

## ***Course Description***

1. Forensic Science. Forensic Science is a course that uses a structured and scientific approach to the investigation of crimes of assault, abuse and neglect, domestic violence, accidental death, homicide, and the psychology of criminal behavior. Students will learn terminology and investigative procedures related to crime scene, questioning, interviewing, criminal behavior characteristics, truth detection, and scientific procedures used to solve crimes. Using scientific methods, students will collect and analyze evidence through case studies and simulated crime scenes such as fingerprint analysis, ballistics, and blood spatter analysis. Students will learn the history, legal aspects, and career options for forensic science.
2. Nature of science. 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.
3. Scientific inquiry. 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.
4. Science and social ethics. 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.
5. Scientific systems. 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.

- PIEMS Number: 13029500
- General Requirements: This course is recommended for students in Grades 11-12.

### ***Unit 1 Safety & Scientific Method***

A. The student is expected to:

- (c)(1)(A) demonstrate safe practices during laboratory and field investigations; and
- (c)(1)(B) demonstrate an understanding of the use and conservation of resources and the proper disposal or recycling of materials;
- (c)(2)(A) know the definition of science and understand that it has limitations, as specified in subsection (b)(2) of this section;
- (c)(2)(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 which have been tested over a wide variety of conditions are incorporated into theories;

- (c)(2)(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;
- (c)(2)(D) distinguish between scientific hypotheses and scientific theories;
- (c)(2)(E) plan and implement descriptive, comparative, and experimental investigations, including asking questions, formulating testable hypotheses, and selecting equipment and technology;
- (c)(3)(A) in all fields of science, 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, so as to encourage critical thinking by the student;
- (c)(3)(B) communicate and apply scientific information extracted from various sources such as current events, news reports, published journal articles, and marketing materials;
- (c)(3)(C) draw inferences based on data related to promotional materials for products and services;
- (c)(3)(D) evaluate the impact of scientific research on society and the environment;
- (c)(3)(E) evaluate models according to their limitations in representing biological objects or events;
- (c)(3)(F) research and describe the history of science and contributions of scientists;
- (c)(6)(A) demonstrate conversions of measurements between English and International System (SI) of units;
- (c)(6)(B) distinguish between physical and chemical properties of matter using the periodic table;
- (c)(6)(C) determine the elements within a compound or mixture; and
- (c)(6)(D) identify the four types of chemical reactions.

## Unit 2 History

A. The student is expected to:

- (c)(4)(A) distinguish between forensic science and criminalistics in law, public safety, corrections, and security;
- (c)(4)(B) identify roles, functions, and responsibilities of forensic science professionals;
- (c)(4)(C) summarize the ethical standards required of a forensic science professional;
- (c)(4)(D) present career information in written and verbal formats;
- (c)(4)(E) recognize the major contributors to the development of forensic science;
- (c)(4)(F) illustrate the history of forensic science; and
- (c)(5)(A) analyze the role of scientists such as forensic pathologists and anthropologists as they relate to a homicide investigation.

## *Unit 3 Legal Systems*

A. The student is expected to:

- (c)(4)(A) distinguish between forensic science and criminalistics in law, public safety, corrections, and security;
- (c)(4)(B) identify roles, functions, and responsibilities of forensic science professionals;
- (c)(4)(C) summarize the ethical standards required of a forensic science professional;
- (c)(5)(D) apply knowledge of the elements of criminal law that guide search and seizure of persons, property, and evidence; and
- (c)(5)(G) outline the chain of custody procedure for evidence discovered in a crime scene.

