
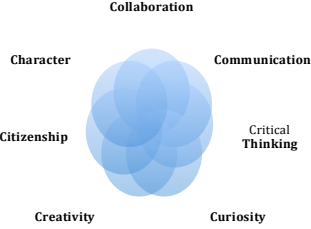


Content Area: Science	Course: Forensics	Grade Level: 11-12
	<p>R14 The Seven Cs of Learning</p> 	
Unit Titles	Length of Unit	
<ul style="list-style-type: none"> • Power of Observation/Introduction to Forensics 	<ul style="list-style-type: none"> • 2-3 weeks 	
<ul style="list-style-type: none"> • Crime Scene Investigation and Evidence Collection 	<ul style="list-style-type: none"> • 3-4 weeks 	
<ul style="list-style-type: none"> • Time of Death 	<ul style="list-style-type: none"> • 1-2 weeks 	
<ul style="list-style-type: none"> • Hair and Fiber Evidence 	<ul style="list-style-type: none"> • 2-3 weeks 	
<ul style="list-style-type: none"> • Fingerprint Analysis 	<ul style="list-style-type: none"> • 1-2 weeks 	
<ul style="list-style-type: none"> • DNA Analysis 	<ul style="list-style-type: none"> • 2-3 weeks 	
<ul style="list-style-type: none"> • Blood and Blood Spatter Analysis 	<ul style="list-style-type: none"> • 2-3 weeks 	



Strands	Course Level Expectations
Forensics	<ul style="list-style-type: none"> • Understand how scientific knowledge is created and communicated in the field. • Realize the accuracy of forensics as it is portrayed in movies, television or books? • Understand ways to protect and preserved evidence and artifacts.
Evidence	<ul style="list-style-type: none"> • Realize that the structure of matter affects the properties and use of materials. • Understand that science and technology impact our world and how we learn about it. • That trace evidence can be analyzed in a variety of ways. • Prints can be developed, stored and used in solving crimes. • Sketches and models are used to rebuild scenes.
Technology	<ul style="list-style-type: none"> • Know that forensic science uses DNA for identification purposes (i.e fingerprinting). • Understand that toxicology is used to determine degree of harm and presence oif toxic substances

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Unit Title	Power of Observation/Introduction to Forensics	Length of Unit	2-3weeks
Inquiry Questions (Engaging & Debatable)	<ul style="list-style-type: none"> • Are people reliable witnesses? • How long has Forensic science intrigued people? • How has forensic science changed over time? • What career pathways can be used in Forensics? 		
Standards*	HS-ETS1-1.		
Unit Strands & Concepts	<p>DISCIPLINARY CORE IDEAS (DCI):</p> <ul style="list-style-type: none"> • Defining and Delimiting Engineering Problems <p>SCIENCE AND ENGINEERING PRACTICES (SEP):</p> <ul style="list-style-type: none"> • Asking Questions and Defining Problems <p>Strands:</p> <ul style="list-style-type: none"> • Observational Skills, • Forensic science is continually changing due to technological advances 		
Key Vocabulary	forensic science, deductive reasoning, eyewitness, perception, Bill of Rights, Miranda Rights, Locard's Principle, Frye Standard, Daubert Ruling, pleas, booking procedure		

* Standards based on the Next Generation Science Standards (NGSS) and the National Research Council (NRC).

