Washington Township School District

The mission of the Washington Township Public Schools *is to provide a safe, positive, and progressive educational environment that provides opportunity for all students to attain the knowledge and skills specified in the NJ Learning Standards at all grade levels, so as to ensure their full participation in an ever-changing world as responsible, self-directed and civic-minded citizen.*

Course Title:	**College Preparatory Forensics**
Grade Level(s):	**10-12th Grade**

Duration:	*Full Year:*	**x**	*Semester:*		*Marking Period:*	

Course Description:

This course is intended for students with an interest in Forensic Science and wish to further their biological, chemical, and physical science application skills related to the field of study. This course exposes students to techniques, and common methods, including laboratory skill development, used in forensic investigations. Major topics of study include: crime scene management and evidence collection, legal issues in forensics, fingerprinting, DNA profiling, blood and blood spatter analysis, glass and paint analysis, anthropology, microscopy, forensic chemistry, document analysis, ballistics, trace evidence, impression evidence, and pathology. This course involves lecture along with inquiry-based labs and activities. Safe laboratory behavior must be practiced at all times; laboratory skills will be developed throughout the course and progression is an expectation.

Grading Procedures:

Marking Period Grades		Year End Course Grade	
Tests	45%	Marking Period 1	20%
Quizzes	15%	Marking Period 2	20%
Lab Work	20%	Marking Period 3	20%
HW/CW	10%	Marking Period 4	20%
Projects	10%	Midterm/Final Exam	10% **EACH**

Primary Resources:

New Jersey Model Curriculum for HS Chemistry

Next Generation Science Standards (NGSS)

New Jersey Student Learning Standards for Science (NJSLS)

Text: Bertino, A.J., & Bertino, P.N. (2016) *Forensic Science Fundamentals and Investigations*. Boston, MA: Cengage.

Washington Township Principles for Effective Teaching and Learning

- Implementing a standards-based curriculum
- Facilitating a learner-centered environment
- Using academic target language and providing comprehensible instruction
- Adapting and using age-appropriate authentic materials
- Providing performance-based assessment experiences
- Infusing 21st century skills for College and Career Readiness in a global society

Designed by:	John Basile

Under the Direction of:	Dr. Patricia Hughes

Written: _____

Revised: _____

BOE Approval: _____

Unit 1: Forensic Science Introduction and Crime Scene Management

Unit Description: This unit begins with a brief history of Forensic Science. Legal considerations applicable to Forensics is included. Crime scene management will also be discussed: crime scene documentation and searching, types of evidence, and collection of evidence. Explanation of careers in Forensic Science concludes the unit.

Unit Duration: 4 weeks

Desired Results

Standard(s):

HS-ETS1-2: Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering. (Evidence Collection and Crime Scene Management)

Indicators:

ETS1.C: Optimizing the Design Solution

Understandings:

Students will understand that…

1. Eyewitness accounts are not always reliable.
2. Locard's Principle of Exchange is the primary principle governing forensic science.
3. The many types of evidence are collected, organized, and processed differently.
4. Forensic science is the use of science to help support criminal and civil court cases.
5. There is a difference between direct and indirect evidence.
6. There is a systematic way to manage a crime scene.

Essential Questions:

1. How does one perceive their surroundings?
2. What is an eyewitness account?
3. What are the legal standards and cases that have shaped forensics over the years?
4. Is an eyewitness testimony reliable?
5. Do forensic scientists try to prove suspects innocent or guilty?
6. How do forensic scientists collect, examine, document, and organize evidence?
7. What is direct and indirect evidence?
8. What are the steps and procedures for managing a crime scene?
9. What is Locard's Principle of Exchange?

Assessment Evidence

Performance Tasks:

Students will be able to…

1. Define observations, and describe what changes occur in the brain while observing
2. Describe examples of factors influencing eyewitness accounts of events
3. Compare the reliability of eyewitness testimony to what actually happened
4. Relate observation skills to their use in forensic science
5. Practice and improve individual observation skills
6. Summarize Locard's Principle of Exchange
7. Identify four examples of trace evidence
8. Distinguish between direct and circumstantial evidence
9. Identify the types of professionals who might be present at a crime scene
10. Summarize the seven steps of a crime scene investigation
11. Explain the importance of securing a crime scene
12. Identify methods by which a crime scene is documented

Other Evidence:

1.Project (Minimum one per marking period) Suggestions: Diorama (Tiny Crime Scene) and Written Response OR Novel Reading Project

2. Quizzes

-Chapters 1 and 2

-Crime Scene Management and Sketching

3. Independent work

-Case Studies

-Online Video Analysis with Questions

-Chapter Review Questions

4.Lab

-Eyewitness and Observation Skills

-Face Sketching

-Types of Evidence: Individual versus Class

-Bill of Rights Activity Investigation of Legal Rights

13. Demonstrate proper technique in collecting and packaging evidence 14. Explain what it means to map a crime scene 15. Describe how evidence from a crime scene is analyzed	

Benchmarks:

Chapter 1 and 2 Test

Project: Diorama (Tiny Crime Scene) and Written Response OR Novel Reading

Learning Plan

Learning Activities:

1. Review Lab Safety/ Quiz on Lab Safety
2. Students read Chapters 1 and 2 / Instructors distribute notes on Chapter 1 and 2
3. Hand out chapter vocabulary sheets and have students define them
4. Go over introduction to Forensic Science and legal issues associated with it
5. Lab: Bill of Rights
6. Go over objectives 1.1-1.6
7. Lab: Eyewitness and Observation Skills
8. Lab: Face Sketching
9. Chapter 1 Review Questions p. 13
10. Complete “Case Studies” and “Careers in Forensics” pp.10-12
11. Chapter 1 Quiz
12. Go over objectives 2.1-2.4
13. Activity 2-1: Locard’s Exchange Principle
14. Lab: Types of Evidence: Individual versus Class
15. Quiz on 2.1-2.4
16. Go over objectives 2.5-2.10
17. Lab: Crime Scene Investigation
18. Quiz on 2.5-2.10
19. Chapter 2 Review Questions p.36
20. Complete “Case Studies” and “Careers in Forensics” pp.34-35
21. There will be extra online and in class independent work throughout the unit
22. Unit 1 Review
23. Unit 1 Test

Resources:

Text: Bertino, A.J., & Bertino, P.N. (2016) *Forensic Science Fundamentals and Investigations*. Boston, MA: Cengage.

Unit Learning Goal and Scale

(Level 2.0 reflects a minimal level of proficiency)

Standard(s):
HS-ETS1-2: Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering. (Evidence Collection and Crime Scene Management)

4.0	**Students will be able to:** • In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond what was taught.
3.0	**Students will be able to:**

	• Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering. (Evidence Collection and Crime Scene Management • Demonstrate appropriate evidence collection techniques • Construct a sketch of a crime scene with correct annotations • Describe procedures for crime scene management
2.0	**Students will be able to:** • Recognize or recall specific vocabulary (for example, analytical skills, deductive reasoning, eyewitness, fact, forensic, logical, observations, opinion, perception, chain of custody, circumstantial evidence, class evidence, crime-scene investigation, crime- scene reconstruction, datum point, direct evidence, first responder, individual evidence, paper bindle, primary crime scene, secondary crime scene, trace evidence, triangulation)
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Unit Modifications for Special Population Students	
Advanced Learners	Critical thinking problems and application of skills presented.
Struggling Learners	Copy notes using fill in notes, collaborative learning activities, utilize all learning styles (visual, audio, kinesthetic, etc.)
English Language Learners	Translation of notes in their native language http://www.state.nj.us/education/modelcurriculum/ela/ELLSupport.pdf
Learners with an IEP	Each special education student has in Individualized Educational Plan (IEP) that details the specific accommodations, modifications, services, and support needed to level the playing field. This will enable that student to access the curriculum to the greatest extent possible in the least restrictive environment. These include: • Variation of time: adapting the time allotted for learning, task completion, or testing • Variation of input: adapting the way instruction is delivered • Variation of output: adapting how a student can respond to instruction • Variation of size: adapting the number of items the student is expected to complete • Modifying the content, process or product Additional resources are outlined to facilitate appropriate behavior and increase student engagement. The most frequently used modifications and accommodations can be viewed here. Teachers are encouraged to use the Understanding by Design Learning Guidelines (UDL). These guidelines offer a set of concrete suggestions that can be applied to any discipline to ensure that all learners can access and participate in learning opportunities. The framework can be viewed here www.udlguidelines.cast.org

Interdisciplinary Connections

Indicators:
Embedded English Language Arts/Literacy and Mathematics Standards
English Language Arts/Literacy
RST.11-12.1, Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.
WHST.9-12.2, Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.
WHST.9-12.5, Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
WHST.9-12.7, Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
WHST.11-12.8, Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
WHST.9-12.9, Draw evidence from informational texts to support analysis, reflection, and research.
SL.11-12.5, Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

Mathematics
MP.2 Reason abstractly and quantitatively.
MP.4 Model with mathematics.
HSN-Q.A.1 Use units to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

Integration of 21st Century Skills

Indicators:
Career Ready Practices
CRP2 – Apply appropriate academic and technical skills.
CRP5 – Consider the environmental, social and economic impacts of decisions.
CRP6 – Demonstrate creativity and innovation.
CRP7 – Employ valid and reliable research strategies.
CRP8 – Utilize critical thinking to make sense of problems and persevere in solving them.
CRP10 – Plan education and career paths aligned to personal goals.
CRP11 – Use technology to enhance productivity.
CRP12 – Work productively in teams while using cultural global competence.
9.2 Career Awareness, Exploration, and Preparation
9.2.12.C.1 – Review career goals and determine steps necessary for attainment.
9.2.12.C.3 – Identify transferable career skills and design alternate career plans.

