

## Rumson-Fair Haven Regional High School

**Course:** *Forensic Science*

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### **Section I: Course Description**

*Forensic Science* is an interdisciplinary laboratory-based science class designed for students who are interested in forensic science. The purpose of this course is for students to investigate crime scenarios using techniques currently used by forensic scientists and crime scene investigators. Students will use previous knowledge of science to develop these investigative techniques in *Forensic Science*.

### **Section II: NJSL: New Jersey Student Learning Standards/Learning Objectives**

1. **2026 New Jersey Student Learning Standards – Science:**

- “Scientific and technological advances have proliferated and now permeate most aspects of life in the 21st century. It is increasingly important that all members of our society develop an understanding of scientific and engineering concepts and processes. Learning how to construct scientific explanations and how to design evidence-based solutions provides students with tools to think critically about personal and societal issues and needs. Students can then contribute meaningfully to decision-making processes, such as discussions about climate change, new approaches to health care, and innovative solutions to local and global problems.”

2. **2023 New Jersey Student Learning Standards - English Language Arts:**

- “A New Jersey education in English Language Arts builds readers, writers, and communicators prepared to meet the demands of college and career and to engage as productive American citizens with global responsibilities. ...Students will develop the necessary skills in reading, writing, speaking, and listening that are the foundations for creative and purposeful expression in language read rich, challenging texts that build their knowledge of the world, grow their confidence and identities as readers, and develop critical thinking skills and vocabulary necessary for long-term success; engage in regular, meaningful, writing authentic tasks, exploring valued topics, writing for impact and expression, and sharing their work with others (including authentic audiences) leverage complex texts and digital media to develop comprehension, active listening, and discussion skills ground daily writing and discussion in evidence, fostering an ability to read critically, build arguments, cite evidence, and communicate ideas to contribute meaningfully as productive citizens evaluate the reliability, credibility, and perspective of authors and speakers across all forms of media express ideas and knowledge through a variety of modalities and media, and serve as effective communicators who purposefully read, write, and speak across multiple disciplines and learn to persist in reading complex texts, establishing lifelong habits to read voluntarily for pleasure, for further education, for information on public policy, and for advancement in the workplace.”

3. **Standard 8.1 (Computer Science) and 8.2 (Design Thinking) of the 2020 NJSL:**

- “The ‘Intent and Spirit of the Computer Science and Design Thinking Standards’ is to focus on deep understanding of concepts that enable students to think critically and systematically about leveraging technology to solve local and global issues. Authentic learning experiences that enable students to apply content knowledge, integrate concepts across disciplines, develop computational thinking skills, acquire and incorporate varied perspectives, and communicate with diverse audiences about the use and effects of computing prepares New Jersey students for college and careers.”

4. **Standard 9.4 (Life Literacies and Key Skills) of the 2020 NJSL:**

- “This standard outlines key literacies and technical skills such as critical thinking, global and cultural awareness, and technology literacy\* that are critical for students to develop to live and work in an interconnected global economy.”
- **Climate Change:** The state of New Jersey has mandated instruction in, “Climate Change across all content areas, leveraging the passion students have shown for this critical issue and providing them opportunities to develop a deep understanding of the science behind the changes and to explore the solutions our world desperately needs.”

5. **\*Amistad Law: N.J.S.A. 18A 52:16A-88:**

- The inclusion of lessons and resources/texts dealing with the African slave trade, slavery in America, the vestiges of slavery in this country and the contributions of African-Americans to our society will be implemented in English and Social Studies courses in accordance with state law: “Every board of

education shall incorporate the information regarding the contributions of African-Americans to our country in an appropriate place in the curriculum of elementary and secondary school students.”

6. **\*Holocaust Law: N.J.S.A. 18A 35-28:**

- The inclusion of lessons and resources/texts that enable pupils to identify and analyze applicable theories concerning human nature and behavior; to understand that genocide is a consequence of prejudice and discrimination; and to understand that issues of moral dilemma and conscience have a profound impact on life will be implemented in English and Social Studies courses in accordance with state law: “Every board of education shall include instruction on the Holocaust and genocides in an appropriate place in the curriculum of all elementary and secondary school pupils. The instruction shall further emphasize the personal responsibility that each citizen bears to fight racism and hatred whenever and wherever it happens.”

7. **\*LGBT and Disabilities Law: N.J.S.A. 18A:35-4.35:**

- A transformative approach to the inclusion of lessons and resources/texts on the contributions and issues concerning the LGBTQ+ population and people with disabilities will be implemented across all core subjects in accordance with state law: “A board of education shall include instruction on the political, economic, and social contributions of persons with disabilities and lesbian, gay, bisexual, and transgender people, in an appropriate place in the curriculum of middle school and high school students as part of the district’s implementation of the New Jersey Student Learning Standards (N.J.S.A.18A:35-4.36). A board of education shall have policies and procedures in place pertaining to the selection of instructional materials to implement the requirements of N.J.S.A. 18A:35-4.35.”