For more info, visit: <http://portal.ct.gov/SDE/Science/Science-Standards-and-Resources>

Unit Title	Power of Observation/Introduction to Forensics	Length of Unit	2-3 weeks
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Critical Content: My students will Know...	Key Skills: My students will be able to (Do)...
<ul style="list-style-type: none"> ● the difference between observation and perception. ● examples of factors that influence eyewitness accounts. ● how forensic science has changed over time. ● the difference among types of law: constitutional, civil, criminal, statutory, common ,equity, and administrative. ● the difference between a felony and a misdemeanor crime and punishment each ensues. ● the difference between the Bill of Rights and the Miranda Rights. ● the divisions of a crime lab and what happens in each department of a crime lab ● what the “CSI Effect” is and how it relates to juries. ● examples of different education disciplines that can lead to a career in forensic science. 	<ul style="list-style-type: none"> ● compare, critically, an eyewitness account to what actually happened. ● relate observational skills to forensic science. ● practice improving their observational skills. ● explain what happens when a person gets arrested. ● explain the difference among pleas: guilty, not guilty and not guilty by reason of insanity. ● investigate and explain the accuracy of the Bertillion measurement system. ● investigate Locard’s Exchange Principle. ● research a forensic career and present it to the class.

Assessments:	<ul style="list-style-type: none"> • Various formative assessments and various laboratory activities (performance tasks) • Summative Assessment
Teacher Resources:	Region 14 Implementation Guide

Unit Title	Crime Scene Investigation and Evidence Collection	Length of Unit	3-4 weeks
Inquiry Questions (Engaging & Debatable)	<ul style="list-style-type: none"> • How are crime scenes sketched? • What happens once a crime scene is found? • How does the police process crime scenes? • How is evidence classified? • How do the police know what is evidence and what is not? • How are different types of evidence collected properly? 		
Standards	HS-ETS1-2, HS-ETS1-4		
Unit Strands & Concepts	<p>DISCIPLINARY CORE IDEAS (DCI):</p> <ul style="list-style-type: none"> • Optimizing the Design Solution <p>Science and Engineering Practices (SEP):</p> <ul style="list-style-type: none"> • Constructing Explanations and Designing Solutions <p>Strands:</p> <ul style="list-style-type: none"> • Crime scene sketching, • Proper procedures and techniques used by law enforcement in processing a crime scene, • Collecting evidence properly and maintaining a chain of custody is essential in forensic science 		
Key Vocabulary	crime scene, chain of custody, first responder, crime-scene reconstruction, paper bindle (druggist fold), primary and secondary crime scenes, circumstantial evidence, direct evidence, class evidence, individual evidence, trace evidence, product rule		

Unit Title	Crime Scene Investigation and Evidence Collection	Length of Unit	3-4 weeks
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Critical Content: My students will Know...	Key Skills: My students will be able to (Do)...
<ul style="list-style-type: none"> • what constitutes a crime scene. • the importance of first responding officer's/crime scene investigator's actions in maintaining the integrity of the crime scene during the investigation. • crime scenes are sketched and the types of information that must be included in the final sketch. • what types of information need to be recorded at the crime scene. • evidence is classified as individual or class. • how different pieces of evidence are collected and packaged properly (ex. hair, DNA, blood, fibers, firearms, etc.) • the importance of the chain of custody of the evidence. • the different types of evidence databases that are available to police. 	<ul style="list-style-type: none"> • explain the jobs of the first responder and the first responding officer in securing and maintaining the integrity of the crime scene. • create a rough sketch of a crime scene. • use triangulation to locate evidence within a crime scene so that it can be put into the crime scene sketch. • create a final crime scene sketch to scale and include all of the necessary information on that sketch. • package different types of evidence and complete a chain of custody properly. • determine the probability of an occurrence using the product rule.

Assessments:	<ul style="list-style-type: none"> • Sketch of a crime scene (rough draft and final sketches) and commentary on what might have happened , Various formative assessments and laboratory activities, Summative Assessment
Teacher Resources:	Region 14 Implementation Guide

