

A Correlation of

Forensic Science An Introduction

3rd Edition, © 2016



To the

Utah Core Standards for Medical Forensics

**A Correlation of Forensic Science: An Introduction, 3rd Edition, ©2016
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CORE STANDARDS, OBJECTIVES AND INDICATORS	
STANDARD 1 Introduction to Medical Forensics	
Students will explore the fundamental aspects of Medical Forensics.	
OBJECTIVE 1: Detail the history and development of medical forensics.	
a. Create a historical timeline	SE: 6-13, 106, 324-325, 584-587, 631-634 LE: 1, 43-44
b. Discuss the federal programs established in the United States to investigate crimes.	SE: 14-24
c. Explore a variety of careers associated with medical forensics professions. Crime laboratory analyst Clinical laboratory technician Microbiologist Fingerprint analyst Criminalist Crime scene photographer Phlebotomist Forensic serology DNA criminalist Serology technician Forensic psychologist Mental health counselor Toxicologist Biochemist Pharmacologist Geneticist Medical examiner	SE: 4-5, 758-763
OBJECTIVE 2: Discuss the organization of the crime laboratory and detail the functions it serves.	
a. Describe the organization of the Utah Crime Lab.	For supporting content, see SE: 14-24
b. Compare and contrast the Utah Crime Lab with a crime lab from another state and an international crime lab.	For supporting content, see SE: 17-22, 34-35, 89-97
OBJECTIVE 3: Describe the importance of physical evidence.	
a. List the types of evidence (eyewitness, class evidence, physical evidence (trace, circumstantial, individual, class).	SE: 25-31, 48, 78-80, 493-500
b. Discuss how evidence is used to convince a jury of guilt.	SE: 25-31, 80-84, 85-97

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STANDARD 2 Fundamental Laboratory Skills	
Students will explore essential laboratory safety skills and fundamental skills related to microscopy and measurement.	
OBJECTIVE 1: Demonstrate appropriate use of personal protective devices.	
a. Describe how personal protective devices protect the evidence and the lab worker.	SE: 68-69 LE: ix-xi
b. Demonstrate how to properly use personal protective devices (e.g., lab coats, gloves, safety glasses).	SE: 68-69
c. Demonstrate safe removal of gloves.	SE: 68-69
OBJECTIVE 2: Exhibit appropriate behavior in the lab.	
a. Explain the dangers of evidence contamination through food, drink, cosmetics, lotion, eye drops, and contact lenses.	For supporting content, see SE: 68-69 LE: x
b. Follow proper disposal and clean-up procedures with respect to chemicals and laboratory equipment.	Students have the opportunity to practice this skill in the Laboratory Experiments throughout the text, and in the Basic Laboratory Exercises. For representative pages, see SE: 44, 75, 101, 140, 182, 242, 288, 320, 360, 412, 450, 488, 525, 555, 580, 618, 665, 697 LE: LE: x
c. Demonstrate proper hand washing technique.	Students have the opportunity to practice this skill in the Laboratory Experiments throughout the text, and in the Basic Laboratory Exercises. SE: 288 LE: 35 For supporting content, see LE: ix, xi
OBJECTIVE 3: Use laboratory equipment correctly and safely.	
a. Demonstrate the proper use of equipment (micropipette, centrifuge, spectrophotometer, electrophoresis apparatus—DNA, thermocycler, microscope, balance, water baths, Vernier calipers, glassware (metric units), rulers/measuring tapes).	SE: 145-146, 157-161, 304-307, 503, 640-644 LE: 2-3, 26-28, 82-89, 91-93 Exercises 1, 4, 6, 7, 9, 11, 13, 14
b. Demonstrate proper use and handling of a compound microscope and a stereoscope.	SE: 163-170, 296-300, 301-306, 315-316, 320-321 LE: 2-3, 46, 47-49, 56-58,
OBJECTIVE 4: Follow laboratory procedures.	
a. Understand the purpose of individual steps within a protocol.	SE: 25-27