8. **Asian American and Pacific Legislation: N.J.S.A 4021/A6100:**

- The inclusion of lessons and resources/texts on the history and contributions of Asian Americans and Pacific Islanders, will enable New Jersey’s schools to provide a curriculum that reflects the diversity of our state. In accordance with state law: “A board of education shall include instruction on the history and contributions of Asian Americans and Pacific Islanders in an appropriate place in the curriculum of students in grades kindergarten through as part of the school district’s implementation of the New Jersey Student Learning Standards in Social Studies.”

9. Acquisition/development/refinement of the higher-order critical thinking skills aligned with the *Revised Bloom’s Taxonomy of Cognitive Objectives*

### **Section III: Curriculum Modifications**

The *Forensic Science* curriculum is subject to case-by-case modifications to support/advance the needs of all students, including special education students, English language learners, gifted students, and those at risk of school failure. These modifications are based on Individualized Learning Programs (IEPs), recommendations made by the district’s Multi Language Learners (MLL) coordinator, feedback from members of the Intervention & Referral Services Team (*I&RS*) for at-risk students, and 504 Plans.

Coursework and assessments will be modified on an individual basis for students when necessary. Modifications may include but are not limited to those outlined on the [Modifications/Accommodations for Science Courses](#) chart.

### **Section IV: Preparation for Standardized Testing**

Instruction in *Forensic Science* is aligned with the requirements of state and national standardized assessments, including the *NJSLA*, the *ACT*, the *PSAT* and the *SAT*.

### **Section V: Curriculum Pacing Guide**

| Curriculum Pacing Guide                  |                                |
|------------------------------------------|--------------------------------|
| Course Title: <i>Forensic Science</i>    | Grade Level: 10th - 12th Grade |
| Unit I: Introduction to Forensic Science | Weeks 1-2                      |

|                                                         |             |
|---------------------------------------------------------|-------------|
| <b>Unit II: Crime Scene Analysis</b>                    | Weeks 3-4   |
| <b>Unit III: Trace Evidence</b>                         | Weeks 5-7   |
| <b>Unit IV: Fingerprinting and Handwriting Analysis</b> | Weeks 8-10  |
| <b>Unit V: DNA</b>                                      | Weeks 11-13 |
| <b>Unit VI: Serology and Blood Spatter Analysis</b>     | Weeks 13-15 |
| <b>Unit VII: Death Investigation</b>                    | Weeks 16-18 |
| <b>Unit VIII: Final Project</b>                         | Weeks 19-20 |

### **Section VI: Technology Skills**

Students in *Forensic Science* will use previously learned technology skills from core science courses.

### **Section VII: Primary Texts and Year-Long Instructional Resources**

The following texts and instructional resources are employed in *Forensic Science*:

- *Common Sense Education* ([www.commonsense.org](http://www.commonsense.org))
- Texas CTE <https://www.txcte.org/resource/scope-and-sequence-forensic-science>)
- Forensic Science Fundamentals and Investigations 2nd edition by Bertino & Bertino
- MindTap for Forensic Science: Fundamentals and Investigations 2nd edition
- *Forensic Science Today*, 2nd Edition by Dr. Henry C. Lee, George M. Taft, Kimberly A. Taylor, Jeanette Hencken
- projectinnocence.com
- pbs.org
- investigationdiscovery.com/investigation/forensics/forensics
- fbi.gov
- eskeletons.org
- <https://www.nist.gov/topics/forensic-science>
- <https://www.youtube.com/user/CJCareers>
- <http://www.gavirtuallearning.org/Resources/SharedForensicScience.aspx>
- Hemospat Demo
- HHMI Biointeractive
- Forensic Files
- Ward's lab kits
- Various websites, case studies, current event articles, and videos

### **Section VIII: Grading Formula and Assessment Modes**

Marking period grades in *Forensic Science* are determined via a percentage weighting model. The specific grading categories and weightings of each will be determined before the start of each academic year and will be published in the posted/distributed course syllabi.

### **Section IX: Unit Templates**

The following unit templates have been established for the *Forensic Science* curriculum by the *Forensic Science* instructional team:

| Unit I: Introduction to Forensic Science                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                      |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|
| Unit Summary                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                      |
| In this unit, students will explore the history, legal aspects, and career options within forensic science. Students will identify and illustrate roles, functions, and responsibilities of different forensic science disciplines such as serology-DNA, trace evidence, fingerprints, and questioned documents, and research and discuss the history of forensic science as well as major contributors in the development of forensic science. Students will compare and contrast the roles of forensic scientists and crime scene investigators. Students will separate fact from fiction by identifying errors and false information that is portrayed by fictitious forensic scientists and criminal investigators as seen on television and in movies. |                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                      |
| Standards/Core Ideas/Performance Expectations                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                      |
| The state standards outlined below, and established by the New Jersey Department of Education, will guide instruction throughout this unit in <i>Forensic Science</i> :                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                      |
| <ul style="list-style-type: none"><li>• 2026 New Jersey Student Learning Standards: Science<ul style="list-style-type: none"><li>◦ HS-ETS1-3</li></ul></li><li>• 2023 New Jersey Student Learning Standards: English Language Arts Grades 11-12<ul style="list-style-type: none"><li>◦ RI.CI.11-12.2, RI.CT.11-12.8, W.IW.11-12.2, SL.PE.11-12.1-2, SL.PE.11-12.8</li></ul></li><li>• 2020 New Jersey Student Learning Standards: Computer Science and Design Thinking<ul style="list-style-type: none"><li>◦ 8.2.12.EC.1</li></ul></li><li>• 2020 New Jersey Student Learning Standards: Career Readiness, Life Literacies and Key Skills<ul style="list-style-type: none"><li>◦ 9.4.12.CI.2-3</li></ul></li></ul>                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                      |
| Unit Essential Questions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Unit Enduring Understandings                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                      |
| <ul style="list-style-type: none"><li>• What skills are important to have in forensic science?</li><li>• How is eyewitness testimony useful to forensic scientists?</li><li>• How is deductive reasoning used in forensic science?</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <ul style="list-style-type: none"><li>• Forensic scientists must be able to observe, interpret, and report observations clearly. They must also be able to determine the significance of evidence.</li><li>• Eyewitness testimony can help police and investigators gain additional evidence but cannot be used to solely convict an individual.</li><li>• Deductive reasoning is used to derive consequences from facts using logical reasoning.</li></ul> |                                                                                                                      |
| Evidence of Learning                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                      |
| <b>Formative &amp; Alternative Assessments:</b> <ul style="list-style-type: none"><li>• Classwork</li><li>• Homework</li><li>• Performance activities/labs</li><li>• Case study assignments</li><li>• Presentations</li><li>• Discussions</li><li>• Current event article/documentary assignments</li><li>• Innocence Project Research</li><li>• One-Eyed Jack</li></ul>                                                                                                                                                                                                                                                                                                                                                                                    | <b>Benchmark &amp; Summative Assessments:</b> <ul style="list-style-type: none"><li>• Topic Quizzes</li><li>• Unit Tests</li><li>• Projects</li></ul>                                                                                                                                                                                                                                                                                                       | <b>Resources Needed:</b> <ul style="list-style-type: none"><li>• Lab/activity materials</li><li>• Computer</li></ul> |

| <b>Unit II: Crime Scene Analysis</b>                                                                                                                                                                                                |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Unit Summary</b>                                                                                                                                                                                                                 |
| In this unit, students will learn the procedures of collecting evidence and demonstrate those skills through various activities. Students will work together to conduct a systematic search of a simulated crime scene for physical |

evidence following crime scene search patterns such as spiral, line, grid, and strip, outline the chain-of-custody procedure for evidence discovered in a crime scene, demonstrate proper techniques for collecting, marking, photographing, packaging, and preserving physical evidence found at a crime scene, and develop a crime scene sketch using coordinates/measurements from fixed points. Students will analyze and describe the elements of their crime scene sketches, such as measurements, compass directions, scale of proportion, legend-key, and title.

#### Standards/Core Ideas/Performance Expectations

The state standards outlined below, and established by the New Jersey Department of Education, will guide instruction throughout this unit in *Forensic Science*:

- 2026 New Jersey Student Learning Standards: Science
  - HS-ETS1-2-3
- 2023 New Jersey Student Learning Standards: English Language Arts Grades 11-12
  - RI.CI.11-12.2, RI.CT.11-12.8, W.IW.11-12.2, SL.PE.11-12.1-2, SL.PE.11-12.8
- 2020 New Jersey Student Learning Standards: Computer Science and Design Thinking
  - 8.2.12.EC.1
- 2020 New Jersey Student Learning Standards: Career Readiness, Life Literacies and Key Skills
  - 9.4.12.CI.1, 9.4.12.CT.1-2

#### Unit Essential Questions

- What are the steps of the investigative process?
- Why is maintaining the chain of custody important?
- Why is the proper collection of evidence crucial to an investigation?
- What are the different types of evidence?
- How did the Daubert and Frye rulings affect the presentation of forensic evidence in court?

#### Unit Enduring Understandings

- The steps of the investigative process include the following: securing the scene, separating witnesses, scanning the scene, seeing the scene, sketching the scene, searching the scene, and securing and collecting evidence.
- It is important to establish and keep a chain of custody to ensure the integrity of the evidence.
- Evidence is needed to determine the method by which a crime has been committed.
- Evidence can be categorized as circumstantial or direct and individual or class.
- The Daubert and Frye rulings established standards that govern what is admissible in court, what is considered science, and recognize that science changes.

