Food Science

Subject: Career and Technical Education
Grade: 11
Expectations: 89
Breakouts: 264

(a) Introduction.

1. Career and technical education instruction provides content aligned with challenging academic standards, industry-relevant technical knowledge, and college and career readiness skills for students to further their education and succeed in current and emerging professions

2. The Law and Public Service Career Cluster focuses on planning, managing, and providing legal services, public safety, protective services, and homeland security, including professional and technical support services

3. Forensic Science is a survey course that introduces students to the application of science to law. Students learn terminology and procedures related to the collection and examination of physical evidence using scientific processes performed in a field or laboratory setting. Students also learn the history and the legal aspects of forensic science

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 currently scientifically testable

5. Students are expected to know that:

    a. 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

    b. 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.

6. Scientific inquiry is the planned and deliberate investigation of the natural world using scientific and engineering practices. Scientific methods of investigation are descriptive, comparative, or experimental. The method chosen should be appropriate to the question being asked. Student learning for different types of investigations include descriptive investigations, which involve collecting data and recording observations without making comparisons; comparative investigations, which involve collecting data with variables that are manipulated to compare results; and experimental investigations, which involve processes similar to comparative investigations but in which a control is identified.

    a. Scientific practices. Students should be able to ask questions, plan and conduct investigations to answer questions, and explain phenomena using appropriate tools and models.

    b. Engineering practices. Students should be able to identify problems and design solutions using appropriate tools and models.

7. Scientific decision making is a way of answering questions about the natural world involving its own set of ethical standards about how the process of science should be carried out. Students should be able to distinguish between scientific decision-making methods (scientific methods) and ethical and social decisions that involve science (the application of scientific information).

8. Science consists of recurring themes and making connections between overarching concepts. Recurring themes include systems, models, and patterns. All systems have basic properties that can be described in 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, while models allow for boundary specification and provide a tool for understanding the ideas presented. 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.

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

10. 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.

(b) Knowledge and Skills Statements

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to

(A) demonstrate professional standards/employability skills such as demonstrating good attendance, punctuality, and ethical conduct; meeting deadlines, and working toward personal and team goals.

(i) demonstrate professional standards

(ii) demonstrate employability skills

(2) 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

(A) ask questions and define problems based on observations or information from text, phenomena, models, or investigations

(i) ask questions based on observations or information from text, phenomena, models, or investigations

(ii) define problems based on observations or information from text, phenomena, models, or investigations

(B) apply scientific practices to plan and conduct descriptive, comparative, and experimental investigations and use engineering practices to design solutions to problems

(i) apply scientific practices to plan descriptive investigations

(ii) apply scientific practices to plan comparative investigations

(iii) apply scientific practices to plan experimental investigations

(iv) apply scientific practices to conduct descriptive investigations

(v) apply scientific practices to conduct comparative investigations

(vi) apply scientific practices to conduct experimental investigations

(vii) use engineering practices to design solutions to problems

(C) use appropriate safety equipment and practices during laboratory, classroom, and field investigations as outlined in Texas Education Agency-approved safety standards

(i) use appropriate safety equipment during laboratory investigations as outlined in Texas Education Agency-approved safety standards

(ii) use appropriate safety equipment during classroom investigations as outlined in Texas Education Agency-approved safety standards

(iii) use appropriate safety equipment during field investigations as outlined in Texas Education Agency-approved safety standards

(iv) use appropriate safety practices during laboratory investigations as outlined in Texas Education Agency-approved safety standards

(v) use appropriate safety practices during classroom investigations as outlined in Texas Education Agency-approved safety standards

(vi) use appropriate safety practices during field investigations as outlined in Texas Education Agency-approved safety standards

(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

(i) use appropriate tools

(ii) use appropriate equipment

(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

(i) collect quantitative data with accuracy using the International System of Units (SI)

(ii) collect quantitative data with precision using the International System of Units (SI)

(iii) collect quantitative data with accuracy using United States customary units

(iv) collect quantitative data with precision using United States customary units

(v) collect qualitative data as evidence

(F) organize quantitative and qualitative data using appropriate methods of communication such as reports, graphs, tables, or charts

(i) organize quantitative data using appropriate methods of communication

(ii) organize qualitative data using appropriate methods of communication

(G) develop and use models to represent phenomena, systems, processes, or solutions to engineering problems

(i) develop models to represent phenomena, systems, processes, or solutions to engineering problems