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b. Perform the steps of laboratory protocols accurately and in sequence.	Students have the opportunity to practice this skill in the Laboratory Experiments throughout the text, and in the Basic Laboratory Exercises. For representative pages, see SE: 75, 101, 140, 182, 242, 288, 320, 360, 412, 450, 488, 525, 555, 618, 665, 694 LE: 2, 26, 33-42, 72-73, 75-76, 84-89, 95-96, 129
OBJECTIVE 5: Comply with policies and requirements for maintaining a lab manual.	
a. Follow standard operating procedures for maintaining a lab manual.	SE: 44, 75 LE: 20, 35, 58, 121-122
b. Document laboratory work following the steps of the Scientific Method (objectives, material, procedures, data/results, and conclusion).	SE: 25, 44 LE: 1-3, 94-98, 99-105
OBJECTIVE 6: Demonstrate proper handling of chemicals.	
a. Communicate the rationale for laboratory labeling procedures.	LE: 34-36
b. Recognize and comply with the labeling of chemicals used in a laboratory setting for safe handling and storage (flammability, corrosiveness, biohazards, toxicity, etc.).	For supporting content, see SE: 543-548 LE: vii, x
c. Reference and interpret the guidelines in Material Safety Data Sheets (MSDS).	For supporting content, see LE: vii, x
STANDARD 3 Students will identify and analyze trace evidence.	
OBJECTIVE 1: Examine trace evidence using a microscope, chromatography, and other techniques.	
a. Define and list examples of trace evidence.	SE: 12, 174-175, 215-223, 224-232, 272, 503, 504-510, 548 LE: 67-70, 71-73, 90-93
b. Collect and analyze various types of trace evidence (dust, pollen, fiberglass, etc.)	SE: 310-311, 312-313
OBJECTIVE 2: Identify microbes using measurement and microscopy techniques in a simulated professional setting.	
a. Define and identify a variety of microbes.	This standard falls outside the scope of the Forensic Science: An Introduction, 3e program.
b. Use a compound microscope to identify microbes.	For supporting content, see SE: 298-300 LE: 43-52

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STANDARD 4 Fingerprint Identification	
Students will explore fingerprint identification.	
OBJECTIVE 1: Describe fingerprint classification.	
a. Describe the 3 fundamental principles of fingerprinting (first, second, and third principles).	SE: 587-592
b. Identify the degrees of fingerprinting (first, second, and third degrees).	SE: 592
OBJECTIVE 2: Identify and classify fingerprint and ridge patterns.	
a. Classify fingerprints into three basic patterns (loops, whorls (double, plain, central, accidental) and arches).	SE: 590-592 LE: 31-42
b. Classify fingerprints using the Ten Print System.	SE: 593-596
c. Identify individualization of fingerprints (ridge characteristics & ridge count).	SE: 89-90, 592
d. Describe the AFIS System of fingerprint identification.	SE: 89-90, 594-597, 634
OBJECTIVE 3: Compare and contrast latent, plastic, and visible fingerprints.	
a. Develop latent fingerprints using dusting, staining, and chemical fuming.	SE: 599-601, 601-607 LE: 34, 37-39, 40-42
b. Develop a plastic fingerprint using a mold (wax, soap, putty, etc.).	SE: 607-608
c. Create and document visible fingerprints using digital photography.	SE: 609-611
STANDARD 5 Hair and Fiber Analysis	
Students will examine hair and fibers in relation to physical evidence	
OBJECTIVE 1: Examine and analyze the forensic aspects of hair.	
a. Describe the microscopic structure of hair (shaft, root, and follicle).	SE: 456 LE: 53-54
b. Describe the general biological make-up and functions of hair (shape, growth, and function).	SE: 460-467
c. Describe the hair growth cycle (anagen, catagen, telogen).	SE: 459-460
d. Characterize the attributes of hair in regards to chemical absorption (root and scalp oil).	SE: 273, 459-460
e. Compare and contrast a variety of hair samples from different human races and different types of animals.	SE: 460-466

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OBJECTIVE 2: Examine and analyze the forensic aspects of fibers.	
a. Identify and compare natural (wool, cotton, silk, cashmere, etc.) and synthetic (polyester, durclon, acrylic, nylon, etc.) fiber types by using physical (microscopic) and chemical (burn, acid, base, acetone) testing methods.	SE: 467-474, 476-478 LE: 3,
b. Compare and contrast common fiber weave patterns (plain, twill, satin, knitted).	SE: 467-473
c. Summarize systematic procedures for collection and identification of hair and fiber evidence.	SE: 474-479, 480
STANDARD 6 Serology	
Students will investigate the characteristics of blood, blood testing, and bloodstain analysis.	
OBJECTIVE 1: Identify the components and chemical properties of blood.	
a. List the components of blood.	SE: 325
b. Identify the antigens and antibodies that determine ABO blood types and the Rh factor.	SE: 325-333
OBJECTIVE 2: Determine genetic probabilities using blood types.	
a. Use a Punnett Square to determine blood type probabilities.	SE: 341
b. Apply the use of a Punnett Square to solve paternity questions.	SE: 341-342, 357
OBJECTIVE 3: Examine and analyze blood spatter.	
a. Illustrate size, shape, and directionality of blood spatter in a laboratory experiment.	SE: 419-422
b. Compare and contrast low, medium, and high velocity blood spatter.	SE: 423-427 LE: 74-80
c. Examine different types of blood spatter patterns (drip, castoff, transfer, swipe, spurt, misting, void, flow, wipe, expired).	SE: 427-441, 449, 450-453 LE: 75-80
OBJECTIVE 4: Describe proper procedures for blood stain evidence collection, presumptive testing (Kastle-Meyer), and preservation.	
a. Describe how to collect a wet stain and a dry stain.	SE: 333-336 LE: 81-89
b. Demonstrate how to collect a large object in reference to blood evidence collection (i.e., sheets, blankets, clothing, etc.).	SE: 333-338
c. Properly perform and explain a presumptive blood test.	SE: 333-338 LE: 82-85

