

Forensic Science

UNIT I: Introduction to Forensic Science and Human Body

Goal 1. The student will demonstrate the ability to explain the history and philosophy of forensic science.

Objectives - The student will be able to:

- a. Define forensic science or criminalistics.
- b. Describe the major contributors to the development of forensic science.
- c. Give examples of typical crime laboratories as they exist on the national, state, and local levels of government in the United States.
- d. Describe the services of a typical comprehensive crime laboratory in the criminal justice system.
- e. List other areas of forensic science that require expertise in a specialized area.
- f. State Locard's Exchange Principle of transfer of evidence.
- g. Analyze the data obtained from a crime scene using deductive reasoning.

Goal 2. The student will demonstrate the ability to identify, collect, and preserve physical evidence.

Objectives - The student will be able to:

- a. Describe the common types of physical evidence encountered at crime scenes.
- b. Explain the difference between the identification and comparison of physical evidence.
- c. Define individual and class characteristics and give examples of physical evidence possessing these characteristics.
- d. Discuss the value of class evidence to a criminal investigation.
- e. Explain the purpose physical evidence plays in reconstructing the events surrounding a crime.
- f. Describe the proper techniques for packaging common types of physical evidence.

Goal 3. The student will demonstrate the ability to construct the process of a crime scene investigation.

Objectives - The student will be able to:

- a. Define the physical evidence of a crime scene.
- b. Explain the responsibilities of the first police officer who arrives at a crime scene.
- c. Explain the steps to be taken for thoroughly recording a crime scene.
- d. Describe the proper procedures for conducting a systematic search of crime scenes for physical evidence.
- e. Define the chain of custody.

Goal 4. The student will 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.

Objectives – The student will be able to:

- a. Describe the various body orientations (i.e. body regions, anatomical positions, body cavities).
- b. Define the terms Rigor Mortis, Liver Mortis and Algor Mortis.
- c. Describe how factors such as temperature and precipitation affect the rate of decomposition.
- d. Explain how the conditions of Rigor Mortis, Liver Mortis, and Algor Mortis are used to determine the time of death.

Goal 5. The student will demonstrate the ability to explain how forensic anthropology is used to identify skeletal evidence to obtain data using a variety of techniques.

Objectives – The student will be able to:

- a. Determine the age, gender, stature, and race of skeleton.
- b. Describe facial reconstruction.
- c. Record the dig of an archaeological site and analyze the findings.

UNIT II: Identification of Human Evidence

Goal 1. The student will demonstrate the ability to identify bite marks used in forensic evidence.

Objectives – The student will be able to:

- a. Identify human bite marks.
- b. Analyze human bite marks to associate a suspect with a crime.

Goal 2. The student will demonstrate the ability to identify, collect, and preserve a variety of fingerprint types.

Objectives - The student will be able to:

- a. Define the ridge characteristics of a fingerprint.
- b. Explain why a fingerprint is a permanent feature of the human anatomy.
- c. List the three major fingerprint patterns and describe their respective subclasses.
- d. Describe visible, plastic, and latent fingerprints.
- e. Explain the techniques for developing prints on porous objects.
- f. Describe the chemical techniques for developing prints on porous objects.
- g. Describe the proper procedures for preserving a developed latent fingerprint.

Goal 3. The student will demonstrate the ability to analyze components of DNA and explain the various methods for analyzing DNA from a crime scene.

Objectives - The student will be able to:

- a. Describe the structure and function of the DNA molecule.
- b. Explain how DNA replicates itself.

- c. Describe the implications of DNA replication for forensic science.
- d. Explain the difference between DNA strands that code for the production of proteins vs. strands that contain repeating sequences of bases.
- e. Explain the technology of polymerase chain reaction (PCR) and how it is applied to forensic science.
- f. Describe the latest DNA typing techniques [Capillary Electrophoresis and Short Tandem Repeat (STR)].
- g. Apply the information from a DNA computerized database to criminal investigation. [e.g., National DNA Index System (NDIS), Combined DNA Index System (CoDIS)].

Goal 4. The student will demonstrate the ability to identify blood type and use a variety of testing techniques.

Objectives - The student will be able to:

- a. Distinguish between the A-B-O antigens and antibodies found for the four blood types: A, B, AB, and O.
- b. Explain why agglutination occurs.
- c. Describe the tests used to characterize a stain as blood.
- d. Explain the significance of the precipitin test to forensic serology.
- e. Describe the absorption-elution technique.
- f. Define a secretor and explain its significance to forensic serology.
- g. List the procedures to be taken for the proper preservation of bloodstained evidence for laboratory analysis.
- h. Describe how blood spatter is analyzed at a crime scene.