(ii) use models to represent phenomena, systems, processes, or solutions to engineering problems

(H) distinguish between scientific hypotheses, theories, and laws

(i) distinguish between scientific hypotheses, theories, and laws

(3) 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

(A) identify advantages and limitations of models such as their size, scale, properties, and materials

(i) identify advantages of models

(ii) identify limitations of models

(B) analyze data by identifying significant statistical features, patterns, sources of error, and limitations

(i) analyze data by identifying significant statistical features

(ii) analyze data by identifying patterns

(iii) analyze data by identifying sources of error

(iv) analyze data by identifying limitations

(C) use mathematical calculations to assess quantitative relationships in data

(i) use mathematical calculations to assess quantitative relationships in data

(D) evaluate experimental and engineering designs.

(i) evaluate experimental designs

(ii) evaluate engineering designs

(4) The student develops evidence-based explanations and communicates findings, conclusions, and proposed solutions. The student is expected to

(A) develop explanations and propose solutions supported by data and models and consistent with scientific ideas, principles, and theories

(i) develop explanations supported by data and consistent with scientific ideas

(ii) develop explanations supported by data and consistent with scientific principles

(iii) develop explanations supported by data and consistent with scientific theories

(iv) develop explanations supported by models and consistent with scientific ideas

(v) develop explanations supported by models and consistent with scientific principles

(vi) develop explanations supported by models and consistent with scientific theories

(vii) propose solutions supported by data and consistent with scientific ideas

(viii) propose solutions supported by data and consistent with scientific principles

(ix) propose solutions supported by data and consistent with scientific theories

(x) propose solutions supported by models and consistent with scientific ideas

(xi) propose solutions supported by models and consistent with scientific principles

(xii) propose solutions supported by models and consistent with scientific theories

(B) communicate explanations and solutions individually and collaboratively in a variety of settings and formats

(i) communicate explanations individually in a variety of settings

(ii) communicate explanations individually in a variety of formats

(iii) communicate explanations collaboratively in a variety of settings

(iv) communicate explanations collaboratively in a variety of formats

(v) communicate solutions individually in a variety of settings

(vi) communicate solutions individually in a variety of formats

(vii) communicate solutions collaboratively in a variety of settings

(viii) communicate solutions collaboratively in a variety of formats

(C) engage respectfully in scientific argumentation using applied scientific explanations and empirical evidence.

(i) engage respectfully in scientific argumentation using applied scientific explanations

(ii) engage respectfully in scientific argumentation using empirical evidence

(5) 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

(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

(i) analyze scientific explanations by using empirical evidence so as to encourage critical thinking by the student

(ii) analyze scientific explanations by using logical reasoning so as to encourage critical thinking by the student

(iii) analyze scientific explanations by using experimental testing so as to encourage critical thinking by the student

(iv) analyze scientific explanations by using observational testing so as to encourage critical thinking by the student

(v) evaluate scientific explanations by using empirical evidence so as to encourage critical thinking by the student

(vi) evaluate scientific explanations by using logical reasoning so as to encourage critical thinking by the student

(vii) evaluate scientific explanations by using experimental testing so as to encourage critical thinking by the student

(viii) evaluate scientific explanations by using experimental testing so as to encourage critical thinking by the student

(ix) critique scientific explanations by using empirical evidence so as to encourage critical thinking by the student

(x) critique scientific explanations by using logical reasoning so as to encourage critical thinking by the student

(xi) critique scientific explanations by using experimental testing so as to encourage critical thinking by the student

(xii) critique scientific explanations by using observational testing so as to encourage critical thinking by the student

(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

(i) relate the impact of past research on scientific thought, including research methodology

(ii) relate the impact of past research on scientific thought, including cost-benefit analysis

(iii) relate the impact of past research on scientific thought, including contributions of diverse scientists as related to the content

(iv) relate the impact of past research on scientific thought, including contributions of diverse engineers as related to the content

(v) relate the impact of past research on society, including research methodology

(vi) relate the impact of past research on society, including cost-benefit analysis

(vii) relate the impact of past research on society, including contributions of diverse scientists as related to the content

(viii) relate the impact of past research on society, including contributions of diverse engineers as related to the content

(ix) relate the impact of current research on scientific thought, including research methodology

(x) relate the impact of current research on scientific thought, including cost-benefit analysis

(xi) relate the impact of current research on scientific thought, including contributions of diverse scientists as related to the content

(xii) relate the impact of current research on scientific thought, including contributions of diverse engineers as related to the content

(xiii) relate the impact of current research on society, including research methodology

(xiv) relate the impact of current research on society, including cost-benefit analysis

(xv) relate the impact of current research on society, including contributions of diverse scientists as related to the content; and

(xvi) relate the impact of current research on society, including contributions of diverse engineers as related to the content; and

(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.