#### Evidence of Learning

##### Formative & Alternative Assessments:

- Classwork
- Homework
- Performance activities/labs
- Case study assignments
- Presentations
- Discussions
- Current event Article/documentary assignments
- Searching and Sketching the Scene Lab
- Photographing the Scene Lab
- The Case of Hester Higginbotham Lab

##### Benchmark & Summative Assessments:

- Topic Quizzes
- Unit Tests
- Projects

##### Resources Needed:

- Lab/activity materials
- Computer

### Unit III: Trace Evidence

#### Unit Summary

There are specific methods students need to learn about processing and analyzing trace evidence commonly found in a crime scene. In this unit, students will participate in “hands-on” activities and simulations to learn and demonstrate trace evidence processing and analysis techniques.

#### Standards/Core Ideas/Performance Expectations

The state standards outlined below, and established by the New Jersey Department of Education, will guide instruction throughout this unit in *Forensic Science*:

- 2026 New Jersey Student Learning Standards: Science
  - HS-ETS1-3
- 2023 New Jersey Student Learning Standards: English Language Arts Grades 11-12
  - RI.CI.11-12.2, RI.CT.11-12.8, W.IW.11-12.2, SL.PE.11-12.1-2, SL.PE.11-12.8
- 2020 New Jersey Student Learning Standards: Computer Science and Design Thinking
  - 8.2.12.EC.3
- 2020 New Jersey Student Learning Standards: Career Readiness, Life Literacies and Key Skills
  - 9.4.12.CI.1, 9.4.12.CT.1-2

| Unit Essential Questions                                                                                                                                                                                                                                                                                                                                                                              | Unit Enduring Understandings                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>● What is Locard's Principle?</li> <li>● What are some types of trace evidence?</li> <li>● What key pieces of information can be obtained from microscopic examination of hair?</li> <li>● What type of evidence is hair?</li> <li>● How can different types of fibers be distinguished and identified?</li> <li>● How is trace evidence collected?</li> </ul> | <ul style="list-style-type: none"> <li>● Locard's Principle is a basic tenet of forensic science that says every contact leaves a trace.</li> <li>● Trace evidence can include hairs, fibers, soil, glass, pollen, and gunshot residue.</li> <li>● A microscope can be used to determine the medulla pattern and width, pigmentation, and scale pattern.</li> <li>● Hair evidence is considered circumstantial evidence. It also serves as class evidence if it is found without the follicle and individual evidence with the follicle.</li> <li>● Fibers can be analyzed microscopically, chemically, and by burning.</li> <li>● Trace evidence is collected by plucking, shaking, and scraping surfaces.</li> </ul> |

#### Evidence of Learning

| Formative & Alternative Assessments:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Benchmark & Summative Assessments:                                                                          | Resources Needed:                                                                              |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>● Classwork</li> <li>● Homework</li> <li>● Performance activities/labs</li> <li>● Case study assignments</li> <li>● Presentations</li> <li>● Discussions</li> <li>● Current event article/documentary assignments</li> <li>● Locard's principle lab</li> <li>● The Case of the Missing Quiz Lab</li> <li>● Matchbook Lab</li> <li>● Hair Identification Lab</li> <li>● Bear Attack Lab</li> <li>● Fiber Burn Test Lab</li> <li>● Glass Lab</li> <li>● Forensic Art Case Study</li> </ul> | <ul style="list-style-type: none"> <li>● Topic Quizzes</li> <li>● Unit Tests</li> <li>● Projects</li> </ul> | <ul style="list-style-type: none"> <li>● Lab/activity materials</li> <li>● Computer</li> </ul> |

#### Unit IV: Fingerprinting and Handwriting Analysis

##### Unit Summary

In this unit, students will participate in "hands-on" activities and occupational task simulations to learn and compare the three major fingerprint patterns of arches, loops, and whorls and their respective subclasses, identify minutiae of fingerprints, including bifurcations, ending ridges, islands, dots, short ridges, and enclosures, and distinguish among patent, plastic, and latent impressions. In addition, students will perform laboratory procedures for lifting latent prints on porous and nonporous objects using chemicals such as iodine and ninhydrin, as well as perform laboratory procedures for lifting latent prints on nonporous objects using fingerprint powders such as black powder and fluorescent powders. In classroom discussions and/or brief presentations, students will compare impression evidence

collected at a simulated crime scene with the known impression, explain the Automated Fingerprint Identification System (AFIS), and describe the characteristics examined in AFIS. Students will be given opportunities to examine samples as well as perform handwriting comparisons of an unknown sample with examples by analyzing characteristics such as letter, line, and formatting. Students will learn and describe different types of examinations performed by a questioned document examiner in a forensic laboratory, including counterfeiting, handwriting, ink, and paper analysis, the security features incorporated in the U.S. currency to prevent counterfeiting, and the process of ink analysis using chromatography.