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STANDARD 7 Mortality	
Students will investigate various aspects of death.	
OBJECTIVE 1: Describe correct anatomical position and the role it plays in human anatomy.	
a. Describe anatomical position	This standard falls outside the scope of the Forensic Science: An Introduction, 3e program.
b. Apply body planes and directional terms related to the body(sagittal, frontal, transverse, superior, inferior, anterior, posterior, dorsal, ventral, medial, lateral, proximal, distal, deep, superficial, parietal, visceral, supine, prone).	LE: 117-118
OBJECTIVE 2: Locate the body cavities, quadrants, and body regions and identify the major organs within each.	
a. Dorsal cavity (cranial, spinal).	This standard falls outside the scope of the Forensic Science: An Introduction, 3e program.
b. Ventral Cavity (thoracic, abdominal, pelvic).	This standard falls outside the scope of the Forensic Science: An Introduction, 3e program.
c. Abdominal quadrants (RUQ, RLQ, LUQ, LLQ).	This standard falls outside the scope of the Forensic Science: An Introduction, 3e program.
d. Body regions (right hypochondriac, epigastric, left hypochondriac, right lumbar, umbilical, left lumbar, right inguinal, hypogastric, left inguinal).	This standard falls outside the scope of the Forensic Science: An Introduction, 3e program.
OBJECTIVE 3: Compare and contrast the manner and method of death.	
a. Define and list manners of death.	SE: 117-119
b. Define and list methods of death.	SE: 117-119
c. Define and list causes of death.	SE: 114-117, 276-277
d. Define and list mechanisms of death.	SE: 114-117
OBJECTIVE 4: Identify the steps of an autopsy procedure and determine cause of death.	
a. List the steps of an external examination.	SE: 110
b. Describe the proper technique to perform a Y-shaped incision.	SE: 110-111
c. List the steps of an internal examination.	SE: 100-112
d. Determine the cause of death using evidence from an autopsy.	SE: 108-113, 114-117, 118-120
OBJECTIVE 5: Identify the stages of decomposition to determine approximate time of death.	
a. Define taphonomy and describe the stages of decomposition (fresh, putrefaction, black putrefaction, butyric, dry).	SE: 122 LE: 115
b. Compare and contrast algor mortis, rigor mortis, and livor mortis.	SE: 120-121
e. Identify common insects associated with decomposition (blow fly, carrion beetle, etc.) and diagram their life cycles (egg, larva, pupa, adult and egg, nymph, adult).	SE: 130-133 LE: 111