(i) research resources

(ii) explore resources

(6) The student explores the history of forensic science. The student is expected to

(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

(i) analyze the historical development of different forensic science disciplines

(ii) analyze the current advancements of different forensic science disciplines

(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.

(i) explain significant historical contributions to the development of forensic science made by contributors

(ii) explain significant historical contributions to the advancement of forensic science made by contributors

(iii) explain significant modern contributions to the development of forensic science made by contributors

(iv) explain significant modern contributions to the advancement of forensic science made by contributors

(7) The student analyzes legal aspects within forensic science. The student is expected to

(A) summarize the ethical standards required of a forensic science professional

(i) summarize the ethical standards required of a forensic science professional

(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

(i) identify terminology in the criminal justice system as [it pertains] to the chain of custody procedure for evidence

(ii) identify procedures employed in the criminal justice system as they pertain to the chain of custody procedure for evidence

(iii) explain knowledge of terminology employed in the criminal justice system as [it pertains] to the chain of custody procedure for evidence

(iv) explain knowledge of procedures employed in the criminal justice system as they pertain to the chain of custody procedure for evidence

(C) identify and explain knowledge of terminology and procedures employed in the criminal justice system as they pertain to expert witness testimony

(i) identify terminology employed in the criminal justice system as [it pertains] to expert witness testimony

(ii) identify procedures employed in the criminal justice system as they pertain to expert witness testimony

(iii) explain knowledge of terminology employed in the criminal justice system as [it pertains] to expert witness testimony

(iv) explain knowledge of procedures employed in the criminal justice system as they pertain to expert witness testimony

(D) research and discuss the effect of biases such as confirmation bias and framing cognitive bias on evidence collection, forensic analysis, and expert testimony

(i) research the effect of biases on evidence collection

(ii) research the effect of biases on forensic analysis

(iii) research the effect of biases on expert testimony

(iv) discuss the effect of biases on evidence collection

(v) discuss the effect of biases on forensic analysis

(vi) discuss the effect of biases on expert testimony

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

(i) compare the admissibility of expert witness testimony in terms of the Frye Standard and the Daubert Standard under federal rules of evidence.

(8) The student explores career options within forensic science. The student is expected to

(A) explore and describe discipline-specific requirements for careers in forensic science, including collegiate course requirements, licensure, certifications, and physical and mental capabilities

(i) explore discipline-specific requirements for careers in forensic science, including collegiate course requirements

(ii) explore discipline-specific requirements for careers in forensic science, including licensure

(iii) explore discipline-specific requirements for careers in forensic science, including certifications

(iv) explore discipline-specific requirements for careers in forensic science, including physical capabilities

(v) explore discipline-specific requirements for careers in forensic science, including mental capabilities

(vi) describe discipline-specific requirements for careers in forensic science, including collegiate course requirements

(vii) describe discipline-specific requirements for careers in forensic science, including licensure

(viii) describe discipline-specific requirements for careers in forensic science, including certifications

(ix) describe discipline-specific requirements for careers in forensic science, including physical capabilities

(x) describe discipline-specific requirements for careers in forensic science, including mental capabilities

(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

(i) 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

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

(i) differentiate the functions of various forensic science disciplines

(9) The student recognizes the procedures of crime scene investigation while maintaining scene integrity. The student is expected to

(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

(i) explain the roles needed to complete a crime scene examination, which may require collaboration with outside experts and agencies

(ii) explain the tasks needed to complete a crime scene examination, which may require collaboration with outside experts and agencies

(iii) demonstrate the ability to work as a member of a crime scene team

(B) develop a detailed, technical written record based on observations and activities, documenting the crime scene examination

(i) develop a detailed, technical written record based on observations, documenting the crime scene examination

(ii) develop a detailed, technical written record based on activities, documenting the crime scene examination

(C) discuss the elements of criminal law that guide search and seizure of persons, property, and evidence

(i) discuss the elements of criminal law that guide search and seizure of persons

(ii) discuss the elements of criminal law that guide search and seizure of property