Unit 2: Forensic Biology

Unit Description: Forensic Biology covers all aspects of potential evidence unique to an individual involved in a crime scene. The unit starts by covering fingerprints and how they are processed after collection. DNA heredity and profiling are discussed next. This section includes processing all types of evidence containing DNA and how traits are inherited from one generation to the next. The unit concludes with a discussion on Blood and Blood Typing.

Unit Duration: 5 weeks

Desired Results

Standard(s):

HS-LS3-1: Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring. (Blood, Fingerprints, DNA)

Indicators:

LS3.A: Inheritance of Traits

Understandings:

Students will understand that…

1. Fingerprints are unique to an individual person.
2. No one, not even identical twins, have the same fingerprints.
3. Small minutiae on a person's fingerprints help to differentiate between similar fingerprints.
4. There are three main types of fingerprints
5. What is the Automated Fingerprint Identification System (AFIS)?
6. How to collect and process a fingerprint found at a crime scene.
7. What is deoxyribonucleic acid (DNA) and how does it relate to forensic biology?
8. Every person has their own DNA which can be made into a profile based on their short tandem repeats (STR).
9. What is Combined DNA Index System (CODIS)?
10. What makes each blood type different and how do forensic scientists use that information for identification purpose.

Essential Questions:

1. What is the history of fingerprints in forensic science?
2. What is a fingerprint?
3. What are minutiae?
4. What are the different types of fingerprints?
5. How does one collect and process a fingerprint?
6. What type of evidence is a fingerprint?
7. How does a computer system sort fingerprints?
8. What is AFIS?
9. What is the Henry system?
10. What is DNA?
11. What type of evidence is DNA?
12. Where can DNA evidence be found?
13. How does one collect DNA evidence?
14. How is a DNA profile made?
15. How does one process DNA evidence?
16. What is CODIS?
17. What are the components of blood?
18. What is the job of each component?
19. What are blood types?
20. How is blood type determined?

Assessment Evidence

Performance Tasks:

Students will be able to…

1. Outline the history of fingerprint analysis
2. Describe the characteristics of fingerprints
3. Compare and contrast the different types of fingerprints
4. Describe how criminals attempt to alter their fingerprints
5. Present and refute arguments that question fingerprint evidence reliability
6. Summarize the proper procedures for collecting fingerprint evidence
7. Describe the latest identification technologies
8. Determine if a fingerprint is consistent with a fingerprint on record
9. Lift a latent print
10. Prepare a ten card and analyze the ridge patterns of the prints
11. Explain how DNA can be important to criminal investigations
12. Explain how crime-scene evidence is collected for DNA analysis
13. Describe how crime scene evidence is processed to obtain DNA
14. Explain what a short tandem repeat (STR) is and explain its importance to forensic science
15. Explain how law-enforcement agencies compare DNA evidence to existing DNA evidence
16. Describe the use of DNA profiling using mitochondrial DNA (mtDNA) and Y chromosome

Other Evidence:

1.Project (Minimum one per marking period) Suggestions: Diorama (Tiny Crime Scene) and Written Response OR Novel Reading

2. Quizzes

-Chapters 6, 7, and 8

- Identity and DNA, DNA profiling, Fingerprint Analysis, Blood Typing

3. Independent work

-Case Studies

-Online Video Analysis with Questions

-Chapter Review Questions

4.Lab

-Lifting Latent Prints

-Study Your Fingerprints (Activity 6-1)

-Giant Balloon Fingerprint (Activity 6-2)

-Determining an Individuals Fingerprint/ Ten Card (Ridge Pattern and Minutiae)

-Reading and Developing a DNA Profile

-Virtual Labs (Lysis Solution Extraction, Polymerase Chain Reaction, Profiling)

-Presumptive Test for Blood (Activity 8-1)

derived short tandem repeats (Y STRs) to help identify a person using the DNA of a family member
17. Compare and contrast a gene and a chromosome, and an intron and exon
18. Describe the Forensic significance of the different types of blood cells
19. Summarize the history of the use of blood analysis in forensics
20. Outline the procedure used to determine blood type
21. Calculate the probability of a person having a specific blood type, using data from population studies

Benchmarks:

Chapters 6, 7, and 8 Tests

Project: Diorama (Tiny Crime Scene) and Written Response OR Novel Reading

Learning Plan

Learning Activities:

1. Students read Chapters 6, 7, and 8 / Instructors distribute notes on Chapter 6, 7, and 8
2. Hand out chapter vocabulary sheets and have students define them
3. Go over objectives 6.1-6.5
4. Lab: Study Your Fingerprints (Activity 6-1)
5. Lab: Determining an Individuals Fingerprint/ Ten Card (Ridge Pattern and Minutiae)
6. Quiz on 6.1-6.5
7. Go over Objectives 6.6-6.10
8. Lab: Lifting Latent Prints
9. Lab: Giant Balloon Fingerprint (Activity 6-2)
10. Chapter 6 Review Questions pp. 172-173
11. Complete “Case Studies” and “Careers in Forensics” pp.170-171
12. Quiz on 6.6-6.10
13. Go over objectives 7.1-7.3
14. Lab: Virtual Labs (Lysis Solution Extraction, Polymerase Chain Reaction, Profiling)
15. Quiz on 7.1-7.3
16. Go over objectives 7.4-7.7
17. Lab: Reading and Developing a DNA Profile
18. Complete any Activities in Chapter 7 pp. 212-229
19. Chapter 7 Review Questions pp. 208-211
20. Complete “Case Studies” and “Careers in Forensics” pp. 204-207
21. Quiz on 7.4-7.7
22. Go over objectives 8.1-8.5
23. Lab: Presumptive Test for Blood (Activity 8-1)
24. Chapter 8 Review Questions (only objectives 8.1-8.5) pp. 247-249
25. Complete “Case Studies” and “Careers in Forensics” pp. 245-246
26. Quiz on 8.1-8.5
27. There will be extra online and in class independent work throughout the unit.
28. Unit 2 Review
29. Unit 2 Test

Resources:

Text: Bertino, A.J., & Bertino, P.N. (2016) *Forensic Science Fundamentals and Investigations*. Boston, MA: Cengage.

Unit Learning Goal and Scale *(Level 2.0 reflects a minimal level of proficiency)*	
Standard(s): **HS-LS3-1: Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring. (Blood, Fingerprints, DNA)**	
4.0	**Students will be able to:** • In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond what was taught.
3.0	**Students will be able to:** • Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring. • Construct a DNA profile of an individual • Demonstrate effective fingerprint and DNA evidence processing techniques. • Differentiate between several fingerprints based on major ridge patterns and minutiae
2.0	**Students will be able to:** • Recognize or recall specific vocabulary (for example, arch, core, delta, fingerprint, AFIS, latent fingerprint, loop, minutiae, patent fingerprint, plastic fingerprint, ridge count, ridge pattern, ten card, whorl, allele, chromosome, CODIS, DNA profile, electrophoresis, exon, gene, genome, intron, karyotype, polymerase chain reaction, primer, short tandem repeats, antigen, antibodies)
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
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Unit Modifications for Special Population Students	
Advanced Learners	Critical thinking problems and application of skills presented.
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		Additional resources are outlined to facilitate appropriate behavior and increase student engagement. The most frequently used modifications and accommodations can be viewed here. Teachers are encouraged to use the Understanding by Design Learning Guidelines (UDL). These guidelines offer a set of concrete suggestions that can be applied to any discipline to ensure that all learners can access and participate in learning opportunities. The framework can be viewed here www.udlguidelines.cast.org
Learners with a 504	Refer to page four in the Parent and Educator Guide to Section 504 to assist in the development of appropriate plans.	

Interdisciplinary Connections

Indicators:
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English Language Arts/Literacy
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SL.11-12.5, Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

Mathematics
MP.2 Reason abstractly and quantitatively.
MP.4 Model with mathematics.
HSN-Q.A.1 Use units to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

Integration of 21st Century Skills

Indicators:
Career Ready Practices
CRP2 – Apply appropriate academic and technical skills.
CRP5 – Consider the environmental, social and economic impacts of decisions.
CRP6 – Demonstrate creativity and innovation.
CRP7 – Employ valid and reliable research strategies.
CRP8 – Utilize critical thinking to make sense of problems and persevere in solving them.
CRP10 – Plan education and career paths aligned to personal goals.
CRP11 – Use technology to enhance productivity.
CRP12 – Work productively in teams while using cultural global competence.

9.2 Career Awareness, Exploration, and Preparation
9.2.12.C.1 – Review career goals and determine steps necessary for attainment.
9.2.12.C.3 – Identify transferable career skills and design alternate career plans.

