Texas CTE

Forensic Science

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Introduction. FS.B

1 **Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.** FS.B.1

2 **The Law, Public Safety, Corrections, and Security Career Cluster focuses on planning, managing, and providing legal services, public safety, protective services, and homeland security, including professional and technical support services.** FS.B.2

3 **Forensic Science is a course that introduces students to the application of science to connect a violation of law to a specific criminal, criminal act, or behavior and victim. Students will learn terminology and procedures related to the search and examination of physical evidence in criminal cases as they are performed in a typical crime laboratory. Using scientific methods, students will collect and analyze evidence such as fingerprints, bodily fluids, hairs, fibers, paint, glass, and cartridge cases. Students will also learn the history and the legal aspects as they relate to each discipline of forensic science.** FS.B.3

4 **Science, as defined by the National Academy of Sciences, is the "use of evidence to construct testable explanations and predictions of natural phenomena, as well as the knowledge generated through this process." This vast body of changing and increasing knowledge is described by physical, mathematical, and conceptual models. Students should know that some questions are outside the realm of science because they deal with phenomena that are not scientifically testable.** FS.B.4

5 **Scientific inquiry is the planned and deliberate investigation of the natural world. Scientific methods of investigation can be experimental, descriptive, or comparative. The method chosen should be appropriate to the question being asked.** FS.B.5

6 **Scientific decision making is a way of answering questions about the natural world. Students should be able to distinguish between scientific decision-making methods and ethical and social decisions that involve the application of scientific information.** FS.B.6

7 **A system is a collection of cycles, structures, and processes that interact. All systems have basic properties that can be described in terms of space, time, energy, and matter. Change and constancy occur in systems as patterns and can be observed, measured, and modeled. These patterns help to make predictions that can be scientifically tested. Students should analyze a system in terms of its components and how these components relate to each other, to the whole, and to the external environment.** FS.B.7

8 **Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.** FS.B.8

9 **Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.** FS.B.9

Knowledge and skills. FS.C

1 **The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to achieve business and industry employability skills standards such as attendance, punctuality, meeting deadlines, working toward personal/team goals every day, and ethical use of technology.** FS.C.1

2 **The student, for at least 40% of instructional time, conducts laboratory and/or field investigations using safe, environmentally appropriate, and ethical practices. The student is expected to:** FS.C.2

- a demonstrate safe practices during laboratory and field investigations; FS.C.2.A
- b demonstrate an understanding of the use and conservation of resources and the proper disposal or recycling of materials. FS.C.2.B

3 **The student uses scientific methods and equipment during laboratory and field investigations. The student is expected to:** FS.C.3

- a know the definition of science and understand that it has limitations, as specified in subsection (b)(4) of this section; FS.C.3.A
- b know that scientific hypotheses are tentative and testable statements that must be capable of being supported or not supported by observational evidence. Hypotheses of durable explanatory power that have been tested over a wide variety of conditions are incorporated into theories; FS.C.3.B
- c know scientific theories are based on natural and physical phenomena and are capable of being tested by multiple independent researchers. Unlike hypotheses, scientific theories are well-established and highly reliable explanations, but they may be subject to change as new areas of science and new technologies are developed; FS.C.3.C
- d distinguish between scientific hypotheses and scientific theories; FS.C.3.D
- e plan and implement descriptive, comparative, and experimental investigations, including asking questions, formulating testable hypotheses, and selecting equipment and technology; FS.C.3.E
- f collect and organize qualitative and quantitative data and make measurements with accuracy and precision using tools such as calculators, spreadsheet software, datacollecting probes, computers, standard laboratory glassware, microscopes, various prepared slides, stereoscopes, metric rulers, electronic balances, gel electrophoresis apparatuses, micropipettors, hand lenses, Celsius thermometers, hot plates, lab notebooks or journals, timing devices, cameras, Petri dishes, lab incubators, dissection equipment, meter sticks, and models, diagrams, or samples of biological specimens or structures; FS.C.3.F
- g analyze, evaluate, make inferences, and predict trends from data; FS.C.3.G
- h communicate valid conclusions supported by the data through methods such as investigative reports, lab reports, labeled drawings, graphic organizers, journals, summaries, oral reports, and technology-based reports. FS.C.3.H