(iii) discuss the elements of criminal law that guide search and seizure of evidence

(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

(i) conduct a primary systematic search of a simulated crime scene for physical evidence utilizing search patterns

(ii) conduct a secondary systematic search of a simulated crime scene for physical evidence utilizing search patterns

(E) document a crime scene using photographic or audiovisual equipment

(i) document a crime scene using photographic or audiovisual equipment

(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

(i) generate a physical or digital crime scene sketch, including coordinates or measurements from fixed points

(ii) generate a physical or digital crime scene sketch, including compass directions

(iii) generate a physical or digital crime scene sketch, including scale of proportion

(iv) generate a physical or digital crime scene sketch, including legend-key

(v) generate a physical or digital crime scene sketch, including heading

(vi) generate a physical or digital crime scene sketch, including title block

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

(i) demonstrate proper techniques for collecting physical evidence found at a crime scene while maintaining documentation, including chain of custody.

(ii) demonstrate proper techniques for packaging physical evidence found at a crime scene while maintaining documentation, including chain of custody.

(iii) demonstrate proper techniques for preserving physical evidence found at a crime scene while maintaining documentation, including chain of custody.

(10) The student analyzes fingerprint evidence in forensic science. The student is expected to

(A) compare the three major fingerprint patterns of arches, loops, and whorls

(i) compare the three major fingerprint patterns of arches, loops, and whorls

(B) identify the minutiae of fingerprints, including bifurcations, ending ridges, dots, short ridges, and enclosures/islands

(i) identify the minutiae of fingerprints, including bifurcations

(ii) identify the minutiae of fingerprints, including ending ridges

(iii) identify the minutiae of fingerprints, including dots

(iv) identify the minutiae of fingerprints, including short ridges

(v) identify the minutiae of fingerprints, including enclosures/islands

(C) distinguish between patent, plastic, and latent impressions

(i) distinguish between patent, plastic, and latent impressions

(D) perform procedures for developing and lifting latent prints on nonporous surfaces using cyanoacrylate and fingerprint powders

(i) perform procedures for developing latent prints on nonporous surfaces using cyanoacrylate

(ii) perform procedures for lifting latent prints on nonporous surfaces using cyanoacrylate

(iii) perform procedures for developing latent prints on nonporous surfaces using fingerprint powders

(iv) perform procedures for lifting latent prints on nonporous surfaces using fingerprint powders

(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

(i) perform procedures for developing latent prints using chemical processes on porous surfaces with chemicals

(ii) perform procedures for developing latent prints using chemical processes on adhesive surfaces with chemicals

(iii) perform procedures for documenting the results via photography

(F) explain the Integrated Automated Fingerprint Identification System (IAFIS) and describe the implications of Next Generation Identification (NGI) systems.

(i) explain the Integrated Automated Fingerprint Identification System (IAFIS)

(ii) describe the implications of Next Generation Identification (NGI) systems.

(11) The student collects and analyzes impression evidence in forensic science. The student is expected to

(A) analyze the class and individual characteristics of tool mark impressions and the recovery and documentation of surface characteristics such as wood or metal

(i) analyze the class of tool mark impressions

(ii) analyze the individual characteristics of tool mark impressions

(iii) analyze the recovery of surface characteristics [of toolmark impressions]

(iv) analyze the documentation of surface characteristics [of tool mark impressions]

(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

(i) analyze the class of footwear impressions

(ii) analyze the individual characteristics of footwear impressions

(iii) analyze the recovery of surface characteristics [of footwear impressions]

(iv) analyze the documentation of surface characteristics [of footwear impressions]

(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

(i) analyze the class of tire tread impressions

(ii) analyze the individual characteristics of tire tread impressions

(iii) analyze the recovery documentation of surface characteristics [of tire tread impressions]

(D) compare impression evidence collected at a simulated crime scene with the known impression.

(i) compare impression evidence collected at a simulated crime scene with the known impression.