Unit 3: Forensic Chemistry

Unit Description: Forensic Chemistry and its applications have a very important role in Forensic Science. The understanding of chemical processes of the body, how drugs effect the body, and the detection of drugs in the body are crucial to the forensic scientist. This unit includes toxicology (the different types of drugs and their effects). However, a majority of the unit is spent on the tools of the forensic chemist to include: spectrophotometry, light, concentration of drugs, micro-crystalline tests, chromatography, and color screening tests. The unit concludes with an examination of explosives and arson investigation techniques.

Unit Duration: 5 weeks

Desired Results

Standard(s):

HS-PS4-4: Evaluate the validity and reliability of claims in published materials of the effects that different frequencies of electromagnetic radiation have when absorbed by matter. (Spectrophotometry and properties of light)

HS-PS1-3: Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles. (Toxicology)

Indicators:

PS1.A: Structures and Properties of Matter

PS4.B: Electromagnetic Radiation

Understandings:
Students will understand that…

1. There are many different types of drugs and they have multiple effects on the body.
2. Toxicologists use various tools to determine specific substances and their concentrations.
3. Presumptive tests give a tentative identification whereas confirmatory tests give an exact identification.
4. Chromatography, microcrystalline, and color tests are some of the major types of identification techniques in forensic chemistry.
5. Light plays a large role in identifying substances.
6. Beer's Law is a law that relates concentration to absorbance.

Essential Questions:

1. What is toxicology/ forensic chemistry?
2. Who is a toxicologist?
3. What is a toxic substance?
4. What influences toxicity?
5. What are drug effects in the body?
6. What may extended drug use lead to?
7. How do toxicologists collect, process, and handle toxic substances?
8. What techniques can toxicologists use on to better understand how and when a person died?
9. What is light?
10. What is Beer's Law?
11. What tools do forensic chemists have at their disposal?
12. How does chromatography work?
13. What is a microcrystalline test?
14. What is the difference between a presumptive and confirmatory test?

Assessment Evidence

Performance Tasks:

Students will be able to…

1. List and describe examples of drugs, poisons, and toxins
2. List factors that affect drug toxicity
3. Describe the role of a toxicologist in analyzing substance evidence
4. Compare and contrast presumptive and confirmatory testing
5. Describe how people get exposed to environmental toxins and describe the effects they have on the body
6. Distinguish among the terms tolerance, addiction, dependence, and withdrawal
7. Relate the signs and symptoms of overdose with a specific substance or combination of substances
8. Show the relationship between the law, crime, and the use of drugs
9. Describe the different instruments and techniques forensic chemists use to identify concentration and identity of drugs and unknown substances
10. Describe the different properties of light
11. Describe Beers' law
12. Utilize chromatography as a forensic technique

Other Evidence:

1.Project (Minimum one per marking period) Suggestions: Case Study (Specific to Trace Evidence, DNA, and Blood) OR Lab Based Project

2. Quizzes

-Chapter 9

- Types of Drugs, Tools of a Forensic Chemist, Properties of Light

3. Independent work

-Case Studies

-Online Video Analysis with Questions

-Chapter Review Questions

4.Lab

-Drug Analysis (Presumptive Testing: Activity 9-1)

-Drug Spot Test (Activity 9-3)

-Chromatography Analysis

-Colorimetry

Benchmarks:

Chapters 9 Test

Projects: Case Study (Specific to Trace Evidence, DNA, and Blood) OR Lab Based Project

Learning Plan

Learning Activities:

1. Students read Chapters 9 / Instructors distribute notes on Chapter 9
2. Hand out chapter vocabulary sheets and have students define them
3. Go over objectives 9.1-9.3
4. Research the types of drugs and their effects on the body
5. Suggestion: Assign a small research project/ presentation on the types of drugs
6. Quiz on 9.1-9.3
7. Go over objectives 9.4-9.5
8. Go over extra material on chromatography, wave properties, light, Beer's Law, and colorimetry.
9. Lab: Drug Analysis (Presumptive Testing: Activity 9-1)
10. Lab: Drug Spot Test (Activity 9-3)
11. Lab: Chromatography Analysis
12. Lab: Colorimetry
13. Quiz on 9.4-9.5
14. Go over Objectives 9.6-9.8
15. Suggestion: Assign a small research project/ presentation on specific incidences with celebrities and overdosing. Talk about tolerance, addiction, dependence, and withdrawal
16. Quiz on 9.6-9.8
17. Chapter 9 Review Questions pp. 297-299
18. Complete "Case Studies" and "Careers in Forensics" pp.294-296
19. There will be extra online and in class independent work throughout the unit.
20. Unit 3 Review
21. Unit 3 Test

Resources:
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Unit Learning Goal and Scale *(Level 2.0 reflects a minimal level of proficiency)*	
Standard(s): **HS-PS1-3: Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles. (Toxicology)**	
4.0	**Students will be able to:** • In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond what was taught.
3.0	**Students will be able to:** • Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles. (Toxicology) • Describe the different types of drugs and the effect they have on the body • Differentiate between multiple drugs based on their properties effects on the body
2.0	**Students will be able to:** • Recognize or recall specific vocabulary (for example, addiction, controlled, substance, dependency, depressant, hallucinogen, illegal drug, narcotic, poison, stimulant, tolerance, toxicity, toxicology, toxin)
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Standard(s): **HS-PS4-4: Evaluate the validity and reliability of claims in published materials of the effects that different frequencies of electromagnetic radiation have when absorbed by matter. (Spectrophotometry and properties of light)**	
4.0	**Students will be able to:** • In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond what was taught.
3.0	**Students will be able to:** • Evaluate the validity and reliability of claims in published materials of the effects that different frequencies of electromagnetic radiation have when absorbed by matter. (Spectrophotometry and properties of light) • Differentiate between confirmatory and presumptive chemical tests • Demonstrate effective use of a colorimeter and effective setup of a chromatography experiment
2.0	**Students will be able to:** • Recognize or recall specific vocabulary (for example, Beer's Law, light, photon, spectrophotometry, concentration, dilution, colorimeter, wavelength, frequency, spectrum)

1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Unit Modifications for Special Population Students	
Advanced Learners	Critical thinking problems and application of skills presented.
Struggling Learners	Copy notes using fill in notes, collaborative learning activities, utilize all learning styles (visual, audio, kinesthetic, etc.)
English Language Learners	Translation of notes in their native language http://www.state.nj.us/education/modelcurriculum/ela/ELLSupport.pdf
Learners with an IEP	Each special education student has in Individualized Educational Plan (IEP) that details the specific accommodations, modifications, services, and support needed to level the playing field. This will enable that student to access the curriculum to the greatest extent possible in the least restrictive environment. These include: • Variation of time: adapting the time allotted for learning, task completion, or testing • Variation of input: adapting the way instruction is delivered • Variation of output: adapting how a student can respond to instruction • Variation of size: adapting the number of items the student is expected to complete • Modifying the content, process or product Additional resources are outlined to facilitate appropriate behavior and increase student engagement. The most frequently used modifications and accommodations can be viewed here. Teachers are encouraged to use the Understanding by Design Learning Guidelines (UDL). These guidelines offer a set of concrete suggestions that can be applied to any discipline to ensure that all learners can access and participate in learning opportunities. The framework can be viewed here www.udlguidelines.cast.org
Learners with a 504 Refer to page four in the Parent and Educator Guide to Section 504 to assist in the development of appropriate plans.	

Interdisciplinary Connections

Indicators:
Embedded English Language Arts/Literacy and Mathematics Standards
English Language Arts/Literacy
RST.11-12.1, Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.
WHST.9-12.2, Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.
WHST.9-12.5, Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
WHST.9-12.7, Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
WHST.11-12.8, Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
WHST.9-12.9, Draw evidence from informational texts to support analysis, reflection, and research.
SL.11-12.5, Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

Mathematics
MP.2 Reason abstractly and quantitatively.
MP.4 Model with mathematics.
HSN-Q.A.1 Use units to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

Integration of 21st Century Skills

Indicators:
Career Ready Practices
CRP2 – Apply appropriate academic and technical skills.
CRP5 – Consider the environmental, social and economic impacts of decisions.
CRP6 – Demonstrate creativity and innovation.
CRP7 – Employ valid and reliable research strategies.
CRP8 – Utilize critical thinking to make sense of problems and persevere in solving them.
CRP10 – Plan education and career paths aligned to personal goals.
CRP11 – Use technology to enhance productivity.
CRP12 – Work productively in teams while using cultural global competence.
9.2 Career Awareness, Exploration, and Preparation
9.2.12.C.1 – Review career goals and determine steps necessary for attainment.
9.2.12.C.3 – Identify transferable career skills and design alternate career plans.

Unit 4: Trace Evidence

Unit Description: Trace Evidence includes all types of evidence that need to be examined with the help of some type of microscope. This unit covers the examination and processing of hairs, fibers, textiles, soil, and plant material. Basic microscopy will be discussed. Usage of a comparison microscope, electron microscope, and stereo microscope will be discussed. This unit includes the study of the structure of the types of evidence, places where evidence can be found or manufactured, and how evidence is used in real life.