#### ***Unit 4 Crime Scene Investigation***

A. The student is expected to:

- (c)(1)(A) demonstrate safe practices during laboratory and field investigations;
- (c)(1)(B) demonstrate an understanding of the use and conservation of resources and the proper disposal or recycling of materials;
- (c)(2)(F) collect and organize qualitative and quantitative data and make measurements with accuracy and precision using tools such as calculators, spreadsheet software, data-collecting 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, meter sticks, and models, diagrams, or samples of biological specimens or structures;
- (c)(2)(G) analyze, evaluate, make inferences, and predict trends from data;
- (c)(2)(H) communicate valid conclusions supported by the data through methods such as lab reports, labeled drawings, graphic organizers, journals, summaries, oral reports, and technology-based reports;
- (c)(3)(A) in all fields of science, 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, so as to encourage critical thinking by the student;
- (c)(3)(B) communicate and apply scientific information extracted from various sources such as current events, news reports, published journal articles, and marketing materials;
- (c)(3)(C) draw inferences based on data related to promotional materials for products and services;
- (c)(3)(D) evaluate the impact of scientific research on society and the environment;
- (c)(3)(E) evaluate models according to their limitations in representing biological objects or events;
- (c)(3)(F) research and describe the history of science and contributions of scientists;
- (c)(5)(A) analyze the role of scientists such as forensic pathologists and anthropologists as they relate to a homicide investigation;
- (c)(5)(B) demonstrate the ability to work as a member of a team;
- (c)(5)(C) conduct a systematic search of a simulated crime scene for physical evidence following crime scene protocol;
- (c)(5)(D) apply knowledge of the elements of criminal law that guide search and seizure of persons, property, and evidence;

- (c)(5)(E) describe the elements of a crime scene sketch such as measurements, compass directions, scale of proportion, legend, key, and title;
- (c)(5)(F) develop a crime scene sketch using triangulation, rectangular coordinates, straight-line methods, and use of coordinates on transecting baseline;
- (c)(5)(G) outline the chain of custody procedure for evidence discovered in a crime scene;
- (c)(5)(H) demonstrate proper techniques for collecting and packaging physical evidence found at a crime scene;
- (c)(5)(I) explain the functions of national databases available to forensic scientists;
- (c)(5)(J) collect and preserve physical evidence from a simulated crime scene; and
- (c)(6)(A) demonstrate conversions of measurements between English and International System (SI) of units.

### ***Unit 5 Forensic Glass Analysis***

A. The student is expected to:

- (c)(1)(A) demonstrate safe practices during laboratory and field investigations;
- (c)(1)(B) demonstrate an understanding of the use and conservation of resources and the proper disposal or recycling of materials;
- (c)(2)(F) collect and organize qualitative and quantitative data and make measurements with accuracy and precision using tools such as calculators, spreadsheet software, data-collecting 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, meter sticks, and models, diagrams, or samples of biological specimens or structures;
- (c)(2)(G) analyze, evaluate, make inferences, and predict trends from data;
- (c)(2)(H) communicate valid conclusions supported by the data through methods such as lab reports, labeled drawings, graphic organizers, journals, summaries, oral reports, and technology-based reports;
- (c)(3)(A) in all fields of science, 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, so as to encourage critical thinking by the student;
- (c)(3)(D) evaluate the impact of scientific research on society and the environment;
- (c)(3)(E) evaluate models according to their limitations in representing biological objects or events;
- (c)(3)(F) research and describe the history of science and contributions of scientists;
- (c)(6)(A) demonstrate conversions of measurements between English and International System (SI) of units;
- (c)(6)(B) distinguish between physical and chemical properties of matter using the periodic table;
- (c)(6)(C) determine the elements within a compound or mixture;
- (c)(6)(D) identify the four types of chemical reactions;
- (c)(6)(E) explain properties of refractive index;
- (c)(6)(F) explain dispersion of light through a prism;

- (c)(6)(H) explain the examination of trace evidence using instruments such as a spectrophotometer, stereoscope, electron microscope, and compound microscope;
- (c)(6)(I) calculate the direction of a projectile by examining glass fractures;
- (c)(6)(J) compare the composition of glass fragments; and
- (c)(7)(B) process trace evidence such as soil, grass, glass, blood, fibers, and hair collected in a simulated crime scene.