(12) The student recognizes the methods to process and analyze hair and fibers found in a crime scene. The student is expected to

(A) demonstrate how to collect hair and fiber evidence at a simulated crime scene

(i) demonstrate how to collect hair evidence at a simulated crime scene

(ii) demonstrate how to collect fiber evidence at a simulated crime scene

(B) perform the analysis of hair and fiber evidence using forensic science methods such as microscopy and flame testing

(i) perform the analysis of hair evidence using forensic science methods

(ii) perform the analysis of fiber evidence using forensic science methods

(C) compare the microscopic characteristics of human hair and non-human hair, including medulla, pigment distribution, and scales

(i) compare the microscopic characteristics of human hair and non-human hair, including medulla

(ii) compare the microscopic characteristics of human hair and non-human hair, including pigment distribution

(iii) compare the microscopic characteristics of human hair and non-human hair, including scales

(D) describe and illustrate the different microscopic characteristics used to determine the origin of a human hair sample

(i) describe the different microscopic characteristics used to determine the origin of a human hair sample

(ii) illustrate the different microscopic characteristics used to determine the origin of a human hair sample

(E) differentiate between natural and synthetic fibers.

(i) differentiate between natural and synthetic fibers.

(13) The student recognizes the methods to process and analyze glass evidence. The student is expected to

(A) demonstrate how to collect and preserve glass evidence

(i) demonstrate how to collect glass evidence

(ii) demonstrate how to preserve glass evidence

(B) compare the composition of various types of glass such as soda lime, borosilicate, leaded, and tempered

(i) compare the composition of various types of glass

(C) determine the direction of a projectile by examining glass fractures

(i) determine the direction of a projectile by examining glass fractures

(D) define refractive index and explain how it is used in forensic glass analysis.

(i) define refractive index

(ii) explain how [refractive index] is used in forensic glass analysis

(14) The student explores principles of questioned document analysis in the physical and digital form. The student is expected to

(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

(i) research different types of examinations performed on digital evidence in a forensic laboratory

(ii) research different types of examinations performed on physical evidence in a forensic laboratory

(iii) explain different types of examinations performed on digital evidence in a forensic laboratory

(iv) explain different types of examinations performed on physical evidence in a forensic laboratory

(B) investigate and describe the security features incorporated in U.S. and foreign currency to prevent counterfeiting

(i) investigate the security features incorporated in U.S. currency to prevent counterfeiting

(ii) investigate the security features incorporated in foreign currency to prevent counterfeiting

(iii) describe the security features incorporated in U.S. currency to prevent counterfeiting

(iv) describe the security features incorporated in foreign currency to prevent counterfeiting

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

(i) perform handwriting comparisons of an unknown sample with exemplars by analyzing characteristics

(15) The student evaluates firearms and ballistics evidence. The student is expected to

(A) describe the mechanism of modern firearms such as long guns and handguns

(i) describe the mechanism of modern firearms

(B) identify the components and characteristics of bullet and cartridge cases

(i) identify the components of bullet cases

(ii) identify the components of cartridge cases

(iii) identify the characteristics of bullet cases

(iv) identify the characteristics of cartridge cases

(C) describe the composition of and method of analysis for gunshot residue and primer residue

(i) describe the composition of gunshot residue

(ii) describe the composition of primer residue

(iii) describe the method of analysis for gunshot residue

(iv) describe the method of analysis for primer residue

(D) conduct and calculate trajectory analysis of bullet strikes within a simulated crime scene

(i) conduct trajectory analysis of bullet strikes within a simulated crime scene

(ii) calculate trajectory analysis of bullet strikes within a simulated crime scene

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

(i) identify the type of information available through the National Integrated Ballistics Information Network.

(ii) recognize the type of information available through the National Integrated Ballistics Information Network.

(16) The student identifies controlled and illicit substances. The student is expected to

(A) differentiate between toxicological analysis and controlled substance analysis as they relate to the method of collection and impact on the body

(i) differentiate between toxicological analysis and controlled substance analysis as they relate to the method of collection

(ii) differentiate between toxicological analysis and controlled substance analysis as they relate to the impact on the body

(B) classify controlled substances using the schedules under the Controlled Substances Act

(i) classify controlled substances using the schedules under the Controlled Substances Act

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

(i) identify unknown substances using presumptive procedures

(ii) identify unknown substances using confirmatory procedures

(17) The student explores toxicology in forensic science. The student is expected to

(A) explain the absorption, distribution, metabolization, and elimination of toxins such as alcohol, prescription drugs, controlled substances, and carbon monoxide through the human body

(i) explain the absorption of toxins through the human body

(ii) explain the distribution of toxins through the human body

(iii) explain the metabolization of toxins through the human body

(iv) explain the elimination of toxins through the human body

(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

(i) describe presumptive laboratory procedures as they relate to toxicological analysis

(ii) describe confirmatory laboratory procedures as they relate to toxicological analysis

(C) interpret results from presumptive and confirmatory laboratory procedures, including GC/MS and their implications

(i) interpret results from presumptive laboratory procedures, including GC/MS

(ii) interpret results from presumptive laboratory procedures, including [the results'] implications

(iii) interpret results from confirmatory laboratory procedures, including GC/MS

(iv) interpret results from confirmatory laboratory procedures, including [the results'] implications

(D) explain the precautions necessary in the forensic laboratory for proper preservation of biological samples.