UNIT III: Trace Evidence

Goal 1. The student will demonstrate the ability to collect and identify glass evidence and soil evidence.

Objectives - The student will be able to:

- a. Define the physical and chemical properties of glass.
- b. Define refractive index.
- c. Distinguish between crystalline solids and amorphous solids.
- d. Describe the flotation and immersion methods for comparing glass specimens.
- e. Explain how to examine glass fractures to determine the direction of impact from a projectile.
- f. Describe the process of collecting glass evidence.
- g. List the important forensic properties of soil.
- h. Describe the density-gradient tube technique.
- i. Describe the process of collecting soil evidence.

Goal 2. The student will demonstrate the ability to collect, preserve, and identify evidence found at a crime scene.

Objectives - The student will be able to:

- a. Describe the cuticle, cortex, and medulla of hair.

- b. Explain the differences between animal and human hairs.
- c. List hair features that are useful for the comparison of human hairs.
- d. Explain the process of collecting hair evidence.
- e. Classify fibers.
- f. List the properties of fibers that are most useful for forensic comparisons.
- g. Describe the structure of a polymer.
- h. Describe the components of paint.
- i. Classify automobile paints.
- j. List the examinations that are most useful for performing a forensic comparison of paint specimens.
- k. Describe the process of collecting and preserving paint evidence.
- l. Identify pollen, fungi, and feathers as trace evidence.

Goal 3. The student will demonstrate the ability to collect, preserve, and identify drug evidence.

Objectives - The student will be able to:

- a. Describe the laboratory tests that forensic chemists normally rely upon to comprise a routine drug identification scheme.
- b. Explain the process of collecting and preserving drug evidence.

Goal 4. The student will demonstrate the ability to determine the techniques used to measure the amount of alcohol and drugs in human body tissues.

Objectives - The student will be able to:

- a. Illustrate the process that describes how alcohol is excreted in the breath via the alveoli sacs.
- b. Describe the design of a breathalyzer.
- c. List the common laboratory procedures for measuring alcohol concentration in the blood.
- d. Describe the precautions taken to properly preserve blood for the analysis of its alcohol content.
- e. Describe the techniques that forensic toxicologists use for isolating and identifying drugs and poisons.
- f. Discuss the significance of finding a drug in human tissues and organs.

UNIT IV: Additional Services of the Crime Laboratory

Goal 1. The student will demonstrate the ability to collect, preserve, and analyze firearm evidence and impressions.

Objectives - The student will be able to:

- a. List the classes and individual characteristics of bullets and cartridge cases.
- b. Describe the use of the comparison microscope for analyzing bullets and cartridge cases.
- c. Distinguish caliber from gauge.
- d. Explain the procedure for determining the distance from where a weapon was fired.

- e. Describe the laboratory tests that determine if a weapon was fired.
- f. List the limitations of present techniques used to analyze firearm evidence.
- g. Explain why it may be possible to restore an obliterated serial number.
- h. List procedures for the collection and preservation of firearm evidence.
- i. Describe how a suspect tool compares to a tool mark.
- j. Explain the significance of class and individual characteristics to the comparison of impressions.
- k. List common field reagents used to enhance bloody footprints.

Goal 2. The student will demonstrate the ability to describe the techniques used to analyze questioned documents.

Objectives - The student will be able to:

- a. Define questioned documents.
- b. List the common characteristics associated with handwriting.
- c. List the important guidelines to be followed for the collection of known writings for comparison to questioned documents.
- d. List the techniques used by document examiners for uncovering alterations, erasures, obliterations, and variations in pen inks.

Goal 3. The student will explore the collection and analysis of evidence found at a fire scene.

Objectives - The student will be able to:

- a. Define oxidation.
- b. Define energy and give examples of its different forms.
- c. Describe how physical evidence must be collected at the scene of a suspected arson or explosion.
- d. Describe the laboratory procedures used for the detection and the identification of hydrocarbon and explosive residues.
- e. List the common laboratory tests employed for the detection of explosives.
- f. List the three requirements for combustion to be ignited and sustained.

Goal 4. The student will demonstrate the ability to use the science of entomology to determine the time of death of a victim.

Objectives - The student will be able to:

- a. Observe the life cycle of carrion insects.
- b. Compare the types of carrion insects in sunny versus shady areas.
- c. Identify the number and types of insects present at a crime scene.