Texas Law and Public Service

Forensic Science

Knowledge and skills. FOSCI

1 **The student, for at least 40% of instructional time, asks questions, identifies problems, and plans and safely conducts classroom, laboratory, and field investigations to answer questions, explain phenomena, or design solutions using appropriate tools and models. The student is expected to:** FOSCI.1

A ask questions and define problems based on observations or information from text, phenomena, models, or investigations; FOSCI.1A

B apply scientific practices to plan and conduct descriptive, comparative, and experimental investigations and use engineering practices to design solutions to problems; FOSCI.1B

C use appropriate safety equipment and practices during laboratory, classroom, and field investigations as outlined in Texas Education Agency-approved safety standards; FOSCI.1C

D use appropriate tools and equipment such as scientific calculators, computers, internet access, digital cameras, video recording devices, meter sticks, metric rulers, measuring tapes, digital range finders, protractors, calipers, light microscopes up to 100x magnification, hand lenses, stereoscopes, digital scales, dissection equipment, standard laboratory glassware, appropriate personal protective equipment (PPE), an adequate supply of consumable chemicals, biological specimens, prepared evidence slides and samples, evidence packaging and tamper evident tape, evidence tents, crime scene tape, L-rulers, American Board of Forensic Odontology (ABFO) scales, alternate light sources (ALS) and ALS protective goggles, blood specimens, blood presumptive tests, glass samples of various chemical composition, human and non-human bones, fingerprint brushes and powders, lifting tapes and cards, ten-print cards and ink pads, swabs with containers, disposable gloves, and relevant and necessary kits; FOSCI.1D

E collect quantitative data with accuracy and precision using the International System of Units (SI) and United States customary units and qualitative data as evidence; FOSCI.1E

F organize quantitative and qualitative data using appropriate methods of communication such as reports, graphs, tables, or charts; FOSCI.1F

G develop and use models to represent phenomena, systems, processes, or solutions to engineering problems; and FOSCI.1G

H distinguish between scientific hypotheses, theories, and laws. FOSCI.1H

2 **The student analyzes and interprets data to derive meaning, identify features and patterns, and discover relationships or correlations to develop evidence-based arguments or evaluate designs. The student is expected to:** FOSCI.2

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A identify advantages and limitations of models such as their size, scale, properties, and materials; FOSCI.2A

B analyze data by identifying significant statistical features, patterns, sources of error, and limitations; FOSCI.2B

C use mathematical calculations to assess quantitative relationships in data; and FOSCI.2C

D evaluate experimental and engineering designs. FOSCI.2D

3 The student develops evidence-based explanations and communicates findings, conclusions, and proposed solutions. The student is expected to: FOSCI.3

A develop explanations and propose solutions supported by data and models and consistent with scientific ideas, principles, and theories; FOSCI.3A

B communicate explanations and solutions individually and collaboratively in a variety of settings and formats; and FOSCI.3B

C engage respectfully in scientific argumentation using applied scientific explanations and empirical evidence. FOSCI.3C

4 The student knows the contributions of scientists and engineers and recognizes the importance of scientific research and innovation on society. The student is expected to: FOSCI.4

A analyze, evaluate, and critique scientific explanations and solutions by using empirical evidence, logical reasoning, and experimental and observational testing so as to encourage critical thinking by the student; FOSCI.4A

B relate the impact of past and current research on scientific thought and society, including research methodology, cost-benefit analysis, and contributions of diverse scientists and engineers as related to the content; and FOSCI.4B

C research and explore resources such as museums, libraries, professional organizations, private companies, online platforms, and mentors employed in a science, technology, engineering, and mathematics (STEM) field. FOSCI.4C

5 The student explores the history of forensic science. The student is expected to: FOSCI.5

A analyze the historical development and current advancements of different forensic science disciplines such as forensic biology, anthropology/odontology, forensic chemistry, trace evidence, ballistics, fingerprints, digital forensics, and questioned documents; and FOSCI.5A

B explain significant historical and modern contributions to the development and advancement of forensic science made by contributors such as Edmond Locard, Mathieu Orfila, Francis Galton, Edwin Henry, and Alec Jeffreys. FOSCI.5B

6 The student analyzes legal aspects within forensic science. The student is expected to: FOSCI.6

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A summarize the ethical standards required of a forensic science professional; FOSCI.6A

B identify and explain knowledge of terminology and procedures employed in the criminal justice system as they pertain to the chain of custody procedure for evidence; FOSCI.6B

C identify and explain knowledge of terminology and procedures employed in the criminal justice system as they pertain to expert witness testimony; FOSCI.6C

