

Medical Forensics

Exam Information	Description
Exam number 730 Items 65 National Career Cluster Healthcare & Human Services Certification available Yes	The Medical Forensics industry certification exam assesses learners' awareness of the branch of health science related to medical forensics. The exam focuses on introductory skills and assessment to develop the ability to identify, analyze, and process information using deductive reasoning and problem-solving. It evaluates knowledge in laboratory skills and safety, microscopy, toxicology, measurement, physical evidence identification, pathology, anthropology, entomology, psychology, blood spatter analysis, and career exploration.

Exam Blueprint and Performance Skills

Standard	Percentage of exam score
1. Fundamental Aspects of Medical Forensics	3%
2. Fundamental Laboratory Skills*	3%
3. Medical Forensics Investigation*	4%
4. Analyzing Trace Evidence (Hair & Fiber)	10%
5. Fingerprint Identification*	15%
6. Death Investigation*	16%
7. Blood Investigation*	15%
8. Exploring Aspects of a Criminal Mind	7%
9. Exploring Physical Evidence and Remains*	12%
10. Investigation of Common Poisonings & Adverse Effects of Drugs	6%
11. Importance of DNA Evidence	9%

*Includes performance skill evaluation

Standard 1 - Fundamental Aspects of Medical Forensics (3% of exam score)

Candidates will explore the fundamental aspects of Medical Forensics.

Objective 1 Detail the history and development of medical forensics.

1. Create a historical timeline.
2. Explore a variety of careers associated with medical forensics professions.
3. Crime laboratory analyst
4. Clinical laboratory technician
5. Microbiologist
6. Fingerprint analyst
7. Criminalist
8. Crime scene photographer
9. Phlebotomist
10. Forensic serology DNA criminalist
11. Serology technician
12. Forensic psychologist
13. Mental health counselor
14. Toxicologist
15. Biochemist
16. Pharmacologist
17. Geneticist
18. Medical examiner

Objective 2 Discuss the organization of the crime laboratory and detail the functions it serves.

1. Discuss the federal programs established in the United States to investigate crimes.
2. ATF
3. FBI
4. Post Office
5. DEA
6. Describe the organization of the Utah Crime Lab.
7. Compare and contrast the Utah Crime Lab with a crime lab from another state and an international crime lab.

Objective 3 Describe the importance of physical evidence and observation.

1. List the types of evidence.
 - a. Eyewitness
 - b. Class evidence
 - c. Physical evidence
 - i. Trace
 - ii. Circumstantial
 - iii. Individual
 - iv. Class

2. Discuss how evidence is used to convince a jury of guilt.
3. Review and practice the steps of becoming an accurate observer.
 - a. Observe systematically
 - b. Turn off filters
 - c. Interpret information later
 - d. Documentation
 - i. Written
 - ii. Photographs

Standard 2 - Fundamental Laboratory Skills (3%)

Candidates will explore essential laboratory safety skills and fundamental skills related to microscopy and measurement

Objective 1 Demonstrate appropriate use of personal protective devices.

1. Describe how personal protective devices protect the evidence and the lab worker.
2. Demonstrate how to properly use personal protective devices (e.g., lab coats, gloves, safety glasses).
3. Demonstrate safe removal of gloves.

Objective 2 Exhibit appropriate behavior in the lab.

1. Explain the dangers of evidence contamination through food, drink, cosmetics, lotion, eye drops, and contact lenses.
2. Follow proper disposal and clean-up procedures with respect to chemicals and laboratory equipment.
3. Demonstrate proper hand washing technique.

Objective 3 Use laboratory equipment correctly and safely.

1. Demonstrate the proper use of equipment.
 - a. Micropipette
 - b. Centrifuge
 - c. Spectrophotometer
 - d. Electrophoresis apparatus-DNA
 - e. Thermocycler
 - f. Microscope
 - g. Balance
 - h. Water bath
 - i. Vernier calipers
 - j. Glassware (metric units)
 - k. Rulers/Measuring tapes
2. Demonstrate proper use, handling, and components of a compound microscope and a stereoscope.
3. Demonstrate the ability to create a wet mount slide.

Objective 4 Follow laboratory procedures.

1. Understand the purpose of individual steps within a protocol.
2. Perform the steps of laboratory protocols accurately and in sequence.

Objective 5 Comply with policies and requirements for maintaining a lab manual.