#### Standards/Core Ideas/Performance Expectations

The state standards outlined below, and established by New Jersey Department of Education, will guide instruction throughout this unit in *Forensic Science*:

- 2026 New Jersey Student Learning Standards: Science
  - HS-ETS1-2, HS-PS1-2, HS-LS1-1-2
- 2023 New Jersey Student Learning Standards: English Language Arts Grades 11-12
  - RI.CI.11-12.2, RI.CT.11-12.8, W.IW.11-12.2, SL.PE.11-12.1-2, SL.PE.11-12.8
- 2020 New Jersey Student Learning Standards: Computer Science and Design Thinking
  - 8.1.8.DA.1 & 5, 8.2.12.EC.3
- 2020 New Jersey Student Learning Standards: Career Readiness, Life Literacies and Key Skills
  - 9.4.12.CI.1, 9.4.12.CT.1-2

#### Unit Essential Questions

- How are fingerprints different between individuals?
- How are fingerprints related to forensic science and criminal investigation?
- What technological resources are available to law enforcement to identify unknown fingerprints recovered at a crime scene?
- What is document analysis, and what role does it play in forensic investigation?

#### Unit Enduring Understandings

- Fingerprints have various ridge patterns that are unique to each individual, which permit them to be systematically classified. A fingerprint remains unchanged during a person's lifetime.
- A fingerprint analyst compares common ridge patterns and minutiae patterns between suspect prints and evidence prints.
- Several methods can be used to identify unknown prints at a crime scene, including powders/dusting, RUVIS, iodine fuming, superglue fuming, and ninhydrin reaction.
- Document analysis includes the examination of any document that has handwriting, a written mark, type, or any paper and ink with uncertain authenticity. Document analysis can provide class and individual evidence.

#### Evidence of Learning

##### Formative & Alternative Assessments:

- Classwork
- Homework
- Performance activities/labs
- Case study assignments
- Presentations
- Discussions
- Current event article/documentary assignments
- The Case of the Missing Soda Lab
- Handwriting Analysis Lab
- Ink Chromatography Lab
- Sealed with a Kiss Lab

##### Benchmark & Summative Assessments:

- Topic Quizzes
- Unit Tests
- Projects

##### Resources Needed:

- Lab/activity materials
- Computer

#### Unit V: DNA

##### Unit Summary

In this unit, students will learn and describe the structure of a DNA molecule and its function, learn and describe the steps used in the extraction of DNA, learn and explain the analytical procedure for forensic DNA typing, including

electrophoresis, polymerase chain reaction, and short tandem repeat, and discuss and interpret the components of an electropherogram.

#### Standards/Core Ideas/Performance Expectations

The state standards outlined below, and established by the New Jersey Department of Education, will guide instruction throughout this unit in *Forensic Science*:

- 2026 New Jersey Student Learning Standards: Science
  - HS-ETS1-2, HS-LS1-1
- 2023 New Jersey Student Learning Standards: English Language Arts Grades 11-12
  - RI.CI.11-12.2, RI.CT.11-12.8, W.IW.11-12.2, SL.PE.11-12.1-2, SL.PE.11-12.8
- 2020 New Jersey Student Learning Standards: Computer Science and Design Thinking
  - 8.1.8.DA.1 & 5, 8.2.12.EC.1 & 3, 8.2.12.ETW.2
- 2020 New Jersey Student Learning Standards: Career Readiness, Life Literacies and Key Skills
  - 9.4.12.CI.1, 9.4.12.CT.1

#### Unit Essential Questions

- What type of evidence is DNA, and how is it useful in a forensic investigation?
- What are the applications of DNA fingerprinting?
- How is DNA evidence compared for matching?
- How is crime scene evidence collected and processed to obtain DNA for analysis?
- How can forensic genetic genealogy be used?

#### Unit Enduring Understandings

- DNA is unique for every individual on the planet.
- Applications include identifying potential suspects and victims of crime, paternity testing, identification of victims of mass disasters, exonerating the wrongfully convicted, and matching organ donors.
- DNA is compared for matching using DNA profiling. This process involves analyzing specific regions of an individual's DNA to create a unique genetic profile, which can then be compared to other DNA samples to determine if they match.
- Evidence is collected and processed to obtain DNA for analysis in the following steps: sample collection, isolation and purification, amplification, targeted region analysis, electrophoresis, data interpretation, matching and comparing, and statistical analysis.
- Forensic genetic genealogy can be used to identify familial relationships associated with a DNA sample. This technique has been used to identify and convict the suspects in the Golden State Killer and Idaho murder cases.