Unit Duration: 5 weeks

Desired Results

Standard(s):

HS-LS1-1: Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells. (Forensic Botany)

HS-LS3-3: Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population. (Hair analysis)

HS-PS1-3: Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles. (Textiles and fiber analysis)

HS-ESS2-5: Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes. (Soil analysis)

Indicators:

PS1.A Structure and Properties of Matter

PS1.B Chemical Reactions

ESS2.C: The Roles of Water in Earth's Surface Processes

LS1.A: Structures and Function

LS3.B: Variation of Traits

Understandings:

Students will understand that…

1. Trace evidence is evidence that is small in amount but enough to measure, such as hair, soil, textiles, fibers, etc.
2. All trace evidence has a similar manner in which it should be collected and organized.
3. Trace evidence can be very useful in linking a suspect to crime scene.
4. Each hair has a different composition from person to person.
5. All hairs have a general structure, however, can look different among animals and persons of different racial backgrounds.
6. There are many types of fibers and textiles that can sometimes be unreliable for use in court.
7. Each piece of botanical evidence can have various compositions in relation to one another.

Essential Questions:

1. What is trace evidence?
2. How can all the types of trace evidence connect a suspect to a crime scene?
3. What is the structure and composition of hair?
4. What characteristics of hair vary among animals and humans?
5. What characteristics of hair vary among different racial backgrounds?
6. How is hair evidence packaged and processed?
7. What are fibers and textiles?
8. What are the components and structures of fibers and textiles?
9. Where can fibers and textiles be created from?
10. How are fibers and textiles collected and processed?
11. What is forensic botany?
12. How do forensic botanists use plant material to link a suspect to a crime scene?
13. How is botanical evidence collected and processed?
14. What is the composition and structure of the different botanical evidence?
15. What are the different types of soil?
16. Where can different types of soil be found?
17. How can soil evidence link a suspect to a crime scene?
18. How are different soils classified?
19. How can soil be related to a burial site? What can it reveal?
20. How reliable is all trace evidence?

Assessment Evidence

Performance Tasks:

Students will be able to…

1. Identify the various parts of the hair
2. Describe variations in the structure of the medulla, cortex, and cuticle of hair
3. Distinguish between human and nonhuman/ animal hair

Other Evidence:

1.Project (Minimum one per marking period) Suggestions: Case Study (Specific to Trace Evidence, DNA, and Blood) OR Lab Based Project

2. Quizzes

-Chapters 3, 4, 5, and 13

4. Determine if two examples of hair are likely to be from the same person
5. Explain how hair can be used in a forensic investigation
6. Calculate the medullary index for a hair
7. Distinguish hairs from individuals belonging to broad racial categories
8. Identify and describe common weave patterns of textile samples
9. Compare and contrast various types of fibers through physical and chemical analysis
10. Describe principal characteristics of common fibers used in their identification
11. Apply forensic techniques to analyze fibers
12. Describe different forms of forensic
13. Discuss how botanical evidence can help solve crimes by linking a person or object to a crime scene, establishing a postmortem interval, or aiding in the location of gravesites
14. Discuss the history of forensic botany
15. Explain the terms plant assemblage and pollen fingerprint/profile
16. Summarize the differences between botanical evidence collection and habitat sampling
17. Describe the correct procedures for collecting, labeling, and documenting, botanical evidence
18. Explain why forensic botanists should consult with local individuals; meteorologists; entomologists, anthropologists, and wildlife specialists when processing a crime scene
19. Describe the distinguishing characteristics and compositions of different soils
20. Compare and contrast the different soil layers found in a soil profile
21. Compare and contrast the four sources of sand
22. Analyze soils using macroscopic and microscopic examination, as well as chemical and physical testing
23. Describe the effects of different physical and chemical compositions of soils on the decomposition of a corpse
24. Explain how soil analysis can link a suspect, victim, tool, or other item of evidence to a crime scene
25. Explain how soil profiles and differences in the soil surface can be used to locate a gravesite
26. Summarize how to collect and document soil evidence

-Microscopy, Properties of Hair, Properties of Fibers and Textiles, Composition of Botanical Evidence

3. Independent work

-Case Studies

-Online Video Analysis with Questions

-Chapter Review Questions

4.Lab

-Trace Evidence: Hair (Activity 3-1)

-Hair Measurement (Activity 3-2)

-Microscopic Fiber Analysis (Activity 4-1)

-Bedsheet Thread Count (Activity 4-2)

-Weave Pattern Analysis (Activity 4-3)

-Burn Analysis of Fibers (Activity 4-5)

-Pollen Examination: Matching a Suspect to a Crime Scene (Activity 5-1)

-Processing a Crime Scene for Botanical Evidence (5-4)

-Examination of Sand (Activity 13-1)

-Soil Evidence Examination (Activity 13-2)

-Chemical and Physical Analysis of Sand (Activity 13-3)

Benchmarks:

Chapter 3, 4, 5, and 13 Test

Projects: Case Study (Specific to Trace Evidence, DNA, and Blood) OR Lab Based Project

Learning Plan

Learning Activities:

1. Students read Chapters 3, 4, 5, and 13 / Instructors distribute notes on Chapter 3, 4, 5, and 13
2. Hand out chapter vocabulary sheets and have students define them
3. Go over objectives 3.1-3.7
4. Lab: Trace Evidence: Hair (Activity 3-1)
5. Lab: Hair Measurement (Activity 3-2)
6. Quiz on 3.1-3.7
7. Chapter 3 Review Questions pp. 64-65
8. Complete “Case Studies” and “Careers in Forensics” pp.61-63
9. Go over objectives 4.1-4.4
10. Lab: Microscopic Fiber Analysis (Activity 4-1)
11. Lab: Bedsheet Thread Count (Activity 4-2)
12. Lab: Weave Pattern Analysis (Activity 4-3)
13. Lab: Burn Analysis of Fibers (Activity 4-5)
14. Quiz on 4.1-4.4
15. Chapter 4 Review Questions pp. 93-95
16. Complete “Case Studies” and “Careers in Forensics” pp.90-92
17. Go over objectives 5.1-5.5
18. Lab: Pollen Examination: Matching a Suspect to a Crime Scene (Activity 5-1)
19. Quiz on 5.1-5.5
20. Go over objectives 5.6-5.9
21. Lab: Processing a Crime Scene for Botanical Evidence (5-4)
22. Quiz on 5.6-5.9
23. Chapter 5 Review Questions pp. 134-136
24. Complete “Case Studies” and “Careers in Forensics” pp.131-133
25. Go over objectives 13.1- 13.4
26. Lab: Examination of Sand (Activity 13-1)
27. Lab: Soil Evidence Examination (Activity 13-2)
28. Quiz on 13.1-13.4
29. Go over objectives 13.5-13.8
30. Lab: Chemical and Physical Analysis of Sand (Activity 13-3)
31. Quiz on 13.5-13.8
32. Chapter 13 Review Questions pp. 430-432
33. Complete “Case Studies” and “Careers in Forensics” pp.426-429
34. There will be extra online and in class independent work throughout the unit.
35. Unit 4 Review
36. Unit 4 Test

Resources:

Text: Bertino, A.J., & Bertino, P.N. (2016) *Forensic Science Fundamentals and Investigations*. Boston, MA: Cengage.

Unit Learning Goal and Scale *(Level 2.0 reflects a minimal level of proficiency)*	
Standard(s): **HS-LS1-1: Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells (Forensic Botany)**	
4.0	**Students will be able to:** • In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond what was taught.
3.0	**Students will be able to:** • Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells (Forensic Botany) • Describe the uses of Forensic Botany in linking a suspect to a crime scene
2.0	**Students will be able to:**

	• Recognize or recall specific vocabulary (for example, angiosperm, assemblage, forensic botany, forensic palynology, gymnosperm, pistil, pollen fingerprint, pollen grain, pollination, postmortem interval, spore, stamen)
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Standard(s): **HS-LS3-3: Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population. (Hair analysis)**	
4.0	**Students will be able to:** • In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond what was taught.
3.0	**Students will be able to:** • Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population. (Hair analysis) • Construct sketches of different human/ animal hairs and properly label their parts • Differentiate between human and other animal hairs/ fur
2.0	**Students will be able to:** • Recognize or recall specific vocabulary (for example, comparison microscope, cortex, medulla, cuticle, hair follicle, hair shaft, keratin, melanin, mtDNA, nuclear DNA)
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Standard(s): **HS-PS1-3: Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles. (Textiles and fiber analysis)**	
4.0	**Students will be able to:** • In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond what was taught.
3.0	**Students will be able to:** • Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles. (Textiles and fiber analysis) • Describe how different textiles and fibers are produced and what their specific microscopic structure is • Differentiate between several fibers and textiles based on chemical and physical composition
2.0	**Students will be able to:** • Recognize or recall specific vocabulary (for example, amorphous, crystalline, direct transfer, fiber, mineral fiber, monomer, polymer, natural fiber, secondary transfer, synthetic fiber, textile, warp, weft, yarn, thread)
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Standard(s):

HS-ESS2-5: Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes (Soil analysis)	
4.0	**Students will be able to:** • In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond what was taught.
3.0	**Students will be able to:** • Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes (Soil Analysis) • Describe how processes on Earth create different soils • Differentiate between the chemical and physical compositions of several soils • Explain how soil evidence can link a suspect to a crime
2.0	**Students will be able to:** • Recognize or recall specific vocabulary (for example, clay, geology, humus, mineral, sand, sediment, silt, soil, soil profile, weathering)
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Unit Modifications for Special Population Students	
Advanced Learners	Critical thinking problems and application of skills presented.
Struggling Learners	Copy notes using fill in notes, collaborative learning activities, utilize all learning styles (visual, audio, kinesthetic, etc.)
English Language Learners	Translation of notes in their native language http://www.state.nj.us/education/modelcurriculum/ela/ELLSupport.pdf
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Interdisciplinary Connections

Indicators:
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SL.11-12.5, Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

Mathematics
MP.2 Reason abstractly and quantitatively.
MP.4 Model with mathematics.
HSN-Q.A.1 Use units to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

Integration of 21st Century Skills

Indicators:
Career Ready Practices
CRP2 – Apply appropriate academic and technical skills.
CRP5 – Consider the environmental, social and economic impacts of decisions.
CRP6 – Demonstrate creativity and innovation.
CRP7 – Employ valid and reliable research strategies.
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CRP12 – Work productively in teams while using cultural global competence.
9.2 Career Awareness, Exploration, and Preparation
9.2.12.C.1 – Review career goals and determine steps necessary for attainment.
9.2.12.C.3 – Identify transferable career skills and design alternate career plans.

