FORENSIC SCIENCE CURRICULUM

Course 18101

Forensic science is designed to provide a basic foundation in the field of criminalistics to students who are interested in the use of science to solve crimes. It will provide an introduction to the application of scientific methods for the examination of physical evidence in the criminal justice system. This course will include, but is not limited to, fingerprints, DNA, genetics, evidence collection and insect reproduction and growth patterns. This course will also include discussions on how popular culture has affected forensics from a legal, science and a perpetrator's point of view. The prerequisite for the course is proficiency on the Biology Keystone Exam or completion of the Keystone Biology course.

FORENSIC SCIENCE OUTLINE:

Goals	Skills	Summative Assessments	Time Frame	Main Resources
• Understand the basic types of laws in the criminal justice system. • Describe the different types of forensic evidence. • Know the characteristics of each type of forensic evidence that are used to provide useful information. • Examine and determine the characteristics of various forensic evidence that provide useful information. • Explain the relationship between modern media and the field of forensic science.	• Search for, record, collect and package evidence at a mock crime scene using proper forensic procedure. • Use appropriate tools to effectively examine and analyze forensic evidence.	End of Lesson Exams	1/2-year	Forensic Science for High School

FORENSIC SCIENCE MAP:

TIME FRAME	BIG IDEAS	CONCEPTS	ESSENTIAL QUESTIONS	STANDARDS	OBJECTIVES	DIFFERENTIATION	ASSESSMENT
Unit 1: Introduction to Forensic Science (Week 1)	• Forensic science is the study and application of science to matters of law.	1. The growth and development of forensic science through history. 2. The use of the scientific method in forensic science. 3. The seven types of laws in the United States.	• What is forensic science? • How does a crime lab work? • How does criminal justice and the law tie into forensic science?	3.1.10.B4 Explain how genetic technologies have impacted the fields of medicine, forensics, and agriculture. 3.1.B.B4 Explain how genetic technologies have impacted the fields of medicine, forensics, and agriculture BIO.B.2.4.1 Explain how genetic engineering has impacted the fields of medicine, forensics, and agriculture (e.g., selective breeding, gene splicing, cloning, genetically modified organisms, gene therapy). S11.A.1.2.1 Explain and apply scientific concepts to societal issues using case studies (e.g., spread of HIV, deforestation, environmental health, energy). S11.A.1.2.2 Use case studies (e.g., Wright brothers' flying machine, Tacoma Narrows Bridge, Henry Petroski's Design Paradigms) to propose possible solutions and analyze economic and environmental implications of solutions for real-world problems. S11.A.2.2.1 Evaluate appropriate methods, instruments, and scale for precise quantitative and qualitative observations (e.g., to compare properties of materials, water quality) S11.A.2.2.2 Explain how technology (e.g., GPS, spectroscope, scanning electron microscope, pH meter, probe, interface, imaging technology,	• Describe how the scientific method is used to solve forensic problems. • Describe different jobs done by forensic scientists and the experts they consult. • Understand the basic types of laws in the criminal justice system.	Students will be given the following: Preferential seating when applicable Study guides Guided notes when applicable Extended time for assignments when needed Separate testing environment when applicable	Daily assignments End of Lesson exams Labs and Classroom activities

				telescope) is used to extend human abilities and precision. S11.A.3.2.1 Compare the accuracy of predictions represented in a model to actual observations and behavior. S11.A.3.2.2 Describe advantages and disadvantages of using models to simulate processes and outcomes. S11.A.3.2.3 Describe how relationships represented in models are used to explain scientific or technological concepts (e.g., dimensions of objects within the solar system, life spans, size of atomic particles, topographic maps). S11.A.3.3.1 Describe or interpret recurring patterns that form the basis of biological classification, chemical periodicity, geological order, or astronomical order. S11.A.3.3.2 Compare stationary physical patterns (e.g., crystals, layers of rocks, skeletal systems, tree rings, atomic structure) to the object's properties. S11.A.3.3.3 Analyze physical patterns of motion to make predictions or draw conclusions (e.g., solar system, tectonic plates, weather systems, atomic motion, waves). S11.B.2.1.1 Explain the theory of evolution by interpreting data from fossil records, similarities in anatomy and physiology, or DNA studies that are relevant to the theory of evolution. S11.B.2.1.2			