D research and discuss the effect of biases such as confirmation bias and framing cognitive bias on evidence collection, forensic analysis, and expert testimony; and FOSCI.6D

E compare the admissibility of expert witness testimony in terms of the Frye Standard and the Daubert Standard under federal rules of evidence. FOSCI.6E

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7 The student explores career options within forensic science. The student is expected to: FOSCI.7

A explore and describe discipline-specific requirements for careers in forensic science, including collegiate course requirements, licensure, certifications, and physical and mental capabilities; FOSCI.7A

B differentiate the roles and responsibilities of professionals in the criminal justice system, including forensic scientists, crime scene investigators, criminologists, court systems personnel, and medicolegal death investigations; and FOSCI.7B

C differentiate the functions of various forensic science disciplines such as forensic biology, forensic chemistry, trace evidence, ballistics, fingerprints, digital forensics, and questioned documents. FOSCI.7C

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8 The student recognizes the procedures of crime scene investigation while maintaining scene integrity. The student is expected to: FOSCI.8

A explain the roles and tasks needed to complete a crime scene examination, which may require collaboration with outside experts and agencies, and demonstrate the ability to work as a member of a crime scene team; FOSCI.8A

B develop a detailed, technical written record based on observations and activities, documenting the crime scene examination; FOSCI.8B

C discuss the elements of criminal law that guide search and seizure of persons, property, and evidence; FOSCI.8C

D conduct a primary and secondary systematic search of a simulated crime scene for physical evidence utilizing search patterns such as spiral, line, grid, and zone; FOSCI.8D

E document a crime scene using photographic or audiovisual equipment; FOSCI.8E

F generate a physical or digital crime scene sketch, including coordinates or measurements from fixed points, compass directions, scale of proportion, legend-key, heading, and title block; and FOSCI.8F

G demonstrate proper techniques for collecting, packaging, and preserving physical evidence found at a crime scene while maintaining documentation, including chain of custody. FOSCI.8G

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9 **The student analyzes fingerprint evidence in forensic science. The student is expected to:** FOSCI.9

- A compare the three major fingerprint patterns of arches, loops, and whorls; FOSCI.9A
- B identify the minutiae of fingerprints, including bifurcations, ending ridges, dots, short ridges, and enclosures/islands; FOSCI.9B
- C distinguish between patent, plastic, and latent impressions; FOSCI.9C
- D perform procedures for developing and lifting latent prints on nonporous surfaces using cyanoacrylate and fingerprint powders; FOSCI.9D
- E perform procedures for developing latent prints using chemical processes on porous and adhesive surfaces with chemicals such as ninhydrin and crystal violet and documenting the results via photography; and FOSCI.9E
- F explain the Integrated Automated Fingerprint Identification System (IAFIS) and describe the implications of Next Generation Identification (NGI) systems. FOSCI.9F

10 **The student collects and analyzes impression evidence in forensic science. The student is expected to:** FOSCI.10

- A analyze the class and individual characteristics of tool mark impressions and the recovery and documentation of surface characteristics such as wood or metal; FOSCI.10A
- B analyze the class and individual characteristics of footwear impressions and the recovery and documentation of surface characteristics such as soil or organic plant material; FOSCI.10B
- C analyze the class and individual characteristics of tire tread impressions and the recovery documentation of surface characteristics such as soil or organic plant material; and FOSCI.10C
- D compare impression evidence collected at a simulated crime scene with the known impression. FOSCI.10D

11 **The student recognizes the methods to process and analyze hair and fibers found in a crime scene. The student is expected to:** FOSCI.11

- A demonstrate how to collect hair and fiber evidence at a simulated crime scene; FOSCI.11A
- B perform the analysis of hair and fiber evidence using forensic science methods such as microscopy and flame testing; FOSCI.11B
- C compare the microscopic characteristics of human hair and non-human hair, including medulla, pigment distribution, and scales; FOSCI.11C
- D describe and illustrate the different microscopic characteristics used to determine the origin of a human hair sample; and FOSCI.11D
- E differentiate between natural and synthetic fibers. FOSCI.11E

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The student recognizes the methods to process and analyze glass evidence. The student is expected to: FOSCI.12

A demonstrate how to collect and preserve glass evidence; FOSCI.12A

B compare the composition of various types of glass such as soda lime, borosilicate, leaded, and tempered; FOSCI.12B

C determine the direction of a projectile by examining glass fractures; and FOSCI.12C

D define refractive index and explain how it is used in forensic glass analysis. FOSCI.12D

13 The student explores principles of questioned document analysis in the physical and digital form. The student is expected to: FOSCI.13