### ***Unit 6 Forensic Hair & Fiber Analysis***

A. The student is expected to:

- (c)(1)(A) demonstrate safe practices during laboratory and field investigations;
- (c)(1)(B) demonstrate an understanding of the use and conservation of resources and the proper disposal or recycling of materials;
- (c)(2)(F) collect and organize qualitative and quantitative data and make measurements with accuracy and precision using tools such as calculators, spreadsheet software, data-collecting 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, meter sticks, and models, diagrams, or samples of biological specimens or structures;
- (c)(2)(G) analyze, evaluate, make inferences, and predict trends from data;
- (c)(2)(H) communicate valid conclusions supported by the data through methods such as lab reports, labeled drawings, graphic organizers, journals, summaries, oral reports, and technology-based reports;
- (c)(3)(A) in all fields of science, 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, so as to encourage critical thinking by the student;
- (c)(3)(D) evaluate the impact of scientific research on society and the environment;
- (c)(3)(E) evaluate models according to their limitations in representing biological objects or events; and
- (c)(3)(F) research and describe the history of science and contributions of scientists;
- (c)(6)(A) demonstrate conversions of measurements between English and International System (SI) of units;
- (c)(6)(B) distinguish between physical and chemical properties of matter using the periodic table;
- (c)(6)(C) determine the elements within a compound or mixture;
- (c)(6)(D) identify the four types of chemical reactions;
- (c)(6)(E) explain properties of refractive index;
- (c)(6)(F) explain dispersion of light through a prism;
- (c)(6)(G) identify the light sources used in forensic science such as ultraviolet light;
- (c)(6)(H) explain the examination of trace evidence using instruments such as a spectrophotometer, stereoscope, electron microscope, and compound microscope;
- (c)(7)(A) perform continuous and light emissions laboratory procedures to identify trace evidence;

- (c)(7)(B) process trace evidence such as soil, grass, glass, blood, fibers, and hair collected in a simulated crime scene;
- (c)(7)(C) compare the anatomy of the human hair to animal hair; and
- (c)(7)(D) differentiate between natural and manufactured fibers.

### ***Unit 7 Paint***

A. The student is expected to:

- (c)(1)(A) demonstrate safe practices during laboratory and field investigations;
- (c)(1)(B) demonstrate an understanding of the use and conservation of resources and the proper disposal or recycling of materials;
- (c)(2)(F) collect and organize qualitative and quantitative data and make measurements with accuracy and precision using tools such as calculators, spreadsheet software, data-collecting 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, meter sticks, and models, diagrams, or samples of biological specimens or structures;
- (c)(2)(G) analyze, evaluate, make inferences, and predict trends from data;
- (c)(2)(H) communicate valid conclusions supported by the data through methods such as lab reports, labeled drawings, graphic organizers, journals, summaries, oral reports, and technology-based reports;
- (c)(3)(A) in all fields of science, 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, so as to encourage critical thinking by the student;
- (c)(3)(D) evaluate the impact of scientific research on society and the environment;
- (c)(3)(E) evaluate models according to their limitations in representing biological objects or events;
- (c)(3)(F) research and describe the history of science and contributions of scientists;
- (c)(5)(C) conduct a systematic search of a simulated crime scene for physical evidence following crime scene protocol;
- (c)(5)(E) describe the elements of a crime scene sketch such as measurements, compass directions, scale of proportion, legend, key, and title;
- (c)(5)(F) develop a crime scene sketch using triangulation, rectangular coordinates, straight-line methods, and use of coordinates on transecting baseline;
- (c)(5)(G) outline the chain of custody procedure for evidence discovered in a crime scene;
- (c)(5)(H) demonstrate proper techniques for collecting and packaging physical evidence found at a crime scene;
- (c)(5)(I) explain the functions of national databases available to forensic scientists;
- (c)(5)(J) collect and preserve physical evidence from a simulated crime scene;
- (c)(6)(A) demonstrate conversions of measurements between English and International System (SI) of units;
- (c)(6)(B) distinguish between physical and chemical properties of matter using the periodic table;
- (c)(6)(C) determine the elements within a compound or mixture;

- (c)(6)(D) identify the four types of chemical reactions;
- (c)(6)(G) identify the light sources used in forensic science such as ultraviolet light;
- (c)(6)(H) explain the examination of trace evidence using instruments such as a spectrophotometer, stereoscope, electron microscope, and compound microscope; and
- (c)(7)(A) perform continuous and light emissions laboratory procedures to identify trace evidence.