				Explain the role of mutations, differential reproduction, and gene recombination in changing the genetic makeup of a population. S11.B.2.1.3 Explain the role of selective breeding and biotechnology in changing the genetic makeup of a population. S11.B.2.1.4 Explain why natural selection can act only on inherited traits. S11.B.2.2.1 Describe how genetic information is expressed (i.e., DNA, genes, chromosomes, transcription, translation, and replication). S11.B.2.2.2 Compare and contrast mitosis and meiosis in passing on genetic information. S11.B.2.2.3 Explain how different patterns of inheritance affect population variability (i.e., multiple alleles, codominance, dominance, recessiveness, sex-influenced traits, and sex-linked traits).			
Unit 2: Types of Evidence (Week 2)	• There are two main types of evidence; testimonial evidence and physical evidence.	1. The value of indirect and direct evidence in a court of law. 2. That eye witness accounts have limitations. 3. What physical evidence can and cannot prove in court. 4. That the forensic scientist's main goal is to find a unique source for the evidence.	• What is the difference between testimonial evidence and physical evidence? • What is the difference between class and individual evidence? • Where is physical evidence found and collected?	3.1.10.B4 Explain how genetic technologies have impacted the fields of medicine, forensics, and agriculture. 3.1.B.B4 Explain how genetic technologies have impacted the fields of medicine, forensics, and agriculture BIO.B.2.4.1 Explain how genetic engineering has impacted the fields of medicine, forensics, and agriculture (e.g., selective breeding, gene splicing, cloning, genetically modified organisms, gene therapy).	• Explain the difference between indirect and direct evidence. • Describe what is meant by physical evidence and give examples. • Tell individual evidence apart from class evidence. • Determine the significance of class evidence..	Students will be given the following: Preferential seating when applicable Study guides Guided notes when applicable Extended time for assignments when needed Separate testing environment when applicable	Daily assignments End of Lesson exams Labs and Classroom activities

Unit 3: Plant The Crime Scene (Weeks 3)	• Forensic science begins at the crime scene, which can provide useful information that must be carefully, systematically, scientifically, and legally collected.	1. The steps to take when processing a crime scene. 2. That the type of evidence determines what packaging should be used. 3. Why the chain of custody must be preserved.	• What types of evidence should be collected from a crime scene? • What steps should be taken to preserve the chain of custody?	3.1.10.B4 Explain how genetic technologies have impacted the fields of medicine, forensics, and agriculture. 3.1.B.B4 Explain how genetic technologies have impacted the fields of medicine, forensics, and agriculture BIO.B.2.4.1 Explain how genetic engineering has impacted the fields of medicine, forensics, and agriculture (e.g., selective breeding, gene splicing, cloning, genetically modified organisms, gene therapy).	• Isolate, record, and search for evidence at a mock crime scene. • Collect and package evidence at a mock crime scene using proper forensic procedure.	Students will be given the following: Preferential seating when applicable Study guides Guided notes when applicable Extended time for assignments when needed Separate testing environment when applicable	Daily assignments End of Lesson exams Labs and Classroom activities
Unit 4: Hair Analysis (Week 4)	• Hair is considered class evidence and is useful in backing up other circumstantial evidence, such as by placing someone at a crime scene.	1. Hair is class evidence. 2. Hair can be used to back up circumstantial evidence. 3. Hair absorbs and adsorbs substances both from within the body and from the external environment.	• How is human and animal hair different? • How is hair properly collected from a crime scene? • What is the form and structure of hair?	3.1.10.B4 Explain how genetic technologies have impacted the fields of medicine, forensics, and agriculture. 3.1.B.B4 Explain how genetic technologies have impacted the fields of medicine, forensics, and agriculture BIO.B.2.4.1 Explain how genetic engineering has impacted the fields of medicine, forensics, and agriculture (e.g., selective breeding, gene splicing, cloning, genetically modified organisms, gene therapy).	• Successfully use a compound microscope. • Describe the structure of hair. • Determine the difference between human and animal hair. • Determine the characteristics of hair that are important for forensic analysis. • Assess the probative value of hair samples. • Identify questions and ideas that guide scientific investigations. • Communicate and defend a scientific argument.	Students will be given the following: Preferential seating when applicable Study guides Guided notes when applicable Extended time for assignments when needed Separate testing environment when applicable	Daily assignments End of Lesson exams Labs and Classroom activities
Unit 5: Fiber Analysis (Week 5)	• Fibers are usually made up of twisted filaments that can be	1. How fibers can be used as circumstantial evidence to link the victim,	• Why are fibers classed as evidence? • Why is it difficult to	3.1.10.B4 Explain how genetic technologies have impacted the fields of medicine, forensics, and agriculture.	• Sample populations using statistical analysis.	Students will be given the following:	Daily assignments End of Lesson exams