1. Follow standard operating procedures for maintaining a lab manual.
2. Document laboratory work following the steps of the Scientific Method.
 - a. Objectives
 - b. Material
 - c. Procedures
 - d. Data/Results
 - e. Conclusion

Objective 6 Demonstrate proper handling of chemicals.

1. Communicate the rationale for laboratory labeling procedures.
2. Recognize and comply with the labeling of chemicals used in a laboratory setting for safe handling and storage (flammability, corrosiveness, biohazards, toxicity, etc.).
3. Reference and interpret the guidelines in Safety Data Sheets (SDS).

Optional: Standard performance evaluations on the final page of this document

Standard 3 - Medical Forensics Investigation (4%)

Candidates 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.

1. Responding officer
2. Crime Scene Investigator
3. Crime Scene Photographer
4. Medical Examiner

Objective 2 Demonstrate or describe proper procedures of evidence collection.

1. Trace (demonstrate)
2. Biological (describe)
3. Drugs, Plants, and Drug Paraphernalia (Describe)
4. Weapons (describe)
5. Fingerprint (demonstrate)

Objective 3 Identify how a crime scene and evidence may be compromised.

1. Contamination (family, law enforcement, crime scene workers, etc.)
2. Chain of custody (evidence lost, etc.)
3. Environmental conditions (temperature, moisture, etc.)
4. Preservation of the crime scene (value of evidence, etc.)
5. Processing at the lab

Optional: Standard performance evaluations on the final page of this document

Standard 4 - Analyzing Trace Evidence (Hair & Fiber) (10%)

Candidates will identify and analyze trace evidence, emphasizing hair and fiber.

Objective 1 Examine trace evidence using a microscope, chromatography, and other techniques.

1. Define and list examples of trace evidence.
2. Collect and analyze various types of trace evidence (dust, pollen, fiberglass, etc.)
3. Define and identify a variety of microbes.
4. Use a compound microscope to identify microbes.

Objective 2 Examine and analyze the forensic aspects of hair.

1. Describe the microscopic structure of hair.
 - a. Shaft
 - i. Cortex
 - ii. Cuticle
 - iii. Medulla
 - b. Root
 - c. Follicle
2. Describe the location of nuclear and mitochondrial DNA associated with hair.
 - a. Shaft
 - b. Root
3. Describe the hair growth cycle and how it relates to trace evidence.
 - a. Anagen, catagen, telogen
 - b. Chemical absorption
4. Describe how to differentiate between animal hair and human hair.

Objective 3 Examine and analyze the forensic aspects of fibers by using physical (microscopic) and chemical (burn, acid, base, acetone) testing methods.

1. Natural fibers
2. Wool
3. Silk
4. Cotton

5. Cashmere
6. Hemp
7. Etc.
8. Synthetic
9. Polyester
10. Spandex
11. Acrylic
12. Nylon
13. Etc.

Standard 5 - Fingerprint Identification (15%)

Candidates will explore fingerprint identification.

Objective 1 Describe fingerprint classification.

1. Describe the 3 fundamental principles of fingerprinting.
 - a. First degree
 - b. Second degree
 - c. Third degree
2. Identify the degrees of fingerprinting
 - a. First degree
 - b. Second degree
 - i. Bifurcation
 - ii. Ridge ending
 - iii. Short ridge
 - iv. Island/Dot
 - v. Double bifurcation
 - vi. Crossover
 - vii. Enclosure
3. Third degree

Objective 2 Identify and classify fingerprint and ridge patterns.

1. Classify fingerprints into 3 basic patterns.
 - a. Loops
 - i. Right
 - ii. Left
 - b. Whorls
 - i. Double
 - ii. Plain
 - iii. Central
 - iv. Accidental

- c. Arches
 - i. Tented
 - ii. Plain
- 2. Identify the individualization of fingerprints.
 - a. Ridge characteristics
 - b. Ridge count
- 3. Describe the IAFIS System of fingerprint identification.

Objective 3 Compare and contrast latent, plastic, and visible fingerprints.

- 1. Develop latent fingerprints using dusting, staining, and chemical fuming.
- 2. Develop a plastic fingerprint using a mold (wax, soap, putty, etc.)
- 3. Create and document visible fingerprints using digital photography.

Optional: Standard performance evaluations on the final page of this document

Standard 6 - Death Investigation (16%)

Candidates will investigate the characteristics of blood, blood testing, and bloodstain analysis.

