughout the semester course.** • **Case Study Analysis** • **Checkpoint questions** • **Performance Assessments** • **Formative/Summative Assessments throughout unit**	• **TEXTBOOK: *Forensic Science for High School,*** by Barbara Ball-Seslich and John Funkhouser. Kendall-Hunt Publisher, ©2009; **ISBN: 978-0-7575-4414-9** • **Projector for powerpoint/video clips/virtual investigations** • **Soil testing lab kits** • **Lyle and Louise Glass analysis lab** • **Lyle and Louise gun powder residue lab** • **Forensic anthropology Bones analysis lab kit (Flinn)**	• **Cooperative case study analysis** • **Student designed lab investigations** • **Investigation analysis reports/individual and cooperative** • **Summative quiz/test** • **Abstract analysis of real-world case studies** • **Performance assessments** • **Benchmark Assessment**