	classified as either natural or artificial.	suspect, and crime scene. 2. Why statistics are important in determining the value of evidence.	individualize fiber to a particular textile fabric or garment? • What is polymerization ?	3.1.B.B4 Explain how genetic technologies have impacted the fields of medicine, forensics, and agriculture BIO.B.2.4.1 Explain how genetic engineering has impacted the fields of medicine, forensics, and agriculture (e.g., selective breeding, gene splicing, cloning, genetically modified organisms, gene therapy).	• Distinguish and identify different types of fibers. • Understand polymerization. • Judge the probative value of fiber evidence. • Design and carry out scientific investigations.	Preferential seating when applicable Study guides Guided notes when applicable Extended time for assignments when needed Separate testing environment when applicable	Labs and Classroom activities
Unit 6: Finger Print Analysis (Weeks 6-7)	• A fingerprint is an impression of the pattern of ridges on the last joint of a person's finger that is unique and consistent throughout a person's lifetime.	1. Why fingerprints are individual evidence. 2. Why there may be no fingerprints at a crime scene. 3. How computers have made personal identification easier.	• What is a fingerprint? • How is a fingerprint collected as evidence? • How are fingerprints identified by individual?	3.1.10.B4 Explain how genetic technologies have impacted the fields of medicine, forensics, and agriculture. 3.1.B.B4 Explain how genetic technologies have impacted the fields of medicine, forensics, and agriculture BIO.B.2.4.1 Explain how genetic engineering has impacted the fields of medicine, forensics, and agriculture (e.g., selective breeding, gene splicing, cloning, genetically modified organisms, gene therapy).	• Define the three basic properties that allow individual identification by fingerprints. • Obtain an inked, readable fingerprint for each finger. • Recognize the general ridge pattern and apply them to the primary Henry-FBI classification. • Tell the difference between latent, plastic and visible fingerprints. • Develop latent prints using physical and chemical methods.	Students will be given the following: Preferential seating when applicable Study guides Guided notes when applicable Extended time for assignments when needed Separate testing environment when applicable	Daily assignments End of Lesson exams Labs and Classroom activities
Unit 7 Trace Evidence (Weeks 8-9)	• Trace evidence is physical evidence found in small amounts at a crime scene	1. How to apply deductive reasoning to analytical data. 2. How to follow qualitative	• What are examples of trace evidence? • What methods are used to	3.1.10.B4 Explain how genetic technologies have impacted the fields of medicine, forensics, and agriculture. 3.1.B.B4	• Identify traces of white powder. • Identify metals. • Classify lip prints. • Design and conduct	Students will be given the following: Preferential seating when applicable	Daily assignments End of Lesson exams