Objective 1 Identify the components and chemical properties of blood.

- 1. List the components of blood.
 - a. Plasma
 - b. Erythrocytes (red blood cells)
 - c. Leukocytes (white blood cells)
 - d. Thrombocytes (platelets)
- 2. Identify the antigens and antibodies that determine ABO blood types and the Rh factor.

Objective 2 Determine genetic probabilities using blood types.

- 1. Use a Punnett Square to determine blood type probabilities.
- 2. Apply the use of Punnett Square to solve paternity questions.

Objective 3 Examine and analyze blood spatter.

- 1. Illustrate size, shape, and directionality of blood spatter in a laboratory experiment.
- 2. Compare and contrast low, medium, and high-velocity blood spatter.
- 3. Examine different types of blood spatter patterns.
 - a. Drip
 - b. Castoff
 - c. Transfer
 - d. Swipe
 - e. Wipe
 - f. Arterial
 - g. Expired
 - h. Misting
 - i. Void

Objective 4 Describe proper procedures for blood stain evidence collection, presumptive testing (Kastle-Meyer), and preservation.

1. Describe how to collect a wet stain and a dry stain.
2. Demonstrate how to collect a large object in reference to blood evidence collection (i.e. sheets, blankets, clothing, etc.)
3. Using residual blood from a mammal, perform and explain a presumptive blood test.
 - a. i.e. Absorption pads from ground beef

Optional: Standard performance evaluations on the final page of this document

Standard 7 - Blood Investigation (15%)

Candidates will investigate various aspects of death.

Objective 1 Describe the correct anatomical position and the role it plays in death investigation.

1. Describe anatomical position.
2. Apply directional terms related to autopsy.
 - a. Superior
 - b. Inferior
 - c. Anterior
 - d. Posterior
 - e. Dorsal
 - f. Ventral
 - g. Medial
 - h. Lateral
 - i. Proximal
 - j. Distal
 - k. Deep Superficial
 - l. Supine
 - m. Prone

Objective 2 Locate the body cavities and body regions and identify the major organs within each.

1. Dorsal cavity
 - a. Cranial
 - b. Spinal
2. Ventral Cavity
 - a. Thoracic
 - b. Abdominal
 - c. Pelvic
3. Body Regions
 - a. Right hypochondriac

- b. Left hypochondriac
- c. Epigastric
- d. Right lumbar
- e. Left lumbar
- f. Umbilical
- g. Right inguinal
- h. Left inguinal
- i. Hypogastric

Objective 3 Identify tests and equipment that are used to measure cardiovascular and pulmonary function.

- 1. Pulse oximeter
- 2. Blood pressure
 - a. Stethoscope
 - b. Sphygmomanometer
- 3. Heart rate
- 4. Respiratory rate
 - a. VO₂ max – the maximal amount of oxygen consumption capacity
 - b. 6-minute walk test
 - c. 12- minute run/walk test
 - d. Bicycle ergometer test
- 5. Rate of Perceived Exertion scale (RPE)

Optional: Standard performance evaluations on the final page of this document

Standard 8 - Exploring Aspects of a Criminal Mind (7%)

Candidates will explore aspects of the criminal mind.

Objective 1 Locate and identify the major organs of the nervous system.

- 1. Brain
 - a. Cerebral cortex
 - b. Cerebellum
- 2. Spinal cord

Objective 2 Identify and describe offender profiling procedures.

- 1. Profiling input
- 2. Decision process models
- 3. Crime assessment
- 4. Criminal profile
- 5. Investigation
- 6. Apprehension

Objective 3 Identify psychological testing processes and procedures and other factors that affect the criminal mind.

1. Describe the tests used to determine the cognitive and personality types of offenders.
2. Discuss the problems with psychometric tests.
3. Describe brain abnormalities, genetics, and environmental factors related to the criminal mind.
4. Describe the physiological functions measured by a polygraph machine.

Objective 4 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.

1. Describe brain abnormalities, genetics, and environmental factors related to the criminal mind.

Objective 5 Explore the psychological aspects of serial killers and mass murderers.

1. Define serial killer.
2. Define mass murderer.
3. Explore the motives of a serial killer.
4. Compare and contrast the types of serial killers.
5. Explore the motives of a mass murder.