A research and explain different types of examinations performed on digital and physical evidence in a forensic laboratory such as digital data recovery, counterfeiting, ink, and paper analysis; FOSCI.13A

B investigate and describe the security features incorporated in U.S. and foreign currency to prevent counterfeiting; and FOSCI.13B

C perform handwriting comparisons of an unknown sample with exemplars by analyzing characteristics such as letter, line, and formatting. FOSCI.13C

14 The student evaluates firearms and ballistics evidence. The student is expected to: FOSCI.14

A describe the mechanism of modern firearms such as long guns and handguns; FOSCI.14A

B identify the components and characteristics of bullet and cartridge cases; FOSCI.14B

C describe the composition of and method of analysis for gunshot residue and primer residue; FOSCI.14C

D conduct and calculate trajectory analysis of bullet strikes within a simulated crime scene; and FOSCI.14D

E identify and recognize the type of information available through the National Integrated Ballistics Information Network. FOSCI.14E

15 The student identifies controlled and illicit substances. The student is expected to: FOSCI.15

A differentiate between toxicological analysis and controlled substance analysis as they relate to the method of collection and impact on the body; FOSCI.15A

B classify controlled substances using the schedules under the Controlled Substances Act; and FOSCI.15B

C identify unknown substances using presumptive and confirmatory procedures such as microchemical/color indicating reagent field tests, microscopy, chromatography, and spectrophotometry. FOSCI.15C

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The student explores toxicology in forensic science. The student is expected to: FOSCI.16

A explain the absorption, distribution, metabolization, and elimination of toxins such as alcohol, prescription drugs, controlled substances, and carbon monoxide through the human body; FOSCI.16A

B describe presumptive and confirmatory laboratory procedures as they relate to toxicological analysis such as head space analysis, solid-phase extractions, gas chromatography-mass spectrometry (GC/MS), color tests, and immunoassays; FOSCI.16B

C interpret results from presumptive and confirmatory laboratory procedures, including GC/MS and their implications; and FOSCI.16C

D explain the precautions necessary in the forensic laboratory for proper preservation of biological samples. FOSCI.16D

17 The student analyzes blood spatter at a simulated crime scene. The student is expected to: FOSCI.17

A analyze blood stain patterns based on surface type and appearance such as size, shape, distribution and location in order to determine the mechanism by which the patterns are created; FOSCI.17A

B explain the methods of chemically enhancing latent blood patterns using reagents such as Blue Star or Amido Black; and FOSCI.17B

C conduct and interpret blood presumptive tests for various biologicals such as phenolphthalein and tetramethylbenzidine (TMB). FOSCI.17C

18 The student analyzes the foundations and methodologies surrounding the processing of biological evidence for the purpose of identification. The student is expected to: FOSCI.18

A identify different types of biological samples and practice proper collection and preservation techniques; FOSCI.18A

B identify the red blood cell antigens and antibodies as they relate to human blood types; FOSCI.18B

C describe the structure of a deoxyribonucleic acid (DNA) molecule and its function; FOSCI.18C

D explain the analytical procedure for generating a DNA profile, including extraction, quantification, amplification, and capillary electrophoresis; FOSCI.18D

E explain the different methodologies surrounding the different types of DNA analysis such as short tandem repeats (STRs), Y-STRs, mitochondrial DNA, and single nucleotide polymorphisms (SNPs); FOSCI.18E

F interpret the components of an electropherogram; and FOSCI.18F

G explore the databasing systems associated with DNA such as Combined DNA Index System (CODIS) and ancestry-based databasing systems. FOSCI.18G

19 The student explores the principles surrounding medicolegal death investigations. The student is expected to: FOSCI.19

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A explain the principles of rigor, algor, and livor mortis and how they apply to deceased persons; FOSCI.19A

B differentiate between the types of wound patterns such as lacerations and blunt force trauma resulting from stabbings, bludgeoning, gunshots, and strangulations; FOSCI.19B

C determine cause and manner of death from an autopsy report obtained through resources such as case studies, simulated autopsies, and dissections; and FOSCI.19C

D determine the approximate time of death using entomology. FOSCI.19D

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20 The student explores principles of anthropology and odontology relevant to forensic science. The student is expected to: FOSCI.20

A identify the major bones of the human skeletal system; FOSCI.20A

B compare composition and structure of human and non-human bones; FOSCI.20B

C describe the collection and preservation methods for bone evidence; FOSCI.20C

D explain the characteristics of the human skeletal system indicative of specific biological sex and approximate range of age and height; and FOSCI.20D

E explain how human remains are identified through dental records such as dentures, xrays, and implants FOSCI.20E