#### Evidence of Learning

##### Formative & Alternative Assessments:

- Classwork
- Homework
- Performance activities/labs
- Case study assignments
- Presentations
- Discussions
- Current event article/documentary assignments
- Rainbow Electrophoresis Lab
- Wrongfully Convicted Lab
- Shark Attack Lab
- Genetic Genealogy Lab

##### Benchmark & Summative Assessments:

- Topic Quizzes
- Unit Tests
- Projects

##### Resources Needed:

- Lab/activity materials
- Computer

### Unit VI: Serology and Blood Spatter Analysis

#### Unit Summary

In this unit, students will learn serology laboratory procedures and research methodologies used to collect and analyze blood and other body fluids. Students will explain and demonstrate crime laboratory procedures to determine if a stain detected in a crime scene is blood and identify the red blood cell antigens and antibodies as they relate to human blood types. Students in this unit will learn how to analyze blood spatter as well as identify invisible blood stains at a simulated crime scene. Students will explain the method of chemically identifying and locating an invisible

blood stain using reagents such as luminol and analyze blood stain patterns based on source, direction, and angle of trajectory.

### Standards/Core Ideas/Performance Expectations

The state standards outlined below, and established by the New Jersey Department of Education, will guide instruction throughout this unit in *Forensic Science*:

- 2026 New Jersey Student Learning Standards: Science
  - HS-ETS1-2, HS-PS1-2, HS-PS2-1, HS-LS3-3
- 2023 New Jersey Student Learning Standards: English Language Arts Grades 11-12
  - RI.CI.11-12.2, RI.CT.11-12.8, W.IW.11-12.2, SL.PE.11-12.1-2, SL.PE.11-12.8
- 2020 New Jersey Student Learning Standards: Computer Science and Design Thinking
  - 8.2.12.EC.1
- 2020 New Jersey Student Learning Standards: Career Readiness, Life Literacies and Key Skills
  - 9.4.12.CT.2

### Unit Essential Questions

- What type of evidence is blood?
- What is the composition of blood and the functions of the blood components?
- What determines blood type and how is it used in forensic science?
- What information can be obtained from serological screening and testing?
- What is a presumptive test and what are some examples of presumptive tests?
- How can blood spatter patterns be used to reconstruct a crime scene?

### Unit Enduring Understandings

- Blood type is considered class evidence, but DNA obtained from a blood sample is individual evidence.
- Blood is composed of plasma, platelets, white blood cells, and red blood cells.
- ABO blood types and Rh factor are used to determine blood type. A blood type may be used for exclusion of individuals but cannot be used for individual identification.
- Serological testing can determine blood, saliva, semen, and other body fluids; DNA analysis using body fluids, toxicology, paternity testing; blood typing, and blood-borne diseases.
- Presumptive tests used to characterize a stain as blood (may include): Kastle-Meyer Test, LeucoMalachite Green, and Luminol, Hemastix. Confirmatory testing for heme/species blood (may include): Precipitin Test, Takayama Crystals, and Teichmann Test.
- Blood spatter analysis can be used to determine the angle of impact, point of origin, height, directionality, type of weapon used, and velocity of blood movement.

### Evidence of Learning

#### Formative & Alternative Assessments:

- Classwork
- Homework
- Performance activities/labs
- Case study assignments
- Presentations
- Discussions
- Current event article/documentary assignments
- Serology Lab
- Blood Typing “Whodunit” Lab
- Blood Spatter Lab

#### Benchmark & Summative Assessment:

- Topic Quizzes
- Unit Tests
- Projects

#### Resources Needed:

- Lab/activity materials
- Computer

## Unit VII: Death Investigation

### Unit Summary

In this unit, students will learn to identify the major bones of the skeletal system as well as how to differentiate between human and animal bones. Students will also participate in class discussions and presentations that describe the techniques used to excavate bones from a crime scene, explain the characteristics of the human skeletal system indicative of specific gender, racial origin, and approximate range of age and height, and explain the role of dental records in identification of human remains. Calculating time and cause of death is vital for some crime scene

investigations. In this unit, students will learn the science behind body decomposition and how to determine cause of death. Students will explain the process and timeline of rigor mortis and its role in calculating time of death, explain post-mortem lividity and its importance when processing a crime scene, determine time of death using entomology, and determine time and cause of death through case studies.

#### Standards/Core Ideas/Performance Expectations

The state standards outlined below, and established by the New Jersey Department of Education, will guide instruction throughout this unit in *Forensic Science*:

- 2026 New Jersey Student Learning Standards: Science
  - HS-ETS1-2, HS-LS1-1&4, HS-PS1-5, HS-PS3-4
- 2023 New Jersey Student Learning Standards: English Language Arts Grades 11-12
  - RI.CI.11-12.2, RI.CT.11-12.8, W.IW.11-12.2, SL.PE.11-12.1-2, SL.PE.11-12.8
- 2020 New Jersey Student Learning Standards: Computer Science and Design Thinking
  - 8.1.8.DA.1 & 5, 8.2.12.EC.1 & 3
- 2020 New Jersey Student Learning Standards: Career Readiness, Life Literacies and Key Skills
  - 9.4.12.CI.1&2, 9.4.12.CT.1-2

#### Unit Essential Questions

- How are the manner, mechanism, cause, and time of death determined?
- What can be determined by analyzing skeletal remains?