4 **The student uses critical thinking, scientific reasoning, and problem solving to make informed decisions within and outside the classroom. The student is expected to:** FS.C.4

- a analyze, evaluate, and critique scientific explanations by using empirical evidence, logical reasoning, and experimental and observational testing, including examining all sides of scientific evidence of those scientific explanations, to encourage critical thinking; FS.C.4.A
- b communicate and apply scientific information extracted from various sources such as current events, news reports, published journal articles, and marketing materials; FS.C.4.B
- c draw inferences based on data related to criminal investigation; FS.C.4.C
- d evaluate the impact of scientific research on criminal investigation, society, and the environment; FS.C.4.D
- e evaluate models according to their limitations in representing biological objects or events; FS.C.4.E
- f research and describe the history of science and contributions of scientists within the criminal justice system. FS.C.4.F

5 **The student explores the history, legal aspects, and career options within forensic science. The student is expected to:** FS.C.5

- a distinguish between criminalistics and criminology; FS.C.5.A
- b identify and illustrate roles, functions, and responsibilities of different forensic science disciplines such as serology-DNA, controlled substances, toxicology, trace evidence, firearms, fingerprints, and questioned documents; FS.C.5.B
- c summarize the ethical standards required of a forensic science professional; FS.C.5.C
- d identify and illustrate roles, functions, and responsibilities of professionals in the criminal justice system, including crime scene investigators, criminalists, attorneys, and medical examiners; FS.C.5.D
- e explore and demonstrate an understanding of the terminology and the procedures employed in the criminal justice system; FS.C.5.E
- f illustrate the history of forensic science and recognize the major contributors in the development of forensic science. FS.C.5.F

6 **The student recognizes the procedures of evidence collection while maintaining the integrity of a crime scene. The student is expected to:** FS.C.6

- a compare and contrast the roles of forensic scientists and crime scene investigators; FS.C.6.A
- b demonstrate the ability to work as a member of a team; FS.C.6.B
- c conduct a systematic search of a simulated crime scene for physical evidence following crime scene search patterns such as spiral, line, grid, and strip; FS.C.6.C
- d apply knowledge of the elements of criminal law that guide search and seizure of persons, property, and evidence; FS.C.6.D
- e describe the elements of a crime scene sketch such as measurements, compass directions, scale of proportion, legend-key, and title; FS.C.6.E
- f develop a crime scene sketch using coordinates/measurements from fixed points; FS.C.6.F
- g outline the chain of custody procedure for evidence discovered in a crime scene; FS.C.6.G
- h demonstrate proper techniques for collecting, packaging, and preserving physical evidence found at a crime scene FS.C.6.H

7 **The student recognizes the methods to process and analyze trace evidence commonly found in a crime scene. The student is expected to** FS.C.7

- a demonstrate how to process trace evidence such as glass, paint, fibers, hair, soil, grass, and blood collected in a simulated crime scene; FS.C.7.A
- b compare and contrast the composition of various types of glass such as soda lime, borosilicate, leaded, and tempered; FS.C.7.
- c determine the direction of a projectile by examining glass fractures; FS.C.7.C
- d define refractive index and explain how it is used in forensic glass analysis; FS.C.7.D
- e describe the instrumental analysis of trace evidence such as microscopy and spectrometry; FS.C.7.E
- f compare and contrast the microscopic characteristics of human hair and animal hair, including medulla, pigment distribution, and scales; FS.C.7.F
- g describe and illustrate the different microscopic characteristics used to determine the racial and somatic origin of a human hair sample; FS.C.7.G
- h differentiate between natural and synthetic fibers; FS.C.7.H
- i describe various examinations performed in forensic paint analysis, including microscopic morphology, binder, and pigment characterization. FS.C.7.I

8 **The student analyzes impression evidence in forensic science. The student is expected to:** FS.C.8

- a compare the three major fingerprint patterns of arches, loops, and whorls and their respective subclasses; FS.C.8.A
- b identify the minutiae of fingerprints, including bifurcations, ending ridges, dots, short ridges, and enclosures; FS.C.8.B
- c distinguish among patent, plastic, and latent impressions; FS.C.8.C
- d perform laboratory procedures for lifting latent prints on porous and nonporous objects using chemicals such as iodine, ninhydrin, silver nitrate, and cyanoacrylate resin; FS.C.8.D
- e perform laboratory procedures for lifting latent prints on nonporous objects using fingerprint powders such as black powder and florescent powders; FS.C.8.E
- f explain the Automated Fingerprint Identification System (AFIS) and describe the characteristics examined in the AFIS; FS.C.8.F
- g compare impression evidence collected at a simulated crime scene with the known impression. FS.C.8.G