Unit Title	Time of Death	Length of Unit	1-2 weeks
Inquiry Questions (Engaging & Debatable)	<ul style="list-style-type: none"> • How does the medical examiner estimate the time of death? • How can insects help estimate the time of death? • How do environmental factors influence the estimated time of death? • How is an autopsy done? 		
Standards	HS-LS1-2, HS-LS2.2, HS-LS1-4, HS-ETS1-3		
Unit Strands & Concepts	<p>DISCIPLINARY CORE IDEAS (DCI):</p> <ul style="list-style-type: none"> • Developing Possible Solutions <p>Strands:</p> <ul style="list-style-type: none"> • Time of Death using: algor mortis, rigor mortis, livor mortis • Entomology • Autopsy 		
Key Vocabulary	cause of death, manner of death, mechanism of death, algor mortis, rigor mortis, livor mortis, autolysis, entomology, larva, instar, spiracle, pupa,		

Unit Title	Time of Death	Length of Unit	1-2 weeks
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Critical Content: My students will Know...	Key Skills: My students will be able to (Do)...
<ul style="list-style-type: none"> ● time of death can be estimated based on characteristics of the body and stages of insect development. ● the effects of environmental factors on body decomposition. ● the succession of different types of insects that are found on a body as it decomposes. ● autopsies are performed to gather information on the cause, manner and mechanism of death and gather evidence. 	<ul style="list-style-type: none"> ● distinguish between the four manners of death: natural, accidental, suicidal and homicidal. ● describe the stages of decomposition of a corpse. ● calculate the approximate time of death using algor mortis, rigor mortis and livor mortis, stomach contents ● calculate time of death using insect stage of development of blow flies. ● predict the influence of environmental factors on body decomposition

Assessments:	<ul style="list-style-type: none"> • Various formative assessments and laboratory performance tasks • Summative Assessment
Teacher Resources:	Region 14 Implementation Guide

Unit Title	Hair and Fiber Evidence	Length of Unit	2-3 weeks
Inquiry Questions (Engaging & Debatable)	<ul style="list-style-type: none"> • How do human and animal hairs differ? • How do forensic scientists tell different hairs apart? • How do forensic scientists tell different fibers apart? • How are natural and synthetic fibers different? 		
Standards	HS-ETS1-3, HS-LS1-4, HS-LS3-1		
Unit Strands & Concepts	<p>Science and Engineering Practices:</p> <ul style="list-style-type: none"> • Scientific Investigations Use a Variety of Methods, • Engaging in Argument from Evidence, • Obtaining, Evaluating, and Communicating Information <p>Strands:</p> <ul style="list-style-type: none"> • Hair structure, Hair analysis. • Natural vs. synthetic fibers, • Fiber analysis 		
Key Vocabulary	medulla, cortex, cuticle, hair follicle, follicular tag, keratin, melanin, neutron activation analysis, comparison microscope, natural fiber, synthetic fiber, textile, warp, weft, monomer, polymer, yarn, amorphous, flame test		

Unit Title	Hair and Fiber Evidence	Length of Unit	2-3 weeks
Critical Content: My students will Know...		Key Skills: My students will be able to (Do)...	
<ul style="list-style-type: none"> • the structure of a hair. • the different places hair is found on the human body and how it is collected. • how to determine if hair is human or animal origin. • how to measure and calculate the medullary index of a hair. • the different techniques that can be used in hair analysis. • where DNA can be found in hair. • the different techniques that can be used in fiber analysis. • how to determine if a fiber is natural or synthetic. 		<ul style="list-style-type: none"> • use a microscope to draw different types of human and animal hair. • label and describe the structure of hair. • analyze an unknown hair to determine if it is of human or animal origin. • calculate the medullary index of hair (if a medulla is present) • create a cuticle imprint from a hair. • use a microscope to draw different types of fibers: cotton, wool, polyester, rayon, nylon and acrylic. • perform a burn test on a fiber to determine the type of fiber material. • analyze an unknown fiber to determine the type of fiber. 	
Assessments:	<ul style="list-style-type: none"> • Various formative assessments, various laboratory activities, and summative assessment 		
Teacher Resources:	Region 14 Implementation Guide		

