

CS HIGH

MS. MASON'S COURSE OUTLINE: SEMESTER 1

TOPIC	CHAPTER(S) FROM <i>CS HIGH</i>	ASSIGNMENTS AND LAB INVESTIGATIONS
<p>Introduction to Forensic Science</p> <p><i>What is forensic science?</i></p> <p><i>What departments and specialties comprise a crime lab?</i></p> <p><i>What are examples of physical evidence, and how is evidence used to support motive, means, and opportunity?</i></p> <p><i>Who were the key players in the development of forensic science as a science?</i></p>	<p>Chapters 2, 15, 21, 22, and 23</p>	<p>Students read <i>The Hound of the Baskervilles</i> or another short story by Sir Arthur Conan Doyle. Alternatively, view the modern version of his tales from the BBC television series <i>Sherlock</i>. Identify Holmes's notable skills in solving a mystery.</p> <p>Students view an episode of the TV series <i>CSI</i>, e.g., "Who Shot Sherlock?" Identify observable differences between real science and TV science.</p> <p>Investigative Activity 1: <i>Nancy Drew, Meet CSI</i>. Using online resources, students write a brief biography of a <i>fictional</i> detective in a movie, TV series, or book, e.g., Nancy Drew, Sherlock Holmes, or <i>CSI</i>'s Gil Grissom. Information must include the character's unique investigative skills.</p> <p>Investigative Activity 2: <i>Sherlock Holmes, Meet Edmund Locard</i>. Describe the contribution(s) of a <i>real</i> person in the development of one of the techniques used by modern day forensic scientists, e.g., Edmund Locard, Matthieu Orfila, Francis Galton, and Sir Alex Jeffries.</p>

		<p>*Activity 2 can be assigned as an alternative to Activity 1.</p> <p>** Both activities are appropriate for younger students.</p>
<p>Crime Scene Analysis and Physical Evidence</p> <p><i>How do investigators search a crime scene?</i></p> <p><i>How do investigators maintain safety of first responders and themselves?</i></p> <p><i>How is physical evidence identified, collected, and preserved?</i></p> <p><i>What is Locard's Principle?</i></p>	<p>Chapters 2, 5, 8, 10, 12, 13, and 17</p>	<p>Investigative Activity 1: <i>Soccer Field Search</i>. Students use crime scene search strategies as they “tag and bag” objects that do not ordinarily belong on a school athletic field or other campus location.</p> <p>Investigative Activity 2: <i>The Disappearance of Ms. Scarlet</i>. Students arrive to class and find the classroom in disarray and their teacher missing. They process the fake crime scene by identifying, collecting, and preserving planted evidence; interviewing potential witnesses; and reconstructing events surrounding the disappearance of their teacher.</p> <p>Investigative Activity 3: <i>DIY Crime Scene</i>. Students create a fake crime scene at their house using at least five pieces of physical evidence. They describe how their evidence trail supports motive, means, and opportunity. Students film their scenes and present their videos to the class. This activity can be assigned as an alternative to Activity 2.</p> <p>*These activities are appropriate for younger students.</p>
<p>Microscopy</p>	<p>Chapters 11 and 20</p>	<p>Lab Investigation: <i>Is That Toothpaste?</i> Students practice</p>

<p><i>How are different microscopes (comparison, stereoscopic, light, electron) used to identify unknown substances found at a crime scene?</i></p>		<p>their light microscope skills as they examine trace evidence samples, such as toothpaste, soap, pollen grains, dust, talcum powder, sugar, hair, fibers, soil, and other appropriate materials. Students can prepare their own samples for viewing under different magnifications. They draw what they observe and identify distinguishing features.</p> <p>*This lab is appropriate for younger students as they learn microscope skills.</p>
<p>Hair and Fiber Analysis</p> <p><i>How can microscopy be used to distinguish between human hair and animal fur?</i></p> <p><i>What techniques can be used to characterize the chemical and physical properties of unknown fabric samples?</i></p>	<p>Chapters 11 and 20</p>	<p>Lab Investigation 1: <i>Hair Today, Gone Tomorrow</i>. Using microscopy, students examine hair samples from human and animal origin to compare distinct features, including cuticle scale and medulla patterns, and color. Students can use prepared slides or make their own from collected samples, including their own hair and pet's fur.</p> <p>Lab Investigation 2: <i>Goat or Plant: What Fabrics Are Safe for Children's Pajamas?</i> Using microscopy and various physical and chemical tests (e.g., burn test, fabric stain), students distinguish between different fabric samples such as silk, cotton, and polyester and then use appropriate tests to identify unknown fibers.</p> <p>*Both labs are appropriate for younger students. Safety precautions, including goggles, are necessary for all ages.</p>