	and may include; hair, fiber, paint chips, body fluids, stains, powders, explosive residue, glass particles, vegetative matter, metal particles, and soil.	analytical schemes. 3. How to gather and use information to solve problems	differentiate metals? • What methods are used to differentiate powders?	Explain how genetic technologies have impacted the fields of medicine, forensics, and agriculture BIO.B.2.4.1 Explain how genetic engineering has impacted the fields of medicine, forensics, and agriculture (e.g., selective breeding, gene splicing, cloning, genetically modified organisms, gene therapy).	scientific investigations	Study guides Guided notes when applicable Extended time for assignments when needed Separate testing environment when applicable	Labs and Classroom activities
Unit 8 Blood Analysis (Week 10)	• Blood evidence is often found at a crime scene, and forensic scientists can use the location, distribution, and pattern of blood and blood stains to reconstruct a crime scene.	1. That an antibody and an antigen of different types will agglutinate, or clump, when mixed together. 2. That the evidence's significance depends on a characteristic's relative occurrence in the population.	• What are the four major blood types found in humans? • Can a bloodstain be used for individualizatio n? • What is a secretor? • What is a presumptive test?	3.1.10.B4 Explain how genetic technologies have impacted the fields of medicine, forensics, and agriculture. 3.1.B.B4 Explain how genetic technologies have impacted the fields of medicine, forensics, and agriculture BIO.B.2.4.1 Explain how genetic engineering has impacted the fields of medicine, forensics, and agriculture (e.g., selective breeding, gene splicing, cloning, genetically modified organisms, gene therapy).	• Determine whether a stain is blood. • Determine whether a bloodstain is human or animal blood. • Determine the blood type of a simulated bloodstain using the ABO/Rh system. • Explore bloodstain patterns as a function of velocity, direction, and height of fall.	Students will be given the following: Preferential seating when applicable Study guides Unit 9Guided notes Unit 10 when applicable Unity 1 Extended time for assignments when needed Separate testing environment when applicable	Daily assignments End of Lesson exams Labs and Classroom activities
Unit 9 DNA Analysis (Week 11-12)	• DNA "fingerprinting " is a common way to identify people by their unique genetic code.	1. That DNA is a long-chain polymer found in nucleated cells, which contain genetic information. 2. That DNA can be used to identify or clear potential suspects in crimes. 3. How DNA is extracted and characterized.	• What is DNA? • What is the difference between a chromosome and a gene? • What are the four bases that pair together in the DNA molecule?	3.1.10.B4 Explain how genetic technologies have impacted the fields of medicine, forensics, and agriculture. 3.1.B.B4 Explain how genetic technologies have impacted the fields of medicine, forensics, and agriculture BIO.B.2.4.1 Explain how genetic engineering has impacted the fields of medicine, forensics, and agriculture (e.g., selective breeding, gene splicing,	• Explain that DNA is a long molecule, tightly packed in the form of a chromosome with genetic material wrapped around it. • Describe the function and purpose of a restriction enzyme.	Students will be given the following: Preferential seating when applicable Study guides Guided notes when applicable Extended time for assignments when needed	Daily assignments End of Lesson exams Labs and Classroom activities

		4. How statistics are used to determine the probability of two people having the same sequence of DNA in a fragment of DNA.		cloning, genetically modified organisms, gene therapy).	• Calculate the probabilities of identity using STR.	Separate testing environment when applicable	
Unit 10 Document and Handwriting Analysis (Week13)	• The examination of questioned documents covers many areas of investigation, including verifying handwriting and signatures; authenticating documents; characterizing papers, pigments, and inks used in writing utensils, instruments, and copying machines; restoring erased and obliterated writing; and determining the relative age of documents and inks.	1. That an expert analyst can individualize handwriting to a particular person. 2. What types of evidence are submitted to the document analyst? 3. The three types of forgery 4. How to characterize different types of paper.	• What are common types of specimens submitted for document analysis? • What makes an individual's handwriting unique? • Where are variations in handwriting expected?	3.1.10.B4 Explain how genetic technologies have impacted the fields of medicine, forensics, and agriculture. 3.1.B.B4 Explain how genetic technologies have impacted the fields of medicine, forensics, and agriculture BIO.B.2.4.1 Explain how genetic engineering has impacted the fields of medicine, forensics, and agriculture (e.g., selective breeding, gene splicing, cloning, genetically modified organisms, gene therapy).	• Characterize their own handwriting using 12 points of analysis. • Detect deliberately disguised handwriting. • Detect erasures and develop impression writing. • List safeguards against the counterfeiting of U.S. currency.	Students will be given the following: Preferential seating when applicable Study guides Guided notes when applicable Extended time for assignments when needed Separate testing environment when applicable	Daily assignments End of Lesson exams Labs and Classroom activities
Unit 11 Forensics and the Media (Weeks 14-15)	• The introduction of forensic science in modern media and television has changed how perpetrators	1. The evolution of forensic science through media popularity. 2. Media and television has changed how forensic science is viewed by	• How has the media influenced forensic science? • Has the popularity of forensic science in	3.1.10.B4 Explain how genetic technologies have impacted the fields of medicine, forensics, and agriculture. 3.1.B.B4 Explain how genetic technologies have impacted the fields of medicine, forensics, and agriculture	• Analyze popular television shows involving forensic science. • Determine how modern media has changed the	Students will be given the following: Preferential seating when applicable Study guides	Daily assignments End of Lesson exams Labs and Classroom activities