Unit 5: Anthropological Evidence

Unit Description: This unit includes a study of the skeletal system and its applications to Forensic Science. The unit begins with the function of the skeletal system and locations of the bones in the body. Students will then examine the clues and actual evidence that can be gained from skeletal examination. These include information on: lifestyle, diet, work habits, age, ethnicity, gender, and stature.

Unit Duration: 5 weeks

Desired Results

Standard(s):

HS-LS4-4: Construct an explanation based on evidence for how natural selection leads to adaptation of populations. (Anthropological evidence and the skeletal system)

Indicators:

LS4.C: Adaptation

Understandings:
Students will understand that…

1. Anthropological evidence can lead to the identification of a person's height, age, gender, race, occupation, and lifestyle.
2. Cartlidge turning to bone is called ossification.
3. The skeletal system functions in the body in ways other than just producing structure and support.
4. The Bertillon method was the predecessor to identifying criminal suspects through DNA analysis and fingerprints.

Essential Questions:

1. What is anthropology?
2. What is ossification?
3. What traits can be determined from anthropological evidence?
4. What is the skeletal system's function and composition?
5. How do osteoblasts and osteoclasts work?
6. What is bone marrow?
7. Where are the bones located in the body?
8. What is the Bertillon method/ anthropometry?

Assessment Evidence

Performance Tasks:
Students will be able to…

1. Summarize the information a forensic anthropologist derives from the skeletal remains to construct a biological profile
2. Distinguish among growth plates, bone caps, bone shafts, and sutures, and explain their significance to forensic anthropology
3. Compare and contrast an adult's skeleton and a child's skeleton in terms of composition, number of bones, suture marks, and growth plates
4. Apply knowledge of bone growth(ossification) to estimate the age of the deceased at the time of death
5. Apply appropriate formulas to estimate the height of a person based on individual bone length
6. Distinguish between male and female skeletal remains based on the structure, the size and shape of the skull, pelvis, and the long bones
7. Provide examples of different types of skeletal trauma due to disease, injuries, occupation, or environmental factors that can provide clues to the identification of skeletal remains

Other Evidence:

1.Project (Minimum one per marking period) Suggestions: Anthropology and Death Scene OR Entomology (Insect Evidence)

2. Quizzes

-Chapters 14

-Skeletal System, Identifying Traits Based on Anthropological Evidence, Estimation of Stature

3. Independent work

-Case Studies

-Online Video Analysis with Questions

-Chapter Review Questions

4.Lab

-Determining the Age of a Skull (Activity 14-1)

-Bones: Male or Female? (Activity 14-2)

-Identifying the Romanovs-an Internet Activity (Activity 14-3)

-Estimation of Body Size from Individual Bones (Activity 14-4)

8. Discuss the significance of isotopes in determining where someone lived 9. Describe methods used to analyze skeletal remains, including radiology, computer imaging, DNA technology, video or photography superimposition, and craniofacial reconstruction	-What Bones Tell Us (Activity 14-5)

Benchmarks:

Chapter 14 Test

Projects: Anthropology and Death Scene OR Entomology (Insect Evidence)

Learning Plan

Learning Activities:

1. Students read Chapter 14 / Instructors distribute notes on Chapter 14
2. Hand out chapter vocabulary sheets and have students define them
3. Go over objectives 14.1-14.4
4. Lab: Determining the Age of a Skull (Activity 14-1)
5. Lab: Bones: Male or Female? (Activity 14-2)
6. Quiz on 14.1-14.4
7. Go over objectives 14.5-14.9
8. Lab: Identifying the Romanovs-an Internet Activity (Activity 14-3)
9. Lab: What Bones Tell Us (Activity 14-5)
10. Quiz on 14.5-14.9
11. Chapter 14 Review Questions pp. 464-466
12. Complete “Case Studies” and “Careers in Forensics” pp.459-463
13. Time will be allotted in this unit to work on an anthropology/ entomology-based project in conjunction with unit 6.
14. There will be extra online and in class independent work throughout the unit.
15. Unit 5 Review
16. Unit 5 Test

Resources:

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Unit Learning Goal and Scale

(Level 2.0 reflects a minimal level of proficiency)

Standard(s):
HS-LS4-4: Construct an explanation based on evidence for how natural selection leads to adaptation of populations. (Anthropological evidence and the skeletal system)

4.0	**Students will be able to:** • In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond what was taught.
3.0	**Students will be able to:** • Construct an explanation based on evidence for how natural selection leads to adaptation of populations. (Anthropological evidence and the skeletal system) • Apply anthropological techniques to help identify unknown characteristics about skeletal remains at a crime scene.

	• Construct a profile for skeletal remains based gender, age, stature, race, and lifestyle based on anthropological evidence • Describe the role the skeletal system plays in the body
2.0	**Students will be able to:** • Recognize or recall specific vocabulary (for example, biological profile, diaphysis, epiphysis, forensic anthropology, growth plate, joints, ossification, osteoporosis, skeletal trauma analysis)
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
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Unit 6: Death Scenes and Autopsies

Unit Description: Determination of the cause of death and the time a body has spent at a location is crucial to analysis of a crime scene. Causes and mechanisms of death, death statistics, and pathology are discussed. This unit concludes with the decomposition of the human body and how bugs and insects affect this process (entomology).

Unit Duration: 5 weeks

Desired Results

Standard(s):

HS-PS3-4: Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics). (Pathology and death mechanisms)

HS-LS2-4: Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem. (Forensic Entomology)

Indicators:

LS2.B: Cycles of Matter and Energy Transfer in Ecosystems

PS3.B: Conversation of Energy and Energy Transfer

Understandings:

Students will understand that

1. Forensic entomologists can use insect evidence to determine time and place of death.
2. Insect evidence can be used to link a suspect to a crime scene.
3. There are four manners of death.
4. Algor mortis, rigor mortis, and livor mortis are post mortem changes.
5. A coroner completes autopsies on bodies to determine time and cause of death.
6. Bodies go through multiple changes during decomposition.
7. There is a large difference between death of a cell and death of an organism.

Essential Questions:

1. What is forensic entomology?
2. How can insects determine time/ cause of death?
3. What inferences can be made about a body from insect evidence?
4. What is a postmortem interval?
5. How can insects be used to link a suspect to a crime scene?
6. How does one collect and process insect evidence?
7. How does a body decompose?
8. What is the difference between cell death and death of an organism?
9. What are the four manners of death?
10. How are algor, rigor, and livor mortis different?
11. How does autopsy determine time and cause of death?

Assessment Evidence

Performance Tasks:

Students will be able to…

1. Distinguish between cellular death and death of an organism
2. Distinguish among four manners of death, natural, accidental, suicidal, and homicidal. Explain the fifth classification, undetermined
3. Distinguish among cause, manner, and mechanism of death
4. Outline the sequence of events that occurs in the first few minutes after death
5. Explain how algor, rigor, and livor mortis develop following death and describe how their development is affected by environmental factors
6. Sequence and describe the chemical and physical changes during decomposition, including autolysis, putrefaction, marbling, and adipocere formation
7. Analyze the evidence from algor, livor, and rigor mortis, stomach contents, and decomposition, along with environmental factors to estimate a postmortem interval
8. Compare and contrast the roles of medical examiners and coroners
9. Describe the procedures of an autopsy, and give examples of how an autopsy helps establish the

Other Evidence:

1.Project (Minimum one per marking period) Suggestions: Anthropology and Death Scene OR Entomology (Insect Evidence)

2. Quizzes

-Chapters 11 and 12

- Mechanisms of Death, Autopsy Analysis

3. Independent work

-Case Studies

-Online Video Analysis with Questions

-Chapter Review Questions

4.Lab

-How to Raise Blowflies for Forensic Entomology (Activity 11-1)

-Observation of Blowflies or Houseflies (Activity 11-3)

-Factors Affecting Postmortem Interval Estimates and Accumulated Degree Hours (Activity 11-4)

-Calculating Postmortem Interval Using Rigor Mortis, Algor Mortis (Activity 12-1 and 12-2)