#### Unit Enduring Understandings

- Students will understand the value of experimentation and innovation.
- The Medical Examiner/Forensic Pathologist, Forensic Toxicologist, and Forensic Entomologist conduct the autopsy procedure and report manners, causes, mechanisms, and time of death. They look for the following: rigor mortis, livor mortis, algor mortis, stages of human decomposition, changes of the eye, stomach contents, insect activity.
- The following can be determined by analyzing skeletal remains: age, gender, race, height determination, facial reconstruction, skeletal trauma analysis, DNA evidence.

#### Evidence of Learning

##### Formative & Alternative Assessments:

- Classwork
- Homework
- Performance activities/labs
- Case study assignments
- Presentations
- Discussions
- Current event article/documentary assignments
- Toxicology Lab
- Autopsy Lab
- Decomposition Lab
- Entomology Lab

##### Benchmark & Summative Assessment:

- Topic Quizzes
- Unit Tests
- Projects

##### Resources Needed:

- Lab/activity materials
- Computer

### Unit VIII: Final Project

#### Unit Summary

For the final unit of this course, students will use the accumulation of information and knowledge they've gained throughout the course to complete a final project. The final project will demonstrate their understanding of various concepts in forensic science. Students will have a choice as to which project they'd like to complete.

#### Standards/Core Ideas/Performance Expectations

The state standards outlined below, and established by the New Jersey Department of Education, will guide instruction throughout this unit in *Forensic Science*:

- 2026 New Jersey Student Learning Standards: Science
  - HS-ETS1-2
- 2023 New Jersey Student Learning Standards: English Language Arts Grades 11-12
  - RI.CI.11-12.2, RI.CT.11-12.8, W.IW.11-12.2, SL.PE.11-12.1-2, SL.PE.11-12.8

| <ul style="list-style-type: none"><li>● 2020 New Jersey Student Learning Standards: Computer Science and Design Thinking<ul style="list-style-type: none"><li>○ 8.2.12.EC.1 &amp; 3</li></ul></li><li>● 2020 New Jersey Student Learning Standards: Career Readiness, Life Literacies and Key Skills<ul style="list-style-type: none"><li>○ 9.4.12.CI.1, 9.4.12.CT.2</li></ul></li></ul> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                 |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|
| Unit Essential Questions                                                                                                                                                                                                                                                                                                                                                                 | Unit Enduring Understandings                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                 |
| <ul style="list-style-type: none"><li>● How do various topics in Forensic Science, i.e., evidence processing and collection, evidence analysis, historical case analysis, arson investigation, and miscellaneous crime scene investigation techniques, work together to help authorities solve crimes and keep the public safe?</li></ul>                                                | <ul style="list-style-type: none"><li>● Forensic science relies on a variety of tried and true scientific processes and techniques used by detectives, scientists, and other law enforcement professionals in order to solve crimes in an effort to keep the public safe.<ul style="list-style-type: none"><li>○ Murder in Miniature: Demonstrate understanding of processing, collection, and use of physical evidence found at a crime scene through the creation of a diorama depicting a crime of choice</li><li>○ Innocence Project: Demonstrate understanding of how current evidence analysis techniques can be used to re-evaluate previous criminal convictions.</li><li>○ Serial Killer Research and Presentation: Demonstrate understanding of historical serial killer cases and the forensic evidence collected and analyzed.</li><li>○ Arson Investigation: Demonstrate understanding of how a fire investigation is conducted and how investigators determine if an arson crime was committed.</li><li>○ True Crime Podcast: Demonstrate understanding of a real-life crime investigation and the forensic tools and techniques used to evaluate evidence</li></ul></li></ul> |                                                                                                                 |
| Evidence of Learning                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                 |
| <b>Formative &amp; Alternative Assessments:</b> <ul style="list-style-type: none"><li>● Classwork</li><li>● Homework</li></ul>                                                                                                                                                                                                                                                           | <b>Benchmark &amp; Summative Assessment:</b> <ul style="list-style-type: none"><li>● Presentation/Project</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <b>Resources Needed:</b> <ul style="list-style-type: none"><li>● Project materials</li><li>● Computer</li></ul> |

### Section X: Unit Reflection

The *Forensic Science* instructional team must confer upon the completion of each instructional unit in *Forensic Science* and rate the degrees to which the instructional units meet performance criteria established by the New Jersey Department of Education using the Unit Reflection Form. Completed unit reflection forms should be used by the instructional team for future modifications within the *Forensic Science* curriculum.