	think and how crime scene investigators work.	both perpetrators and the general public. 3. Has the overall popularity of forensic science in the media influenced career choices for young people?	television changed how perpetrators act? • How has forensic science changed through modern technology?	BIO.B.2.4.1 Explain how genetic engineering has impacted the fields of medicine, forensics, and agriculture (e.g., selective breeding, gene splicing, cloning, genetically modified organisms, gene therapy). CC.1.2.11-12.G Integrate and evaluate multiple sources of information presented in different media or formats (e.g. visually, quantitatively) as well as in words in order to address a question or solve a problem. CC.1.3.9-10.G Analyze the representation of a subject or a key scene in two different artistic mediums, including what is emphasized or absent in each treatment. CC.1.5.11-12.C Integrate multiple sources of information presented in diverse formats and media (e.g. visually, quantitative, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data. L.F.2.2.1 Analyze how literary form relates to and/or influences meaning of a text. L.F.2.2.2 Compare and evaluate the characteristics that distinguish fiction from literary nonfiction. L.F.2.2.3 Explain, interpret, compare, describe, analyze, and/or evaluate connections between texts. L.F.2.2.4	face of forensic science. • Discuss how modern media may have created smarter perpetrators.	Guided notes when applicable Extended time for assignments when needed Separate testing environment when applicable	

				Compare and evaluate the characteristics that distinguish narrative, poetry, and drama.			
Unit 12 Forensic Entomology (Weeks 16-18)	• Forensic entomology is the study of insects for medico-legal purposes. There are many ways insects can be used to help solve a crime, but the primary purpose of forensic entomology is estimating time since death.	1. Analysis of insect life cycles for the purpose of time. 2. How the environment affects the insect life cycle. 3. How the cause of death may influence the insect life cycle and alter the time of death.	• What are the stages of an insect's life cycle? • How does temperature affect an insect's life cycle? • How does cause of death influence an insect's life cycle?	3.1.10.A3 Compare and contrast the life cycles of different organisms. 3.1.10.B4 Explain how genetic technologies have impacted the fields of medicine, forensics, and agriculture. 3.1.B.B4 Explain how genetic technologies have impacted the fields of medicine, forensics, and agriculture BIO.B.2.4.1 Explain how genetic engineering has impacted the fields of medicine, forensics, and agriculture (e.g., selective breeding, gene splicing, cloning, genetically modified organisms, gene therapy). S11.A.1.1.5 Analyze or compare the use of both direct and indirect observation as means to study the world and the universe (e.g., behavior of atoms, functions of cells, birth of stars). S11.A.1.3.1 Use appropriate quantitative data to describe or interpret change in systems (e.g., biological indices, electrical circuit data, automobile diagnostic systems data). S11.A.1.3.2 Describe or interpret dynamic changes to stable systems (e.g., chemical reactions, human body, food webs, tectonics, homeostasis). S11.A.1.3.3 Describe how changes in physical and biological indicators (e.g., soil, plants, animals) of water systems reflect changes in these systems (e.g. changes in bloodworm	• Identify the stages of an insect's life cycle. • Analyze how temperature affects an insect's life cycle. • Conduct a lab involving different causes of death and their effects on insect populations and life cycles. • Identify different carrion insect species.	Students will be given the following: Preferential seating when applicable Study guides Guided notes when applicable Extended time for assignments when needed Separate testing environment when applicable	Daily assignments End of Lesson exams Labs and Classroom activities

				populations reflect changes in pollution levels in streams). S11.A.2.1.3 Use data to make inferences and predictions, or to draw conclusions, demonstrating understanding of experimental limits. S11.A.2.1.4 Critique the results and conclusions of scientific inquiry for consistency and logic. S11.A.2.1.5 Communicate results of investigations using multiple representations. S11.A.2.2.1 Evaluate appropriate methods, instruments, and scale for precise quantitative and qualitative observations (e.g., to compare properties of materials, water quality) S11.A.3.1.1 Apply systems analysis, showing relationships (e.g., flowcharts, concept maps), input and output, and measurements to explain a system and its parts. S11.A.3.1.3 Use appropriate quantitative data to describe or interpret a system (e.g., biological indices, electrical circuit data, automobile diagnostic systems data). S11.A.3.1.4 Apply the universal systems model of inputs, processes, outputs, and feedback to a working system (e.g., heating, motor, food production) and identify the resources necessary for operation of the system. S11.A.3.2.1			

				Compare the accuracy of predictions represented in a model to actual observations and behavior. S11.A.3.2.2 Describe advantages and disadvantages of using models to simulate processes and outcomes. S11.A.3.2.3 Describe how relationships represented in models are used to explain scientific or technological concepts (e.g., dimensions of objects within the solar system, life spans, size of atomic particles, topographic maps). S11.B.1.1.2 Compare and contrast the structural and functional similarities and differences among living things (e.g., classify organisms into classification groups, compare systems).			