<p>Forensic Toxicology and Chemistry</p> <p><i>What are the different categories of prescription and illegal drugs (e.g., hallucinogens, narcotics, and drugs for high blood pressure, diabetes, and heart arrhythmias)?</i></p> <p><i>What techniques are used to identify specific drugs, poisons, and toxins (e.g., color tests, chromatography, and confirmational tests)?</i></p> <p><i>How does a basic understanding of chemistry apply to the study of forensic toxicology?</i></p>	<p>Chapters 9, 11, and 18</p>	<p>Investigative Activity 1: <i>Drug Research Project</i>. Students choose a prescription or illegal drug from a list and research its purpose, side effects, medical uses, interactions with other drugs, and means of identification. They research a case in which the drug has been used in a poisoning, overdose, or crime (e.g., celebrity overdose, Chicago Tylenol murders, steroid use by professional athletes). Students share their research by creating a 10-minute slide presentation that they share with the class.</p> <p>Activity 2: <i>Debate</i>. Students debate whether the legal age for alcohol consumption be lowered to 18.</p> <p>Lab Investigation 1: <i>Who’s Guilty of Forgery?</i> Students use paper and thin-layer chromatography and different solvents to identify ink samples.</p> <p>Lab Investigation 2: <i>Drug Bust at Jackson High</i>. Students are provided with samples of white powders (e.g., salt, sugar, baking soda, and talcum powder) confiscated from several lockers. Using equipment and supplies found in a typical high school science lab, they perform simple physical and chemical tests on the powders. Students then use the same tests to identify an unknown white powder found in a student backpack.</p> <p>*Activities 1 and 2 are suitable</p>
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		<p>for high school students, whereas both labs are appropriate for younger students.</p> <p>**Safety precautions, including goggles, are necessary for all ages.</p>
<p>Fingerprint Analysis</p> <p><i>How are fingerprints formed?</i></p> <p><i>How are minutiae of fingerprint ridge patterns (e.g., loops, whorls, arches, deltas) used to identify individuals?</i></p> <p><i>What laboratory techniques are used to detect both visible and latent fingerprints, collect them, and preserve them?</i></p> <p><i>What is AFIS, and why do popular TV crime shows always refer to it?</i></p>		<p>Lab Investigation: <i>Who Left Their Mark?</i></p> <p><i>Part I:</i> Using an ink pad, students make a set of their own fingerprints and identify ridge patterns, including loops, whorls, and deltas. Students exchange their set of prints with another student for examination. They tally how many students in the class have at least one print with a common ridge pattern and calculate the frequency of each pattern in the population.</p> <p><i>Part II:</i> Students use various techniques (e.g., powders, Superglue fuming, and iodine fuming) to identify and examine latent prints from various objects found in the classroom.</p> <p>*This lab is appropriate for younger students.</p>
<p>DNA Analysis</p> <p><i>What is the structure of DNA and what does it do? What scientists contributed to the discovery of DNA's structure and function?</i></p> <p><i>How is DNA evidence identified, collected, preserved, and analyzed?</i></p> <p><i>What advances in DNA</i></p>	<p>Chapters 20 and 21</p>	<p>Activity 1: <i>Modeling the Structure of DNA.</i> Using various art supplies, students create models of the DNA helix and use their models to describe how DNA stores genetic information and replicates during cell division.</p> <p>Activity 2: <i>Is King Tut Really Buried in His Tomb?</i> Using online resources, students write</p>

<p><i>technology have occurred in the decades since the discovery of the molecule's structure?</i></p> <p><i>What is CODIS, why do popular TV crime shows always refer to it?</i></p> <p><i>What is the Innocence Project?</i></p>		<p>a short summary of how DNA evidence was used in an historical context, such as the O.J. Simpson murders, the Colin Pitchfork conviction, and the identification of members of the Romanov family and Egyptian mummies.</p> <p><i>Activity 3: Modeling DNA Fingerprinting.</i> This paper, pen, and scissors labs introduces students to DNA fingerprinting. If shown a restriction map, students predict the number and arrangement of DNA fragments in a gel after digestion with restriction enzymes followed by electrophoresis. They explain the principles behind DNA fingerprinting.</p> <p><i>Lab Investigation 1: DNA Extraction.</i> Students extract DNA from their cheek cells or another source using common techniques. They then manipulate an experimental variable such as temperature and incubation time to determine its effect on the amount of DNA extracted. Note: Commercial kits are available.</p> <p><i>Lab Investigation 2: Who's Your Daddy?</i> Using restriction enzymes and gel electrophoresis, students compare small samples of DNA to determine paternal and maternal identity. Note: Commercial kits are available.</p> <p>*Activity 2 and Lab Investigation 2 are likely too complex for younger students.</p>
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		**Lab safety precautions must be observed.
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SEMESTER 2 TOPICS

During Semester 2, students will explore additional topics in forensic science, including serology (blood typing and blood spatter patterns), glass and soil evidence, tool marks and other impressions, forensic anthropology (study of bones and skeletal remains), the polymerase chain reaction (DNA analysis), entomology (bugs), arson, and ballistics. The final exam at the end of the year includes a mock crime scene.