-Analysis of Evidence from Death Scenes (Activity 12-4)

cause of death, manner of death, and postmortem interval
10. Support the claim that it is often difficult to pinpoint the postmortem interval.
11. Describe several examples of the ways that forensic entomology is used to help solve crimes
12. Compare and contrast the four stages of blowfly metamorphosis and describe the significance of blowflies in forensic entomology.
13. Describe the function of each of the following organs on blowflies and explain the significance of each structure to forensic entomology: spiracles, mouth hooks, crop.
14. Describe the effect of different environmental factors on insect development
15. Describe the five stages of decomposition
16. Relate the process of insect succession to the changing environment that occurs during the stages of decomposition
17. Explain how forensic entomologists interpret forensic evidence and environmental conditions to estimate a postmortem interval
18. Explain how insect evidence is analyzed to provide evidence of the deceased person's identity or drug, poison, or toxin exposure
19. Summarize the procedures for documenting and collecting insect evidence from a crime scene

Benchmarks:

Chapter 11 and 12 Tests

Projects: Anthropology and Death Scene OR Entomology (Insect Evidence)

Learning Plan

Learning Activities:

1. Students read Chapters 11 and 12 / Instructors distribute notes on Chapters 11 and 12
2. Hand out chapter vocabulary sheets and have students define them
3. Go over objectives 11.1-11.4
4. Lab: How to Raise Blowflies for Forensic Entomology (Activity 11-1)
5. Lab: Observation of Blowflies or Houseflies (Activity 11-3)
6. Quiz on 11.1-11.4
7. Go over objectives 11.5-11.9
8. Lab: Factors Affecting Postmortem Interval Estimates and Accumulated Degree Hours (Activity 11-4)
9. Quiz on 11.5-11.9
10. Chapter 11 Review Questions pp. 367-369
11. Complete "Case Studies" and "Careers in Forensics" pp. 364-366
12. Go over objectives 12.1-12.5
13. Lab: Calculating Postmortem Interval Using Rigor Mortis, Algor Mortis (Activity 12-1 and 12-2)
14. Lab: Analysis of Evidence from Death Scenes (Activity 12-4)
15. Quiz 12.1-12.5
16. Go over objectives 12.6-12.10
17. Suggestion: Mini "Body Farm" Research Project
18. Quiz 12.6-12.10
19. Chapter 12 Review Questions pp. 402-405
20. Complete "Case Studies" and "Careers in Forensics" pp. 400-401

21. Time will be allotted in this unit to work on an anthropology/ entomology-based project in conjunction with unit 5.
22. There will be extra online and in class independent work throughout the unit.
23. Unit 6 Review
24. Unit 6 Test

Resources:
Text: Bertino, A.J., & Bertino, P.N. (2016) *Forensic Science Fundamentals and Investigations*. Boston, MA: Cengage.

Unit Learning Goal and Scale *(Level 2.0 reflects a minimal level of proficiency)*	
Standard(s): **HS-PS3-4: Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics). (Pathology and death mechanisms)**	
4.0	**Students will be able to:** • In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond what was taught.
3.0	**Students will be able to:** • Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics). (Pathology and death mechanisms) • Describe the processes that occur postmortem for an organism • Differentiate between the ways an organism can die
2.0	**Students will be able to:** • Recognize or recall specific vocabulary (for example, algor mortis, autolysis, autopsy, cause of death, coroner, decomposition, livor mortis, manner of death, mechanism of death, medical examiner, putrefaction, rigor mortis)
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Standard(s): **HS-LS2-4: Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem. (Forensic Entomology)**	
4.0	**Students will be able to:** • In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond what was taught.
3.0	**Students will be able to:** • Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem. (Forensic Entomology) • Explain the factors that affect decomposition • Describe the importance of researching entomological evidence and its help with understanding decomposition
2.0	**Students will be able to:**

	• Recognize or recall specific vocabulary (for example, accumulated degree hours, complete metamorphosis, crop, entomology, grub, insect succession, instar, larva, maggot, oviposition, pupa, spiracles)
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Unit Modifications for Special Population Students	
Advanced Learners	Critical thinking problems and application of skills presented.
Struggling Learners	Copy notes using fill in notes, collaborative learning activities, utilize all learning styles (visual, audio, kinesthetic, etc.)
English Language Learners	Translation of notes in their native language http://www.state.nj.us/education/modelcurriculum/ela/ELLSupport.pdf
Learners with an IEP	Each special education student has in Individualized Educational Plan (IEP) that details the specific accommodations, modifications, services, and support needed to level the playing field. This will enable that student to access the curriculum to the greatest extent possible in the least restrictive environment. These include: • Variation of time: adapting the time allotted for learning, task completion, or testing • Variation of input: adapting the way instruction is delivered • Variation of output: adapting how a student can respond to instruction • Variation of size: adapting the number of items the student is expected to complete • Modifying the content, process or product Additional resources are outlined to facilitate appropriate behavior and increase student engagement. The most frequently used modifications and accommodations can be viewed here. Teachers are encouraged to use the Understanding by Design Learning Guidelines (UDL). These guidelines offer a set of concrete suggestions that can be applied to any discipline to ensure that all learners can access and participate in learning opportunities. The framework can be viewed here www.udlguidelines.cast.org
Learners with a 504 Refer to page four in the Parent and Educator Guide to Section 504 to assist in the development of appropriate plans.	

Interdisciplinary Connections

Indicators:
Embedded English Language Arts/Literacy and Mathematics Standards
English Language Arts/Literacy
RST.11-12.1, Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.
WHST.9-12.2, Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.
WHST.9-12.5, Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
WHST.9-12.7, Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
WHST.11-12.8, Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
WHST.9-12.9, Draw evidence from informational texts to support analysis, reflection, and research.
SL.11-12.5, Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

Mathematics
MP.2 Reason abstractly and quantitatively.
MP.4 Model with mathematics.
HSN-Q.A.1 Use units to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

Integration of 21st Century Skills

Indicators:
Career Ready Practices
CRP2 – Apply appropriate academic and technical skills.
CRP5 – Consider the environmental, social and economic impacts of decisions.
CRP6 – Demonstrate creativity and innovation.
CRP7 – Employ valid and reliable research strategies.
CRP8 – Utilize critical thinking to make sense of problems and persevere in solving them.
CRP10 – Plan education and career paths aligned to personal goals.
CRP11 – Use technology to enhance productivity.
CRP12 – Work productively in teams while using cultural global competence.
9.2 Career Awareness, Exploration, and Preparation
9.2.12.C.1 – Review career goals and determine steps necessary for attainment.
9.2.12.C.3 – Identify transferable career skills and design alternate career plans.

Unit 7: Impression Evidence and Other Physical Markings

Unit Description: This unit includes the exploration of impression evidence and how it applies to solving a criminal or civil case. Impression evidence includes: tool marks, bite marks, tread/tire marks, footwear, ballistic impressions. The unit concludes with a discussion on glass. Glass analysis covers the different types of glass, the impression left by impacted glass, and the different refractive indices of glass.

Unit Duration: 5 weeks

Desired Results

Standard(s):

HS-PS2-1: Analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration. (Impression evidence)

Indicators: PS2.A: Forces and Motion

Understandings:

Students will understand that…

1. Glass comes in various forms and can be created synthetically or naturally.
2. Beveling happens when pressure builds on impact from a firearm on glass.
3. Refractive indices can help when determining types of glass.
4. Determining the sequence of impacts in glass can be done by examining the concentric and radial fractures.
5. Many different tools, tires, and body parts can leave impression evidence.
6. Oblique lighting is used to observe impressions.
7. Glass and impression evidence can link certain objects a crime scene which can then lead to the identification of a suspect.

Essential Questions:

1. What are the different types of glass?
2. How can glass be created naturally and synthetically?
3. What role does knowing a glass' refractive index play in a criminal investigation?
4. How does a forensic glass analyst tell the pattern of impacts on glass?
5. What is beveling?
6. What can bullet holes in glass determine?
7. What are concentric and radial fractures?
8. What is the Becke line?
9. What can form impression evidence?
10. What evidence can impression analysts obtain from various types of impressions?
11. Why is it important to collect and process impressions as soon as they are noticed?
12. How does one produce an impression or cast molding?
13. What are the different types of tool marks?
14. What kind of lighting is best for photographing tool marks?
15. How has technology made identifying tool marks easier?