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f. Identify various environmental factors related to time of death (temperature, humidity, cause of death, etc.)	SE: 120-122, 156 LE: 106-114
STANDARD 8 Forensic Psychology	
Students will explore aspects of the criminal mind.	
OBJECTIVE 1: Locate and identify the major organs of the nervous system.	
a. Brain (cerebral cortex, cerebellum, lobes, brainstem).	This standard falls outside the scope of the Forensic Science: An Introduction, 3e program.
b. Spinal cord.	This standard falls outside the scope of the Forensic Science: An Introduction, 3e program.
OBJECTIVE 2: Describe the importance of the role of membranes in the nervous system.	
a. Describe the three layers of meninges (dura mater, arachnoid mater, pia mater).	This standard falls outside the scope of the Forensic Science: An Introduction, 3e program.
b. Identify the three types of hemorrhage involving the meninges.	This standard falls outside the scope of the Forensic Science: An Introduction, 3e program.
OBJECTIVE 3: Identify and describe offender profiling procedures.	
a. Profiling input	This standard falls outside the scope of the Forensic Science: An Introduction, 3e program.
b. Decision process models	This standard falls outside the scope of the Forensic Science: An Introduction, 3e program.
c. Crime assessment	This standard falls outside the scope of the Forensic Science: An Introduction, 3e program.
d. Criminal profile	This standard falls outside the scope of the Forensic Science: An Introduction, 3e program.
e. Investigation	This standard falls outside the scope of the Forensic Science: An Introduction, 3e program.
f. Apprehension	This standard falls outside the scope of the Forensic Science: An Introduction, 3e program.
OBJECTIVE 4: Identify psychological testing processes and procedures used to study the criminal mind.	
a. Describe the tests used to determine the cognitive and personality types of offenders.	This standard falls outside the scope of the Forensic Science: An Introduction, 3e program.
b. Discuss the problems with psychometric tests.	This standard falls outside the scope of the Forensic Science: An Introduction, 3e program.
OBJECTIVE 5: Compare and contrast neurobiological brain abnormalities and mental conditions related to abnormal psychology and the criminal brain and technical instrumentation used to diagnose these abnormalities.	
a. Describe brain abnormalities, genetics, and environmental factors related to the criminal mind.	This standard falls outside the scope of the Forensic Science: An Introduction, 3e program.
b. Compare and contrast a PET Scan and a MRI in diagnosing brain abnormalities.	This standard falls outside the scope of the Forensic Science: An Introduction, 3e program.
OBJECTIVE 6: Compare and contrast the use of a polygraph machine with the physiological workings of the mind and body.	

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a. Describe the physiological functions measured by a polygraph machine.	This standard falls outside the scope of the Forensic Science: An Introduction, 3e program.
b. Interpret data collected from a polygraph.	This standard falls outside the scope of the Forensic Science: An Introduction, 3e program.
OBJECTIVE 7: Explore the psychological aspects of a serial killer.	
a. Define serial killer.	SE: 23, 92, 322-323, 490-491, 598, 620-621, 670-671, 700-701
b. Explore the motives of serial killers	For supporting content, see SE: 23, 92, 322-323, 490-491, 598, 620-621, 670-671, 700-701
c. Compare and contrast the types of serial killers.	For supporting content, see SE: 23, 92, 322-323, 490-491, 598, 620-621, 670-671, 700-701
STANDARD 9 Identification of Physical Evidence and Remains	
Students will explore characteristics of physical evidence and remains.	
OBJECTIVE 1: Identify the basic bones of the skeleton and distinguish the differences between long and short bones.	
a. Cranium b. Vertebrae c. Sternum d. Xiphoid process e. Ribs f. Humerus g. Radius h. Ulna i. Carpals j. Metacarpals k. Phalanges l. Pelvis m. Femur n. Patella o. Tibia p. Fibula q. Tarsals r. Metatarsals s. Phalanges.	SE: 123-128 LE: 116-119
OBJECTIVE 2: Use skeletal remains to determine the physical characteristics of an individual.	
a. Determine the sex of an individual based on skull, jaw, brow ridge, pelvis, and femur.	SE: 123-128, 129, 390 LE: 119-122
b. Determine the ancestry of an individual.	SE: 127
c. Estimate the age of an individual.	SE: 125-127 LE: 120-123

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d. Estimate the height, build and handedness of an individual.	SE: 127-128
OBJECTIVE 3: Identify injuries, bone diseases, and possible causes of death using bone characteristics.	
a. Compare and contrast pre and postmortem bone injuries (i.e., fractures).	LE: 4-13
b. Identify bone patterns indicating disease (i.e., arthritis).	This standard falls outside the scope of the Forensic Science: An Introduction program.
c. Identify bone markings that could indicate cause of death (stab wound, bullet hole, blunt force trauma, etc.).	SE: 110, 114-119
OBJECTIVE 4: Describe how teeth are used in forensic identification.	
a. Name and number deciduous (baby) and permanent teeth.	For supporting content, see SE: 125, 141 LE: 122-126
b. Employ dentition patterns as a means for bite mark identification.	SE: 22, 23 LE: 122-126
c. Compare and contrast bite mark patterns antemortem and postmortem.	For supporting content, see SE: 656-657 LE: 122-126
d. Describe the use of forensic dentistry in regards to mass disasters and body identification.	SE: 22, 657, 760
STANDARD 10 Toxicology	
Students will develop an understanding of the adverse effects of drugs and be acquainted with the laboratory investigation of the most common poisonings.	
OBJECTIVE 1: Identify the parts of the circulatory and excretory systems.	
a. Cardiovascular System: (heart (aorta, superior vena cava inferior vena cava, atria, ventricles), lungs (left and right, thymus gland, thyroid gland) arteries, capillaries, veins).	SE: 250-253
b. Digestive System: (esophagus, stomach, liver, spleen, pancreas, small intestine, large intestine).	This standard falls outside the scope of the Forensic Science: An Introduction program.
c. Urinary System: (kidneys, ureters, bladder, urethra)	This standard falls outside the scope of the Forensic Science: An Introduction program.
OBJECTIVE 2: Compare and contrast laboratory procedures used for measuring the concentration of alcohol in the bloodstream.	
a. Describe techniques used to measure the blood alcohol content (BAC) through blood.	SE: 254-260, 261-264
b. Describe techniques used to measure the blood alcohol content (BAC) through the breath (infrared spectrophotometry and electrochemical fuel cell technology).	SE: 224-232, 253-260