### ***Unit 8 Footwear & Tire Impressions***

A. The student is expected to:

- (c)(1)(A) demonstrate safe practices during laboratory and field investigations;
- (c)(1)(B) demonstrate an understanding of the use and conservation of resources and the proper disposal or recycling of materials;
- (c)(2)(F) collect and organize qualitative and quantitative data and make measurements with accuracy and precision using tools such as calculators, spreadsheet software, data-collecting 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, meter sticks, and models, diagrams, or samples of biological specimens or structures;
- (c)(2)(G) analyze, evaluate, make inferences, and predict trends from data;
- (c)(2)(H) communicate valid conclusions supported by the data through methods such as lab reports, labeled drawings, graphic organizers, journals, summaries, oral reports, and technology-based reports;
- (c)(3)(A) in all fields of science, 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, so as to encourage critical thinking by the student;
- (c)(3)(D) evaluate the impact of scientific research on society and the environment;
- (c)(3)(E) evaluate models according to their limitations in representing biological objects or events;
- (c)(3)(F) research and describe the history of science and contributions of scientists;
- (c)(5)(C) conduct a systematic search of a simulated crime scene for physical evidence following crime scene protocol;
- (c)(5)(D) apply knowledge of the elements of criminal law that guide search and seizure of persons, property, and evidence;
- (c)(5)(E) describe the elements of a crime scene sketch such as measurements, compass directions, scale of proportion, legend, key, and title;
- (c)(5)(G) outline the chain of custody procedure for evidence discovered in a crime scene;
- (c)(5)(H) demonstrate proper techniques for collecting and packaging physical evidence found at a crime scene;
- (c)(5)(I) explain the functions of national databases available to forensic scientists;
- (c)(5)(J) collect and preserve physical evidence from a simulated crime scene;
- (c)(6)(A) demonstrate conversions of measurements between English and International System (SI) of units; and

- (c)(6)(G) identify the light sources used in forensic science such as ultraviolet light.

### ***Unit 9 Fingerprints***

A. The student is expected to:

- (c)(1)(A) demonstrate safe practices during laboratory and field investigations;
- (c)(1)(B) demonstrate an understanding of the use and conservation of resources and the proper disposal or recycling of materials;
- (c)(2)(F) collect and organize qualitative and quantitative data and make measurements with accuracy and precision using tools such as calculators, spreadsheet software, data-collecting 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, meter sticks, and models, diagrams, or samples of biological specimens or structures;
- (c)(2)(G) analyze, evaluate, make inferences, and predict trends from data;
- (c)(2)(H) communicate valid conclusions supported by the data through methods such as lab reports, labeled drawings, graphic organizers, journals, summaries, oral reports, and technology-based reports;
- (c)(3)(A) in all fields of science, 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, so as to encourage critical thinking by the student;
- (c)(3)(B) communicate and apply scientific information extracted from various sources such as current events, news reports, published journal articles, and marketing materials;
- (c)(3)(D) evaluate the impact of scientific research on society and the environment;
- (c)(3)(E) evaluate models according to their limitations in representing biological objects or events;
- (c)(3)(F) research and describe the history of science and contributions of scientists;
- (c)(8)(A) compare the three major fingerprint patterns of arches, loops, and whorls and their respective subclasses;
- (c)(8)(B) identify characteristics of fingerprints, including bifurcations, ending ridges, ridge islands, dots, short ridges, and divergence ridges;
- (c)(8)(C) distinguish among visible, plastic, and latent fingerprints;
- (c)(8)(D) perform laboratory procedures for lifting latent prints on porous and nonporous objects using chemicals such as iodine, ninhydrin, silver nitrate, and cyanoacrylate resin;
- (c)(8)(E) perform laboratory procedures for lifting latent prints on nonporous objects using fingerprint powders such as black powder and florescent powders;
- (c)(8)(F) explain the Automatic Fingerprint Identification System; and
- (c)(8)(G) compare fingerprints collected at a simulated crime scene with the fingerprints of a suspect.