Assessment Evidence

Performance Tasks:

Students will be able to…

1. Describe the three major components of glass
2. Compare and contrast soda glass, lead glass, and heat resistant glass
3. List and describe the physical properties of glass
4. Calculate the density of glass samples
5. Estimate the refractive index of glass using the submersion method and Becke lines
6. Distinguish between radial and concentric fractures in terms of their appearance, how they are formed, and their location on fractured glass
7. Summarize and describe the information that can be gained by analyzing bullet holes in fractured glass
8. Compare and contrast laminated, tempered or safety glass, and bullet resistant glass in terms of structure, use, and fracture pattern
9. Describe how to properly collect and document glass evidence
10. Summarize the ways to determine whether two glass fragments are consistent
11. Provide examples of how impression evidence gives clues about the crime scene, persons at the scene, and events occurred at the scene
12. Provide well supported arguments that evidence such as foot, shoe, and dental impressions are usually considered class evidence
13. Distinguish among latent, patent, and plastic impressions

Other Evidence:

1.Project (Minimum one per marking period) Suggestions: Final Crime Scene Project OR Career Research

2. Quizzes

-Chapters 15, 16, and 17

-Glass Analysis, Identifying Tool Marks, Processing Glass and Physical Markings

3. Independent work

-Case Studies

-Online Video Analysis with Questions

-Chapter Review Questions

4.Lab

-Glass Fracture Pattern Analysis (Activity 15-1)

-Glass Density (15-2)

-Refractive Index Submersion Test (Activity 15-3)

-Snell's Law (Activity 15-4)

-Making a Plaster or Paris Cast (Activity 16-1)

-Shoe Size, Foot Size, and Height (Activity 16-2)

-Tire Impressions and Analysis (16-3)

-Dental Impressions (Activity 16-5)

-Tool Marks (Activity 17-1)

-Hammer Impressions (Activity 17-2)

14. Summarize the significance of foot and shoe impression evidence, and outline procedures for collecting impression evidence from different types of surfaces
15. Describe the features of tire impressions and skid marks used to help identify tire or a vehicle's wheelbase, track width, and/or turning diameter
16. Compare and contrast skid marks, including how they are produced, when they are produced, what they look like, and how they can be used to reconstruct events leading to a collision
17. Summarize the methods used to produce an impression or cast
18. Analyze impression evidence to determine if it is consistent with evidence from a crime scene
19. Describe how forensic investigators analyze evidence from tools and tool marks to help solve crimes
20. Describe variations in tool surfaces that could be used to identify specific tools
21. Compare and contrast the three major types of tool marks provide examples of tools that produce those types of marks
22. Provide examples of foreign materials found in tool marks, and elaborate on how this evidence can be used to link a suspect to a crime
23. Analyze and process a crime scene at which tools were used to commit a crime
24. Outline the sequence of procedures for photographing, documenting, casting, and collecting evidence from tools and tool marks
25. Justify the claim that tool-mark evidence is usually considered circumstantial evidence, supporting your claim with the facts from the chapter
26. Discuss the role of technology in crime scene analysis of tools and tool marks
27. Describe the roles of the Scientific Working Groups (SWGs) and the Organization Scientific Area Committees (OSAC) in the improvement of evidence reliability

Benchmarks:

Chapter 15, 16, and 17 Tests

Project: Final Crime Scene Project OR Career Research

Learning Plan

Learning Activities:

1. Students read Chapters 15, 16, and 17 / Instructors distribute notes on Chapters 15, 16, and 17
2. Hand out chapter vocabulary sheets and have students define them
3. Go over objectives 15.1-15.5
4. Lab: Glass Fracture Pattern Analysis (Activity 15-1)
5. Lab: Glass Density (15-2)
6. Lab: Refractive Index Submersion Test (Activity 15-3)
7. Quiz on 15.1-15.5
8. Go over objectives 15.6-15.10
9. Lab: Snell's Law (Activity 15-4)
10. Quiz on 15.6-15.10
11. Chapter 15 Review Questions pp. 498-500
12. Complete "Case Studies" and "Careers in Forensics" pp. 495-497
13. Go over objectives 16.1-16.4
14. Lab: Making a Plaster or Paris Cast (Activity 16-1)
15. Lab: Shoe Size, Foot Size, and Height (Activity 16-2)
16. Quiz 16.1-16.4
17. Go over objectives 16.5-16.8
18. Lab: Tire Impressions and Analysis (16-3)
19. Lab: Dental Impressions (Activity 16-5)
20. Quiz 16.5-16.8
21. Chapter 16 Review Questions pp. 533-535
22. Complete "Case Studies" and "Careers in Forensics" pp. 529-532
23. Go over objectives 17.1-17.5
24. Lab: Tool Marks (Activity 17-1)
25. Lab: Hammer Impressions (Activity 17-2)
26. Quiz 17.1-17.5
27. Go over objectives 17.6-17.9
28. Lab: Casting Impressions of Hammer Strikes on Wood in Silicone (Activity 17-3)
29. Quiz 17.6-17.9
30. Chapter 17 Review Questions pp. 571-573
31. Complete "Case Studies" and "Careers in Forensics" pp. 568-570
32. Time will be allotted in this unit to work on a project in conjunction with unit 8.
33. There will be extra online and in class independent work throughout the unit.
34. Unit 7 Review
35. Unit 7 Test

Resources:

Text: Bertino, A.J., & Bertino, P.N. (2016) *Forensic Science Fundamentals and Investigations*. Boston, MA: Cengage.

Unit Learning Goal and Scale *(Level 2.0 reflects a minimal level of proficiency)*	
Standard(s): **HS-PS2-1: Analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration. (Impression evidence)**	
4.0	**Students will be able to:** • In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond what was taught.
3.0	**Students will be able to:** • Analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration. (Impression evidence) • Differentiate between different impressions and correctly identify the source of the impression • Identify cause of death based on tool marks • Construct a sequence of events based on glass evidence • Differentiate between types of glass and how they are naturally or synthetically produced

2.0	**Students will be able to:** • Recognize or recall specific vocabulary (for example, amorphous, backscatter, bulletproof, concentric fracture, density, glass, laminated, lead glass, normal line, radiating fracture, refraction, refractive index, silicon dioxide, tempered glass, groove, latent impression, plastic impression, rib, sole, track width, tread, turning diameter, wheelbase, abrasion marl, cutting mark, indentation mark, tool mark)
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Unit Modifications for Special Population Students	
Advanced Learners	Critical thinking problems and application of skills presented.
Struggling Learners	Copy notes using fill in notes, collaborative learning activities, utilize all learning styles (visual, audio, kinesthetic, etc.)
English Language Learners	Translation of notes in their native language http://www.state.nj.us/education/modelcurriculum/ela/ELLSupport.pdf
Learners with an IEP	Each special education student has in Individualized Educational Plan (IEP) that details the specific accommodations, modifications, services, and support needed to level the playing field. This will enable that student to access the curriculum to the greatest extent possible in the least restrictive environment. These include: • Variation of time: adapting the time allotted for learning, task completion, or testing • Variation of input: adapting the way instruction is delivered • Variation of output: adapting how a student can respond to instruction • Variation of size: adapting the number of items the student is expected to complete • Modifying the content, process or product Additional resources are outlined to facilitate appropriate behavior and increase student engagement. The most frequently used modifications and accommodations can be viewed here. Teachers are encouraged to use the Understanding by Design Learning Guidelines (UDL). These guidelines offer a set of concrete suggestions that can be applied to any discipline to ensure that all learners can access and participate in learning opportunities. The framework can be viewed here www.udlguidelines.cast.org
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WHST.9-12.5, Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
WHST.9-12.7, Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
WHST.11-12.8, Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
WHST.9-12.9, Draw evidence from informational texts to support analysis, reflection, and research.
SL.11-12.5, Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

Mathematics
MP.2 Reason abstractly and quantitatively.
MP.4 Model with mathematics.
HSN-Q.A.1 Use units to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

Integration of 21st Century Skills

Indicators:
Career Ready Practices
CRP2 – Apply appropriate academic and technical skills.
CRP5 – Consider the environmental, social and economic impacts of decisions.
CRP6 – Demonstrate creativity and innovation.
CRP7 – Employ valid and reliable research strategies.
CRP8 – Utilize critical thinking to make sense of problems and persevere in solving them.
CRP10 – Plan education and career paths aligned to personal goals.
CRP11 – Use technology to enhance productivity.
CRP12 – Work productively in teams while using cultural global competence.
9.2 Career Awareness, Exploration, and Preparation
9.2.12.C.1 – Review career goals and determine steps necessary for attainment.
9.2.12.C.3 – Identify transferable career skills and design alternate career plans.

Unit 8: Other Common Types of Forensics Evidence

Unit Description: As fundamental and pre-requisite information has been presented and mastered, students can delve deeper into more sophisticated forensic science topics. Unit topics include: Ballistic flight paths, blood spatter, document analysis, paint analysis, and cybercrime.

Unit Duration: 5 weeks

Desired Results

Standard(s):

HS-PS2-1: Analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration. (Ballistics and blood spatter)

HS-PS1-3: Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles. (Paint analysis and document analysis)

Indicators:

PS2.A: Forces and Motion

PS1.A: Structure and Properties of Matter

PS3.A: Definitions of Energy

Understandings:

Students will understand that…

1. Blood can form various patterns determined by drop height, speed, and surface.
2. Document analysis has many applications to forensic science including: determining forged documents, analyzing handwriting styles, and linking certain objects to crime scenes.
3. Chemical and physical techniques can determine forgeries and link documents to a crime scene.
4. There are several limitations to document analysis.
5. Firearms have specific steps in their discharging.
6. Gun residue can link suspects to a crime scene.
7. Projectiles have trajectories determined by type of projectile, acceleration, mass, and indirect conditions.
8. The composition of paints based on their manufacturer can lead to distinguishing certain colors.
9. There are ways to identify and prevent cybercrime.