(i) explain the precautions necessary in the forensic laboratory for proper preservation of biological samples

(18) The student analyzes blood spatter at a simulated crime scene. The student is expected to

(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

(i) analyze blood stain patterns based on surface type in order to determine the mechanism by which the patterns are created

(ii) analyze blood stain patterns based on appearance in order to determine the mechanism by which the patterns are created

(B) explain the methods of chemically enhancing latent blood patterns using reagents such as Blue Star or Amido Black

(i) explain the methods of chemically enhancing latent blood patterns using reagents

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

(i) conduct blood presumptive tests for various biologicals

(ii) interpret blood presumptive tests for various biologicals

(19) The student analyzes the foundations and methodologies surrounding the processing of biological evidence for the purpose of identification. The student is expected to

(A) identify different types of biological samples and practice proper collection and preservation techniques

(i) identify different types of biological samples

(ii) practice proper collection techniques [of biological samples]

(iii) practice proper preservation techniques [of biological samples]

(B) identify the red blood cell antigens and antibodies as they relate to human blood types

(i) identify the red blood cell antigens as they relate to human blood types

(ii) identify the red blood cell antibodies as they relate to human blood types

(C) describe the structure of a deoxyribonucleic acid (DNA) molecule and its function

(i) describe the structure of a deoxyribonucleic acid (DNA) molecule

(ii) describe the function [of a DNA molecule]

(D) explain the analytical procedure for generating a DNA profile, including extraction, quantification, amplification, and capillary electrophoresis

(i) explain the analytical procedure for generating a DNA profile, including extraction

(ii) explain the analytical procedure for generating a DNA profile, including quantification

(iii) explain the analytical procedure for generating a DNA profile, including amplification

(iv) explain the analytical procedure for generating a DNA profile, including capillary electrophoresis

(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)

(i) explain the different methodologies surrounding the different types of DNA analysis

(F) interpret the components of an electropherogram

(i) interpret the components of an electropherogram

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

(i) explore the databasing systems associated with DNA

(20) The student explores the principles surrounding medicolegal death investigations. The student is expected to

(A) explain the principles of rigor, algor, and livor mortis and how they apply to deceased persons

(i) explain the [principle] of rigor mortis

(ii) explain the [principle] of algor mortis

(iii) explain the [principle] of livor mortis

(iv) explain how [rigor mortis applies] to deceased persons

(v) explain how [algor mortis applies] to deceased persons

(vi) explain how [livor mortis applies] to deceased persons

(B) differentiate between the types of wound patterns such as lacerations and blunt force trauma resulting from stabbings, bludgeoning, gunshots, and strangulations

(i) differentiate between the types of wound patterns resulting from stabbings, bludgeoning, gunshots, and strangulations

(C) determine cause and manner of death from an autopsy report obtained through resources such as case studies, simulated autopsies, and dissections

(i) determine cause of death from an autopsy report obtained through resources

(ii) determine manner of death from an autopsy report obtained through resources

(D) determine the approximate time of death using entomology.

(i) determine the approximate time of death using entomology

(21) The student explores principles of anthropology and odontology relevant to forensic science. The student is expected to

(A) identify the major bones of the human skeletal system

(i) identify the major bones of the human skeletal system

(B) compare composition and structure of human and non-human bones;

(i) compare composition of human and non-human bones

(ii) compare structure of human and non-human bones

(C) describe the collection and preservation methods for bone evidence;

(i) describe the collection methods for bone evidence

(ii) describe the preservation methods for bone evidence

(D) explain the characteristics of the human skeletal system indicative of specific biological sex and approximate range of age and height; and

(i) explain the characteristics of the human skeletal system indicative of specific biological sex

(ii) explain the characteristics of the human skeletal system indicative of approximate range of age

(iii) explain the characteristics of the human skeletal system indicative of approximate range of height

(E) explain how human remains are identified through dental records such as dentures, x-rays, and implants.

(i) explain how human remains are identified through dental records