### ***Unit 10 Forensic Serology/DNA***

A. The student is expected to:



- (c)(1)(A) demonstrate safe practices during laboratory and field investigations;
- (c)(1)(B) demonstrate an understanding of the use and conservation of resources and the proper disposal or recycling of materials;
- (c)(2)(F) collect and organize qualitative and quantitative data and make measurements with accuracy and precision using tools such as calculators, spreadsheet software, data-collecting 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, meter sticks, and models, diagrams, or samples of biological specimens or structures;
- (c)(2)(G) analyze, evaluate, make inferences, and predict trends from data;
- (c)(2)(H) communicate valid conclusions supported by the data through methods such as lab reports, labeled drawings, graphic organizers, journals, summaries, oral reports, and technology-based reports;
- (c)(3)(A) in all fields of science, 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, so as to encourage critical thinking by the student;
- (c)(3)(B) communicate and apply scientific information extracted from various sources such as current events, news reports, published journal articles, and marketing materials;
- (c)(3)(D) evaluate the impact of scientific research on society and the environment;
- (c)(3)(E) evaluate models according to their limitations in representing biological objects or events;
- (c)(3)(F) research and describe the history of science and contributions of scientists;
- (c)(7)(B) process trace evidence such as soil, grass, glass, blood, fibers, and hair collected in a simulated crime scene;
- (c)(9)(A) analyze blood stain patterns based on source, direction, and angle of trajectory;
- (c)(9)(B) explain the method of chemically isolating an invisible blood stain using reagents such as luminol;
- (c)(11)(A) explain forensic laboratory procedures to determine if a stain detected in a crime scene is blood;
- (c)(11)(B) identify the red blood cell antigens and antibodies as they relate to human blood types;
- (c)(11)(C) determine genotypes and phenotypes in the human red blood cell system using Punnet Squares;
- (c)(11)(D) research methodologies used to collect and analyze other body fluids;
- (c)(12)(A) diagram the deoxyribonucleic acid molecule, including nitrogen bases, sugars, and phosphate groups;
- (c)(12)(B) explain base pairing of adenine, thymine, cytosine, and guanine as they relate to deoxyribonucleic acid fingerprinting;
- (c)(12)(C) extract deoxyribonucleic acid from food such as peas and strawberries;
- (c)(12)(D) explain the polymerase chain reaction laboratory procedure for forensic deoxyribonucleic acid typing; and
- (c)(12)(E) collect and package deoxyribonucleic acid from a simulated crime scene.