Essential Questions:

1. What are the different pieces of information needed to process blood spatter?
2. What are the different types of blood spatter patterns?
3. How the different types of blood spatter patterns formed?
4. What are the qualitative and quantitative traits of document analysis?
5. How has technology increased success in determining forged documents?
6. How does one detect forgery in checks, money, and documents?
7. What are the limitations to handwriting analysis?
8. What are the different types of firearms?
9. How does a firearm discharge?
10. How do ballistic analysts determine trajectory of a projectile?
11. What are the compositions of different firearm residues?
12. How does one process and collect ballistic evidence?
13. What is the composition of paint?
14. How has technology made processing paint evidence easier?
15. How can paint evidence link a suspect to a crime scene?
16. What is cybercrime?
17. How can cybercrime be prevented?

Assessment Evidence

Performance Tasks:

Students will be able to…

1. Describe the proper procedures for handling blood evidence
2. Analyze blood spatter evidence using angle of impact, area of convergence, and area of origin
3. Compare and contrast different types of blood spatter patterns
4. Describe how different types of blood spatter patterns are formed
5. Explain how a sample of handwriting evidence is compared with an exemplar using both qualitative and quantitative characteristics
6. Describe some of the limitations of handwriting analysis
7. Identify a historical case of document fraud and explain how the fraudulent documents were created

Other Evidence:

1.Project (Minimum one per marking period) Suggestions: Final Crime Scene Project OR Career Research

2. Quizzes

-Chapters 8, 10, and 18

-Document Analysis, Handwriting Analysis, Preventing Cybercrime, Reconstruct a Crime Scene using Projectiles and Blood Spatter

3. Independent work

-Case Studies

-Online Video Analysis with Questions

-Chapter Review Questions

4.Lab

8. Describe recent developments in technology for use in handwriting analysis 9. List and describe several ways in which businesses prevent check forgery 10. Describe features of new paper currency that protect against counterfeiting 11. Compare and contrast older paper currencies with new currencies, including those on plastic stock 12. Compare and contrast the different types of firearms, including handguns, rifles, and shotguns. 13. Put in order the sequence of events that results in a firearm discharging 14. Estimate the trajectory of a projectile 15. Discuss the composition and formation of gunshot residue and its reliability as a source of evidence 16. Compare and contrast entrance and exit wounds, including size, shape, gunshot residue, and the presence of burns 17. Distinguish among the various forms of firearm evidence, including rifling, markings on cartridges, marks on projectiles, and gunshot residue 18. Discuss how technology has improved the ability to obtain, compare, analyze, store, and retrieve firearm and ballistics evidence 19. Process and analyze a crime scene for fire arm and ballistics evidence 20. Describe the ways criminals commit cyber crimes 21. Describe how one can stop cybercrime 22. Discuss the components of paint 23. Describe the ways to use paint to solve a crime	-Creating and Modeling Blood-Spatter Patterns (Activity 8-2) -Blood Spatter Analysis (Activity 8-3) -Area of Convergence and Area of Origin (Activity 8-4 and 8-6) -Blood Droplet Impact Angle (Activity 8-5) -Handwriting Analysis (Activity 10-1) -Analysis of Ransom Note (10-2) -Examination of Currency (Activity 10-3) -Bullet Trajectory (Activity 18-1) -Firing Pin Analysis (Activity 18-2) -How Good is Your Aim? (Activity 18-4)

Benchmarks:

Chapters 8, 10, and 18 Tests

Project: Final Crime Scene Project OR Career Research

Learning Plan

Learning Activities:

1. Students read Chapters 8, 10, and 18 / Instructors distribute notes on Chapters 8, 10, and 18
2. Hand out chapter vocabulary sheets and have students define them
3. Go over objectives 8.6-8.9
4. Lab: Creating and Modeling Blood-Spatter Patterns (Activity 8-2)
5. Lab: Area of Convergence and Area of Origin (Activity 8-4 and 8-6)
6. Lab: Blood Droplet Impact Angle (Activity 8-5)
7. Quiz on 8.6-8.9
8. Chapter 8 Review Questions (only objectives 8.6-8.9) pp. 247-249
9. Go over objectives 10.1-10.4
10. Lab: Handwriting Analysis (Activity 10-1)
11. Lab: Analysis of Ransom Note (10-2)
12. Quiz on 10.1-10.4
13. Go over objectives 10.5-10.7
14. Lab: Examination of Currency (Activity 10-3)
15. Quiz on 10.5-10.7
16. Chapter 10 Review Questions pp. 331-332
17. Complete “Case Studies” and “Careers in Forensics” pp. 328-330

18. Go over objectives 18.1-18.4
19. Lab: Bullet Trajectory (Activity 18-1)
20. Lab: Firing Pin Analysis (Activity 18-2)
21. Quiz 18.1-18.4
22. Go over objectives 18.5-18.8
23. Lab: How Good is Your Aim? (Activity 18-4)
24. Quiz 18.5-18.8
25. Chapter 18 Review Questions pp. 602-603
26. Complete “Case Studies” and “Careers in Forensics” pp. 598-601
27. Time will be allotted in this unit to work on a project in conjunction with unit 7.
28. There will be extra online and in class independent work throughout the unit.
29. Unit 8 Review
30. Unit 8 Test

Resources:
Text: Bertino, A.J., & Bertino, P.N. (2016) *Forensic Science Fundamentals and Investigations*. Boston, MA: Cengage.

Unit Learning Goal and Scale *(Level 2.0 reflects a minimal level of proficiency)*	
Standard(s): **HS-PS2-1: Analyze data to support the claim that Newton’s second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration. (Ballistics and blood spatter)**	
4.0	**Students will be able to:** • In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond what was taught.
3.0	**Students will be able to:** • Analyze data to support the claim that Newton’s second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration. (Ballistics and blood spatter) • Construct a sequence of events based on blood spatter evidence and ballistic evidence • Describe where a projectile might have come from based on trajectory • Identify where blood may have come from based on spatter pattern at a crime scene
2.0	**Students will be able to:** • Recognize or recall specific vocabulary (for example, ballistics, breech, bullet, caliber, cartridge, firearm, gunshot residue, lands and grooves, pistol, revolver, rifle, trajectory, angle of impact, area of convergence, area of origin, cast off pattern, passive drop, satellite, spine, swipe, wipe)
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Standard(s): **HS-PS1-3: Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles. (Paint analysis and document analysis)**	
4.0	**Students will be able to:** • In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond what was taught.

3.0	**Students will be able to:** • Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles. (Paint analysis and document analysis) • Describe the physical and chemical composition of paint and documents • Identify forged documents based on handwriting, chemical composition, and physical properties
2.0	**Students will be able to:** • Recognize or recall specific vocabulary (for example, paint, composition, primer, PDQ, counterfeiting, currency, document analysis, document expert, exemplar, forgery, fraudulence, questioned document)
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Unit Modifications for Special Population Students	
Advanced Learners	Critical thinking problems and application of skills presented.
Struggling Learners	Copy notes using fill in notes, collaborative learning activities, utilize all learning styles (visual, audio, kinesthetic, etc.)
English Language Learners	Translation of notes in their native language http://www.state.nj.us/education/modelcurriculum/ela/ELLSupport.pdf
Learners with an IEP	Each special education student has in Individualized Educational Plan (IEP) that details the specific accommodations, modifications, services, and support needed to level the playing field. This will enable that student to access the curriculum to the greatest extent possible in the least restrictive environment. These include: • Variation of time: adapting the time allotted for learning, task completion, or testing • Variation of input: adapting the way instruction is delivered • Variation of output: adapting how a student can respond to instruction • Variation of size: adapting the number of items the student is expected to complete • Modifying the content, process or product Additional resources are outlined to facilitate appropriate behavior and increase student engagement. The most frequently used modifications and accommodations can be viewed here. Teachers are encouraged to use the Understanding by Design Learning Guidelines (UDL). These guidelines offer a set of concrete suggestions that can be applied to any discipline to ensure that all learners can access and participate in learning opportunities. The framework can be viewed here www.udlguidelines.cast.org
Learners with a 504	Refer to page four in the Parent and Educator Resource Guide to Section 504 to assist in the development of appropriate plans.

Interdisciplinary Connections

Indicators:
Embedded English Language Arts/Literacy and Mathematics Standards
English Language Arts/Literacy
RST.11-12.1, Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.
WHST.9-12.2, Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.
WHST.9-12.5, Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
WHST.9-12.7, Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
WHST.11-12.8, Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
WHST.9-12.9, Draw evidence from informational texts to support analysis, reflection, and research.
SL.11-12.5, Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

Mathematics
MP.2 Reason abstractly and quantitatively.
MP.4 Model with mathematics.
HSN-Q.A.1 Use units to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

Integration of 21st Century Skills

Indicators:
Career Ready Practices
CRP2 – Apply appropriate academic and technical skills.
CRP5 – Consider the environmental, social and economic impacts of decisions.
CRP6 – Demonstrate creativity and innovation.
CRP7 – Employ valid and reliable research strategies.
CRP8 – Utilize critical thinking to make sense of problems and persevere in solving them.
CRP10 – Plan education and career paths aligned to personal goals.
CRP11 – Use technology to enhance productivity.
CRP12 – Work productively in teams while using cultural global competence.
9.2 Career Awareness, Exploration, and Preparation
9.2.12.C.1 – Review career goals and determine steps necessary for attainment.
9.2.12.C.3 – Identify transferable career skills and design alternate career plans.