Unit Title	Fingerprint Analysis	Length of Unit	1-2 weeks
Inquiry Questions (Engaging & Debatable)	<ul style="list-style-type: none"> • How fingerprints unique to each person? • How are fingerprints lifted at a crime scene? • How do forensic scientists match a fingerprint to a person? 		
Standards	HS-ETS1-3, HS-LS3-1, HS-LS3-3		
Unit Strands & Concepts	<p>Science and Engineering Practices:</p> <ul style="list-style-type: none"> • Scientific Investigations Use a Variety of Methods, Engaging in Argument from Evidence, • Obtaining, Evaluating, and Communicating Information <p>Strands:</p> <ul style="list-style-type: none"> • Fingerprint types, • Minutiae patterns in fingerprints, • Lifting fingerprints 		
Key Vocabulary	loop, whorl, arch, delta, core, minutiae (bridge, bifurcation, island, eye, ridge, dot, spur, trifurcation), ten-print card, Henry System, plastic fingerprint, latent fingerprint, patent fingerprint, ridge pattern, ninhydrin, cyanoacrylate fuming, silver nitrate, iodine fuming, magnetic powder		

Unit Title	Fingerprint Analysis	Length of Unit	1-2 weeks
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Critical Content: My students will Know...	Key Skills: My students will be able to (Do)...
<ul style="list-style-type: none"> • fingerprints are caused by dermal skin ridges that form in utero and serve a purpose. • no two people have the same fingerprints based on their ridge patterns called minutiae. • how fingerprints are classified. • how the Henry system is used to classify fingerprints. • fingerprints may be visible or invisible to the naked eye at a crime scene. • fingerprints can be lifted at a crime scene and analyzed. • how some criminals attempted to alter their fingerprints. • IAFIS is the database for fingerprints. 	<ul style="list-style-type: none"> • create a 10 print card of their fingerprints. • identify the characteristics of fingerprints (loop, whorl or arch and what type). • calculate their Henry system number using their ten-print card. • identify whether a fingerprint is a patent, latent or plastic print. • match prints if given samples. • identify minutiae patterns in fingerprints. • properly collect fingerprints using charcoal dusting powder, magnetic powder, cyanoacrylate fuming, iodine fuming.

Assessments:	<ul style="list-style-type: none"> • Various formative assessments, various laboratory activities, and summative assessment
Teacher Resources:	Region 14 Implementation Guide

Unit Title	DNA Analysis	Length of Unit	2-3 weeks
Inquiry Questions (Engaging & Debatable)	<ul style="list-style-type: none"> • How is DNA unique to each individual (except identical twins)? • How does the structure of DNA lend itself to be used in forensic analysis? • Where can DNA be found in a crime scene? 		
Standards	HS-LS3-1, HS-LS3-2, HS-LS3-3		
Unit Strands & Concepts	<p>Science and Engineering Practices:</p> <ul style="list-style-type: none"> • Planning and Carrying Out Investigations, • Scientific Investigations Use a Variety of Methods, • Using Mathematics and Computational Thinking, • Analyzing and Interpreting Data, • Engaging in Argument from Evidence <p>Strands:</p> <ul style="list-style-type: none"> • DNA structure, DNA replication, Restriction enzymes, • DNA identification, Sources of DNA, • Gel electrophoresis, Recombinant DNA 		
Key Vocabulary	double helix, nucleotide, nitrogen bases (adenine, thymine, guanine, and cytosine), deoxyribose, allele, chromosome, DNA fingerprint, restriction enzymes, gene, gel electrophoresis, PCR(polymerase chain reaction), STR (short tandem repeat), recombinant DNA, VNTR (variable number of tandem repeats), polymorphisms		