## ***Unit 11 Forensic Toxicology***

A. The student is expected to:

- (c)(1)(A) demonstrate safe practices during laboratory and field investigations;
- (c)(1)(B) demonstrate an understanding of the use and conservation of resources and the proper disposal or recycling of materials.
- (c)(2)(F) collect and organize qualitative and quantitative data and make measurements with accuracy and precision using tools such as calculators, spreadsheet software, data-collecting 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, meter sticks, and models, diagrams, or samples of biological specimens or structures;
- (c)(2)(G) analyze, evaluate, make inferences, and predict trends from data;
- (c)(2)(H) communicate valid conclusions supported by the data through methods such as lab reports, labeled drawings, graphic organizers, journals, summaries, oral reports, and technology-based reports;
- (c)(3)(A) in all fields of science, 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, so as to encourage critical thinking by the student;
- (c)(3)(D) evaluate the impact of scientific research on society and the environment;
- (c)(3)(E) evaluate models according to their limitations in representing biological objects or events;
- (c)(3)(F) research and describe the history of science and contributions of scientists;
- (c)(6)(A) demonstrate conversions of measurements between English and International System (SI) of units;
- (c)(6)(B) distinguish between physical and chemical properties of matter using the periodic table;
- (c)(6)(C) determine the elements within a compound or mixture;
- (c)(6)(D) identify the four types of chemical reactions;
- (c)(10)(A) explain the absorption, distribution, and elimination of alcohol through the human body;
- (c)(10)(B) describe the blood alcohol laboratory procedures as they relate to blood alcohol concentration;
- (c)(10)(C) explain the levels of tolerance and impairment due to alcohol consumption; and
- (c)(10)(D) explain the precautions necessary in the forensic laboratory for proper preservation of blood samples.

## ***Unit 12 Controlled Substances***

A. The student is expected to:

- (c)(1)(A) demonstrate safe practices during laboratory and field investigations;
- (c)(1)(B) demonstrate an understanding of the use and conservation of resources and the proper disposal or recycling of materials;

- (c)(2)(F) collect and organize qualitative and quantitative data and make measurements with accuracy and precision using tools such as calculators, spreadsheet software, data-collecting 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, meter sticks, and models, diagrams, or samples of biological specimens or structures;
- (c)(2)(G) analyze, evaluate, make inferences, and predict trends from data;
- (c)(2)(H) communicate valid conclusions supported by the data through methods such as lab reports, labeled drawings, graphic organizers, journals, summaries, oral reports, and technology-based reports;
- (c)(3)(A) in all fields of science, 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, so as to encourage critical thinking by the student;
- (c)(3)(B) communicate and apply scientific information extracted from various sources such as current events; news reports, published journal articles, and marketing materials;
- (c)(3)(C) draw inferences based on data related to promotional materials for products and services;
- (c)(3)(D) evaluate the impact of scientific research on society and the environment;
- (c)(3)(E) evaluate models according to their limitations in representing biological objects or events; and
- (c)(3)(F) research and describe the history of science and contributions of scientists.
- (c)(6)(A) demonstrate conversions of measurements between English and International System (SI) of units;
- (c)(6)(B) distinguish between physical and chemical properties of matter using the periodic table;
- (c)(6)(C) determine the elements within a compound or mixture;
- (c)(6)(D) identify the four types of chemical reactions;
- (c)(6)(G) identify the light sources used in forensic science such as ultraviolet light;
- (c)(6)(H) explain the examination of trace evidence using instruments such as a spectrophotometer, stereoscope, electron microscope, and compound microscope;
- (c)(13)(A) classify controlled substances using Food and Drug Administration classification; and
- (c)(13)(B) identify controlled substances using laboratory procedures such as color test reactions, microcrystalline procedures, chromatography, and spectrophotometry

### ***Unit 13 Questioned Documents***

A. The student is expected to:

- (c)(2)(G) analyze, evaluate, make inferences, and predict trends from data;
- (c)(2)(H) communicate valid conclusions supported by the data through methods such as lab reports, labeled drawings, graphic organizers, journals, summaries, oral reports, and technology-based reports;
- (c)(3)(A) in all fields of science, 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, so as to encourage critical thinking by the student;

