

Oakwood City School District Forensic Science II Standards

One goal of science education is to help students become scientifically literate citizens able to use science as a way of knowing about the natural and material world. All students should have sufficient understanding of scientific knowledge and scientific processes to enable them to distinguish what is science from what is not science and to make informed decisions about career choices, health maintenance, quality of life, community and other decisions that impact both themselves and others.

Forensic Science is a high school level course, which satisfies the Ohio Core science graduation requirements of Ohio Revised Code Section 3313.603. This section of Ohio law requires three units of science. Each course should include inquiry-based laboratory experience that engages students in asking valid scientific questions and gathering and analyzing information.

Forensic Science is the application of science (chemistry, physics, and biology) to the criminal and civil laws that are enforced by police agencies in a criminal justice system. It includes the investigation of fingerprinting, fiber analysis, ballistics, arson, trace evidence analysis, poisons, drugs, blood spatters, and blood samples. Students are taught the proper collection, preservation, and laboratory analysis of various samples.

Forensic Science II is a continuation of Forensic Science I. This is a lab-based course that will explore advanced forensic science topics that build upon the basic techniques learned in Forensics I. Major topics of study include forensic anthropology, pathology, toxicology, odontology, handwriting analysis, glass and soil analysis, and ballistics. A variety of guest speakers will help to provide students with real world experience.

Forensic Science II Standards

Forensic Anthropology

- A. Describe how bone is formed.
- B. Distinguish between the axial skeleton and the appendicular skeleton.
- C. Learn the basic anthropological methods to determine the sex, height, race, and approximate age of skeletal remains.
- D. Distinguish between male and female skeletal remains based on skull, jaw, brow ridge, pelvis, and femur.
- E. Describe how bones contain a record of injuries and disease.
- F. Describe how a person's approximate age could be determined by examining his or her bones.
- G. Explain the differences in facial structures among different races.
- H. Describe the role of mitochondrial DNA in bone identification.

Forensic Pathology

- A. Demonstrate the ability to apply the principles of forensic pathology in determining the time of death of a victim by evaluating the stages of decomposition.
- B. Define the terms Rigor Mortis, Liver Mortis, and Algor Mortis.
- C. Explain how the conditions of Rigor Mortis, Liver Mortis, and Algor Mortis are used to determine the time of death.
- D. Calculate the time of death using rigor mortis.
- E. Calculate the time of death using algor mortis.
- F. Describe the various body orientations (i.e. body regions, anatomical positions, body cavities.)
- G. Describe the steps involved in performing an autopsy.

Drug Identification and Toxicology

- A. Discuss the main types of commonly abused drugs, with particular reference to their chemical nature, physical forms, and effects.
- B. List and define the schedules of the Controlled Substances Act.
- C. Describe the laboratory tests normally used to perform a routine drug identification analysis.
- D. Understand the proper collection and preservation of drug evidence. •

- E. Describe the role of a toxicologist.
- F. Explain how alcohol is absorbed into the bloodstream, transported throughout the body, and eliminated by oxidation and excretion.
- G. Understand the process by which alcohol is excreted into the breath via the lungs.
- H. Describe commonly used field sobriety tests to assess alcohol impairment.

Impression Evidence

- A. Forensic Odontology
 - a. Identify human bite marks.
 - b. Analyze human bite marks to associate a suspect with a crime.
 - c. Prepare dental impressions and match them with bite marks.
 - d. Define cheiloscopy
 - i. A forensic investigation technique that deals with identification of humans based on lips traces.
- B. Tire Impressions
 - a. Describe how to make tire impressions
 - b. Use track width and wheelbase information to identify vehicles.

Handwriting Analysis, Forgery, and Counterfeiting

- A. Describe 12 types of handwriting exemplars that can be analyzed in a document.
- B. Demonstrate an example of each of the 12 exemplars of handwriting traits.
- C. Identify the major goals of forensic handwriting analysis.
- D. Describe some of the technology used in handwriting analysis.
- E. Describe between the terms forgery and fraudulence.
- F. Identify several ways in which businesses prevent check forgery.
- G. Describe four features of paper currency that are used to detect counterfeit bills.
- H. Design an experiment using paper chromatography to determine which pen altered a note.

Ballistics

- A. Discuss the difference between a handgun, a rifle, and a shotgun.
- B. Distinguish between a bullet and a cartridge.
- C. Discuss rifling on a gun barrel and how it affects the flight of the projectile.
- D. Explain the relationship between barrel size and caliber.
- E. Explain how bullets are test-fired and matched.
- F. Discuss the role of ballistics recovery and examination at the crime scene.
- G. Determine the position of the shooter based on bullet trajectory.

Toolmarks

- A. Discuss the significance of tool mark impressions in criminal investigations.
- B. Describe three major types of tool mark impressions.
- C. Describe variations in tool surface characteristics that are used to identify individual tools.
- D. Summarize the steps of a tool mark examination and analysis.
- E. Summarize how technology is helping tool experts in criminal identifications.
- F. Match tool marks with the instrument that produced them.
- G. Describe how tool mark evidence is collected, preserved, and documented.

DNA Fingerprinting

- A. Explain how crime scene evidence is collected for DNA analysis.
- B. Describe how crime scene evidence is processed to obtain DNA.
- C. Describe how radioactive probes are used in DNA fingerprinting.
- D. Explain how DNA evidence is compared for matching.
- E. Explain how DNA fingerprinting is used to determine if specimens come from related or unrelated individuals.
- F. Explain how to use DNA fingerprinting to identify DNA from a parent, child, or relative of another person.

Trace Evidence

- A. Glass Analysis
 - a. Explain how glass is formed.
 - b. List some of the characteristics of glass.
 - c. Provide examples of different types of glass.
 - d. Calculate the density of glass.
 - e. Use the refractive index to identify different types of glass.
 - f. Describe how glass fractures.
 - g. Analyze glass fracture patterns to determine how glass was broken.
 - h. Explain how glass is used as evidence.
- B. Soil Analysis
 - a. Recognize various soil types and describe some methods for examining soil samples.
 - b. Distinguish sand samples by size, color, and composition.

- c. Perform a soil analysis, including macroscopic and microscopic examination, as well as chemical and physical analysis.
- d. Explain how soil evidence can link suspects to crime scenes.
- C. Paint Analysis
 - a. Describe how paint samples are examined to link them to the original source.
 - b. Describe the proper collection and preservation of forensic paint evidence.

Arson Investigation

- A. Discuss the chemistry of fire.
- B. Understand the importance of the examination of a fire scene for signs of arson.
- C. Describe how to collect physical evidence at the scene of a suspected arson or explosion.

Forensic Palynology: Pollen and Spore Examination

- A. Distinguish between pollen and spores.
- B. Define a pollen "fingerprint".
- C. Classify the different organisms that produce pollen and spores.
- D. Summarize the different methods of pollination in plants and the relevance in solving crimes.
- E. Identify the different ways that spores are dispersed.
- F. State the characteristics of pollen and spores that are important for identification in forensic studies.
- G. Summarize how pollen and spore evidence is collected at a crime scene.
- H. Describe how pollen and spore samples are analyzed and evaluated.