Unit Title	DNA Analysis	Length of Unit	2-3 weeks
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Critical Content: My students will Know ...	Key Skills: My students will be able to (Do) ...
<ul style="list-style-type: none"> • DNA, except for identical twins is unique to each individual. • DNA can be found in the nucleus, mitochondria and chloroplasts of eukaryotic cells. • the structure and components of DNA. • PCR (Polymerase Chain Reaction) is a technique used by scientists to make multiple copies of DNA or segments of DNA. • restriction enzymes are used to cut DNA into fragments. • gel electrophoresis is a technique to separate fragments of DNA or proteins, which can then be used to identify a person. • DNA can be found in saliva, skin, semen, blood, sweat, or hair at a crime scene. • Recombinant DNA is DNA that is inserted from one species into another species. • CODIS is the database for DNA samples. 	<ul style="list-style-type: none"> • explain the structure of DNA. • explain the significance of DNA in a human. • explain the base-pairing rules for the nitrogen bases and use it to create the complementary strand of DNA if given one side of the strand. • explain how PCR works and its benefits. • explain how gel electrophoresis is used to separate fragments of DNA. • model how a restriction enzyme is used to cut DNA. • conduct a gel electrophoresis experiment using DNA samples including: making the gel, loading the samples in the gel, staining the gel and analyzing the gel.

Assessments:	<ul style="list-style-type: none"> • Various formative assessments, various laboratory activities, and summative assessment
Teacher Resources:	Region 14 Implementation Guide

Unit Title	Blood and Blood Spatter Analysis	Length of Unit	2-3 weeks
Inquiry Questions (Engaging & Debatable)	<ul style="list-style-type: none"> • How do you know what blood type you are? • What can blood or blood spatter at a crime scene tell forensic scientists about the crime? • How can you tell if blood found at a crime scene is human blood, animal blood or something else? 		
Standards	HS-LS1-2, HS-LS3-2, HS-LS3-3		
Unit Strands & Concepts	<p>Science and Engineering Practices:</p> <ul style="list-style-type: none"> • Planning and Carrying Out Investigations, • Scientific Investigations Use a Variety of Methods, • Using Mathematics and Computational Thinking, • Analyzing and Interpreting Data, • Engaging in Argument from Evidence <p>Strands:</p> <ul style="list-style-type: none"> • Blood characteristics • function of blood • ABO • Blood typing • blood spatter analysis 		
Key Vocabulary	agglutination, antibodies, antigens, antigen-antibody response, plasma membrane proteins, red blood cells, white blood cells, plasma, , platelets, blood clotting, ABO blood groups, point of origin, line of convergence, satellite drop, spike, velocity		

Unit Title	Blood and Blood Spatter Analysis	Length of Unit	2-3 weeks
Critical Content: My students will Know...		Key Skills: My students will be able to (Do)...	
<ul style="list-style-type: none"> the composition of blood and the function of its components. blood types (ABO system) is based on antigens found on the surface of red blood cells. Blood typing is based on antigen-antibody complexes that are part of the normal immune system function in humans. how to calculate the probability of certain blood types or blood proteins in a population. the different tests that can be used to determine the presence of blood: hemastix, Kastle-Meyer, blood typing, precipitan, etc. blood spatter can tell forensic scientists: the velocity of blood drop, direction the blood came from and at what angle, what type of weapon may have been used, the height the victim was at when they were attacked, where the person was when they were attacked, etc. 		<ul style="list-style-type: none"> explain the components in blood and their functions. explain the antigen-antibody complex and how it relates to blood typing. conduct a blood typing analysis with simulated blood to determine blood types. calculate the probability of certain blood types/ blood proteins in a given population. conduct an experiment to determine if blood is present or not. conduct an experiment, gather data and analyze the effect of impact angle on blood drops. conduct an experiment, gather data, and analyze the effect of height of a blood drop on blood spatter patterns. conduct experiments, gather data and analyze the effect of arterial spurts, walking, running, velocity, etc. have on blood spatter patterns. 	
Assessments:	<ul style="list-style-type: none"> Various formative assessments, various laboratory activities, and summative assessment 		
Teacher Resources:	Region 14 Implementation Guide		