9 **The student analyzes blood spatter at a simulated crime scene. The student is expected to:** FS.C.9

- a analyze blood stain patterns based on source, direction, and angle of trajectory; FS.C.9.A
- b explain the method of chemically isolating an invisible blood stain using reagents such as luminol. FS.C.9.B

10 **The student explores toxicology laboratory procedures in forensic science. The student is expected to:** FS.C.10

- a explain the absorption, distribution, and elimination of alcohol through the human body; FS.C.10.A
- b describe the blood alcohol laboratory procedures as they relate to blood alcohol concentration; FS.C.10.B
- c explain the levels of tolerance and impairment due to alcohol consumption; FS.C.10.C
- d explain the precautions necessary in the forensic laboratory for proper preservation of blood samples FS.C.10.D

11 The student explores serology laboratory procedures in forensic science. The student is expected to: FS.C.11

- a explain forensic laboratory procedures to determine if a stain detected in a crime scene is blood; FS.C.11.A
- b identify the red blood cell antigens and antibodies as they relate to human blood types; FS.C.11.B
- c determine genotypes and phenotypes in the human red blood cell system using Punnet Squares; FS.C.11.C
- d research methodologies used to collect and analyze other body fluids. FS.C.11.D

12 The student analyzes deoxyribonucleic acid (DNA) laboratory procedures in forensic science. The student is expected to: FS.C.12

- a describe the structure of a DNA molecule and its function; FS.C.12.A
- b describe the steps used in extraction of DNA; FS.C.12.B
- c explain the analytical procedure for forensic DNA typing, including electrophoresis, polymerase chain reaction, and short tandem repeat; FS.C.12.C
- d interpret the components of an electropherogram. FS.C.12.D

13 The student identifies drugs found at a simulated crime scene. The student is expected to: FS.C.13

- a classify controlled substances using the schedules under the Controlled Substances Act; and FS.C.13.A
- b identify controlled substances using laboratory procedures such as microchemical tests, microscopy, chromatography, and spectrophotometry. FS.C.13.B

14 The student evaluates bullet and tool mark impressions in a criminal investigation. The student is expected to: FS.C.14

- a explain the individual characteristics of tool marks; FS.C.14.A
- b describe the mechanism of modern firearms; FS.C.14.B
- c recognize characteristics of bullet and cartridge cases; FS.C.14.C
- d describe the composition of and method of analysis for gunshot residue and primer residue; FS.C.14.D
- e recognize the type of information available through the National Integrated Ballistics Information Network. FS.C.14.E

15 The student explores principles of questioned document analysis in forensic science. The student is expected to: FS.C.15

- a describe different types of examinations performed by a questioned document examiner in a forensic laboratory, including counterfeiting, handwriting, ink, and paper analysis; FS.C.15.A
- b describe the security features incorporated in the U.S. currency to prevent counterfeiting; FS.C.15.B
- c perform handwriting comparisons of an unknown sample with exemplars by analyzing characteristics such as letter, line, and formatting; FS.C.15.C
- d describe the process of ink analysis using chromatography FS.C.15.D

16 The student explores principles of anthropology relevant to forensic science. The student is expected to: FS.C.16

- a identify the major bones of the human skeletal system; FS.C.16.A
- b compare composition and structure of human bones with other animals; FS.C.16.B
- c describe the techniques used to excavate bones from a crime scene; FS.C.16.C
- d explain the characteristics of the human skeletal system indicative of specific gender, racial origin, and approximate range of age and height; FS.C.16.D
- e explain the role of dental records in identification of human remains. FS.C.16.E

17 The student calculates the time and cause of death in relationship to decomposition of the human body. The student is expected to: FS.C.17

- a explain the process and timeline of rigor mortis and its role in calculating time of death; FS.C.17.A
- b explain post mortem lividity and its importance when processing a crime scene; FS.C.17.B
- c determine time of death using entomology; FS.C.17.C
- d determine time and cause of death methodologies through case studies. FS.C.17.D