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OBJECTIVE 3: Identify the five schedules of drug types and classify according to the effects that they have on the body.	
a. Describe the five schedules of drug types (schedules 1-5).	SE: 208-210
b. Classify the types of drugs based on the physiological effects on the body (stimulants, depressants, narcotics).	SE: 187-191
OBJECTIVE 4: Relate the signs and symptoms of an overdose and poisoning with a specific class of drugs or toxins.	
a. Hallucinogens (MDMA, mescaline, LSD, PCP).	SE: 194-198, 205-206, 208-211, 213
b. Narcotics (opium, heroin, codeine, morphine, methadone, oxycodone).	SE: 191-194, 213, 271
c. Stimulants (amphetamines cocaine, crack, methamphetamines).	SE: 201-205, 213, 271
d. Anabolic steroids	SE: 206-207
e. Depressants (including alcohol).	SE: 198-201
f. Bacterial Toxins (botulism, tetanus)	This standard falls outside the scope of the Forensic Science: An Introduction program.
g. Heavy metals and pesticides (lead, mercury, arsenic, cyanide, strychnine).	SE: 245, 274, 275
OBJECTIVE 5: Discuss chemical agents that may be used for bioterrorism.	
a. Ricin (castor beans)	For supporting content, see SE: 528
b. Anthrax (Bacillus anthracis)	SE: 20-21
c. Lock jaw (Clostridium tetani)	This standard falls outside the scope of the Forensic Science: An Introduction program.
OBJECTIVE 6: Compare and contrast methods used to collect and package drug evidence.	
a. Identify procedures used to collect and package plant substances.	SE: 60-63
b. Identify procedures used to collect and package liquids.	SE: 60-65
c. Identify procedures used to collect and package biohazards.	SE: 60-65, 543-544
STANDARD 11 DNA Evidence	
Students will investigate the importance of DNA evidence.	
OBJECTIVE 1: Identify the structure and function of a DNA molecule.	
a. Describe the structure of DNA.	SE: 364-367
b. Describe the function of DNA.	SE: 367-369
c. Compare and contrast nuclear DNA and mitochondrial DNA.	SE: 392-398

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OBJECTIVE 2: Describe advancements in technology used to obtain a DNA fingerprint.	
a. Discuss the purpose of PCR.	SE: 369-373, 382-384
b. Define RFLP and discuss how it relates to forensic identification.	SE: 374-381
c. Define STR and discuss how it relates to forensic identification.	SE: 384-391, 395-397
d. Describe the CODIS System of DNA identification.	SE: 91-94, 395-397
STANDARD 12 Medical Forensics Investigation	
Students will describe techniques used to process a homicide crime scene and preserve the evidentiary value of the scene.	
OBJECTIVE 1: Describe how various medical forensics professionals process a crime scene.	
a. Responding officer	SE: 49-50, 56-57
b. Crime Scene Investigator	SE: 49, 50, 56, 416-418
c. Medical Examiner	SE: 106, 276-277
OBJECTIVE 2: Identify how a crime scene and evidence may be compromised.	
a. Contamination (family, law enforcement, crime scene workers, etc.).	SE: 50, 416-417, 512-513, 540-541
b. Chain of custody (evidence lost, etc.).	SE: 65-68
c. Environmental conditions (temperature, moisture, etc.).	SE: 120-122
d. Preservation of the scene (value of evidence, etc.).	SE: 50-56, 56-65, 71, 75, 106-107, 233, 395-396, 398-402, 466-467, 479, 517-518, 543-544, 568-571, 646-647, 649-657 LE: 14-24
e. Processing at the lab	SE: 571-575