- (c)(3)(B) communicate and apply scientific information extracted from various sources such as current events, news reports, published journal articles, and marketing materials;
- (c)(3)(C) draw inferences based on data related to promotional materials for products and services;
- (c)(3)(D) evaluate the impact of scientific research on society and the environment;
- (c)(3)(E) evaluate models according to their limitations in representing biological objects or events;
- (c)(3)(F) research and describe the history of science and contributions of scientists;
- (c)(5)(C) conduct a systematic search of a simulated crime scene for physical evidence following crime scene protocol;
- (c)(5)(D) apply knowledge of the elements of criminal law that guide search and seizure of persons, property, and evidence;
- (c)(5)(G) outline the chain of custody procedure for evidence discovered in a crime scene;
- (c)(5)(H) demonstrate proper techniques for collecting and packaging physical evidence found at a crime scene;
- (c)(5)(I) explain the functions of national databases available to forensic scientists;
- (c)(5)(J) collect and preserve physical evidence from a simulated crime scene;
- (c)(6)(B) distinguish between physical and chemical properties of matter using the periodic table;
- (c)(6)(C) determine the elements within a compound or mixture;
- (c)(6)(G) identify the light sources used in forensic science such as ultraviolet light;
- (c)(6)(H) explain the examination of trace evidence using instruments such as a spectrophotometer, stereoscope, electron microscope, and compound microscope;
- (c)(7)(A) perform continuous and light emissions laboratory procedures to identify trace evidence;
- (c)(7)(B) process trace evidence such as soil, grass, glass, blood, fibers, and hair collected in a simulated crime scene; and
- (c)(7)(D) differentiate between natural and manufactured fibers.

### ***Unit 14 Firearms & Toolmarks***

A. The student is expected to:

- (c)(1)(A) demonstrate safe practices during laboratory and field investigations;
- (c)(1)(B) demonstrate an understanding of the use and conservation of resources and the proper disposal or recycling of materials;
- (c)(2)(G) analyze, evaluate, make inferences, and predict trends from data;
- (c)(2)(H) communicate valid conclusions supported by the data through methods such as lab reports, labeled drawings, graphic organizers, journals, summaries, oral reports, and technology-based reports;
- (c)(3)(A) in all fields of science, 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, so as to encourage critical thinking by the student;

- (c)(3)(B) communicate and apply scientific information extracted from various sources such as current events, news reports, published journal articles, and marketing materials;
- (c)(3)(C) draw inferences based on data related to promotional materials for products and services;
- (c)(3)(D) evaluate the impact of scientific research on society and the environment;
- (c)(3)(F) research and describe the history of science and contributions of scientists;
- (c)(14)(A) explain the individual characteristics of tool marks;
- (c)(14)(B) recognize characteristics of bullet and cartridge cases;
- (c)(14)(C) explain laboratory methodologies used to determine whether an individual has fired a weapon such as identifying gun shot residue; and
- (c)(14)(D) recognize the type of information available through the National Integrated Ballistics Information Network.

### ***Unit 15 Forensic Anthropology***

A. The student is expected to:

- (c)(2)(F) collect and organize qualitative and quantitative data and make measurements with accuracy and precision using tools such as calculators, spreadsheet software, data-collecting 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, meter sticks, and models, diagrams, or samples of biological specimens or structures;
- (c)(2)(G) analyze, evaluate, make inferences, and predict trends from data;
- (c)(2)(H) communicate valid conclusions supported by the data through methods such as lab reports, labeled drawings, graphic organizers, journals, summaries, oral reports, and technology-based reports;
- (c)(3)(A) in all fields of science, 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, so as to encourage critical thinking by the student;
- (c)(3)(D) evaluate the impact of scientific research on society and the environment;
- (c)(3)(E) evaluate models according to their limitations in representing biological objects or events;
- (c)(3)(F) research and describe the history of science and contributions of scientists;
- (c)(15)(A) identify the major bones of the human skeletal system;
- (c)(15)(B) compare composition and structure of human bones with other animals;
- (c)(15)(C) describe the techniques used to excavate bones from a crime scene;
- (c)(15)(D) determine unique characteristics of the human skeletal system such as gender and age;
- (c)(15)(E) explain the role of dental records in identification of remains;
- (c)(15)(F) describe the role of dental matching in forensic science;
- (c)(16)(A) explain the process and timeline of rigor mortis and its role in calculating time of death;
- (c)(16)(B) explain post mortem lividity and its importance when processing a crime scene;
- (c)(16)(C) determine time of death using entomology; and

- (c)(16)(D) determine time and cause of death through case studies.