| Unit Reflection Form: Forensic Science                                                                                                                |          |            |        |
|-------------------------------------------------------------------------------------------------------------------------------------------------------|----------|------------|--------|
| Lesson Activities:                                                                                                                                    | Strongly | Moderately | Weakly |
| Foster student use of technology as a tool to develop critical thinking, creativity, and innovation skills;                                           |          |            |        |
| Are challenging and require higher-order thinking and problem-solving skills;                                                                         |          |            |        |
| Allow for student choice;                                                                                                                             |          |            |        |
| Provide scaffolding for acquiring targeted knowledge/skills;                                                                                          |          |            |        |
| Integrate modern, global perspectives, especially those regarding diversity, genocide, global issues, and historical ones regarding racial relations; |          |            |        |
| Integrate 21 <sup>st</sup> century skills;                                                                                                            |          |            |        |
| Provide opportunities for interdisciplinary connection and transfer of knowledge and skills;                                                          |          |            |        |

|                                                                                                                       |  |  |  |
|-----------------------------------------------------------------------------------------------------------------------|--|--|--|
| Are varied to address different student learning styles and preferences;                                              |  |  |  |
| Are differentiated based on student needs;                                                                            |  |  |  |
| Are student-centered with teacher acting as a facilitator and co-learner during the teaching and learning process;    |  |  |  |
| Provide means for students to demonstrate knowledge and skills and progress in meeting learning goals and objectives; |  |  |  |
| Provide opportunities for student reflection and self-assessment;                                                     |  |  |  |
| Provide data to inform and adjust instruction to better meet the varying needs of learners.                           |  |  |  |

### **Appendix** ***Writing Instruction and the RFH Community***

Writing instruction should happen across the RFH Community. Writing across the curriculum is a philosophy that advances the belief that writing is a method of learning. Since all departments are committed to helping students learn, writing must be used as a methodology to advance student learning.

Each academic discipline has its own unique conventions, formats and structures. It is the responsibility of each department to agree upon domain-specific writing praxes, model them for students, and require them to utilize them on a consistent basis. Students must understand that acceptable writing in one domain may not be acceptable writing in another area. The development of domain-specific writing skills supports the overall development of the student writer because all writing is grounded in the writing situation: audience, context, purpose, subject, and writer. Representatives from the academic disciplines must share their domain-specific writing praxes with each other, identify intersections, and determine how to address perceived gaps that limit student learning.

Students must experience writing situations that help them learn how to think creatively and critically and communicate effectively in the academic disciplines. Writing instruction, regardless of the academic discipline, must always reinforce student understanding of the writing situation. When students experience writing situations, they must study examples of domain-specific writing in order to understand how writers communicate in discipline-related contexts. This does not mean information embedded in textbooks. Domain-specific writing is writing that is used to inform and influence readers as it draws them into an established circle of discourse. Students must use these non-fiction texts to develop the close reading skills that will shape their own writing. Focused engagement with domain-specific writing should not be limited to basic reading comprehension and topical understanding. It must also include the analysis of the writing situation that is represented in the text: audience, context, purpose, subject, and writer. The close reading of well-written texts—regardless of the domain—will show students the importance of writing mechanics, diction, and syntax. The development of close reading skills will also help the students grow in terms of their ability to construct and advance independent and original claims that are well-supported by evidence. Domain-specific writing is grounded in the positioning of claims and the effective use of evidence.

The final written product is important; nevertheless, the learning that results in this production must not be devalued. The writing process is not limited to the basic steps of planning, drafting, revising, and editing/proofreading. It is a complex sequence of critical and creative thinking and writing that leads to the production of a text that provides evidence of learning and understanding. Students must ultimately develop the ability to self-assess the effectiveness of their writing as a representation of the writing situation. Without the use of models that evidence learning and understanding, students will not develop the ability to self-assess their own work—the true outcome of the writing process.

#### **What types of writing situations should RFH students engage in?**

RFH students should engage in writing situations across the curriculum that require them to:

- write to improve mechanical proficiency, diction usage, and syntactical sophistication
- write to narrate, describe, and reflect
- write to summarize and report

- write to classify and define
- write to explain how process leads to an outcome
- write to compare, contrast and evaluate
- write to speculate on cause and effect
- write to propose solutions and solve problems
- write to analyze

These writing situations should be positioned in a coordinated, developmental sequence that extends across the academic disciplines.

Upon Completion of Grade 12, RFH students must be ready to transition to the following writing situations:

- write to analyze
- write to persuade (argument)

The core focus of first-year college writing courses are analysis and argument. These courses orient the students to the demands and expectations of writing for the academic culture of college. At colleges/universities with carefully coordinated writing programs, students must demonstrate proficiency in analysis and argument before they transition to upper level courses that require them to engage in the following writing situation:

- write to investigate (research)