Standard 9 - Exploring Physical Evidence and Remains (12%)

Candidates 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.

1. Cranium
2. Vertebrae
3. Sternum
4. Xiphoid process
5. Ribs
6. Hyoid
7. Humerus
8. Radius
9. Ulna
10. Carpals
11. Metacarpals
12. Phalanges
13. Pelvis
14. Femur
15. Patella
16. Tibia
17. Fibula
18. Tarsals
19. Metatarsals
20. Phalanges

Objective 2 Use skeletal remains to determine the physical characteristics of an individual.

1. Determine the sex of an individual based on skull, jaw, brow ridge, pelvis, and femur.
2. Determine the ancestry of an individual.
3. Estimate the age of an individual.
4. Estimate the height, build, and handedness of an individual.

Objective 3 Identify injuries, bone diseases, and possible causes/methods of death using bone characteristics.

1. Compare and contrast pre and postmortem bone injuries (i.e. fractures).
2. Identify bone patterns indicating disease (i.e. arthritis).
3. Identify bone markings that could indicate cause of death (i.e. stab wound, bullet hole, blunt force trauma, etc.)

Objective 4 Describe how teeth are used in forensic identification.

1. Name and number of deciduous (baby) and permanent teeth.
2. Employ dentition patterns as a means for bite mark identification.
3. Describe the use of forensic dentistry in regard to mass disasters and body identification.

Optional: Standard performance evaluations on the final page of this document

Standard 10 - Investigation of Common Poisonings & Adverse Effects of Drugs (6%)

Candidates 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 five schedules of drug types and classify according to the effects that they have on the body.

1. Describe the five schedules of drug types.
 - a. Schedules 1-5
2. Classify the Categories of drugs based on the physiological effects on the body and the chemical composition.
 - a. Stimulants (i.e. Amphetamines, Cocaine, Crack, Methamphetamines, Adderall, other mental disorder medications)
 - b. Depressants (i.e. Alcohol, Sedatives, Xanax, Marijuana, All narcotics, other mental disorder medication)
 - c. Narcotics/Opioids (i.e. Heroin, Codeine, Methadone, Oxycodone)
 - d. Hallucinogens (i.e. Ecstasy (MDMA), Bath salts, Mushrooms, GHB, other "date rape" drugs)

Objective 2 Describe how individual body systems are affected by drug intake.

1. Integumentary
2. Skeletal

3. Muscular
4. Nervous
5. Cardiovascular
6. Respiratory
7. Endocrine
8. Digestive
9. Urinary
10. Reproductive

Objective 3 Identify signs and symptoms of an overdose.

1. Stimulants
2. Depressants
3. Narcotics/Opioids
4. Hallucinogens

Objective 4 Describe current field and laboratory procedures used for measuring the concentration of alcohol in the bloodstream.

1. Describe techniques used to measure the blood alcohol content (BAC).
 - a. Through blood
 - b. Through the breath
2. Anabolic steroids
3. Depressants (including alcohol)
4. Bacterial toxins
 - a. Botulism
 - b. Tetanus
5. Heavy metals and pesticides
 - a. Lead
 - b. Mercury
 - c. Arsenic
 - d. Cyanide
 - e. Strychnine

Objective 5 Describe how teeth are used in forensic identification.

1. Bacterial toxins
 - a. Botulism (clostridium botulinum)
 - b. Tetanus (clostridium tetani) lockjaw
2. Bioterrorism
 - a. Ricin (castor beans)
 - b. Anthrax (Bacillus anthracis)

Objective 6 Compare and contrast methods used to collect and package drug evidence.

1. Identify procedures used to collect and package plant substances.
2. Identify procedures used to collect and package liquids.
3. Identify procedures used to collect and package biohazards.

Standard 11 - Importance of DNA Evidence (9%)

Candidates will investigate the importance of DNA evidence.

Objective 1 Identify the structure and function of a DNA molecule.

1. Describe the structure of DNA.
2. Describe the function of DNA.
3. Compare and contrast nuclear DNA and mitochondrial DNA

Objective 2 Describe advancements in technology used to obtain a DNA fingerprint.

1. Describe the purpose of PCR.
2. Define RFLP and discuss how it relates to forensic identification.
3. Define STR and discuss how it relates to forensic identification.
4. Describe the CODIS System of DNA identification.
5. Processing at the lab

Performance Skills Evaluation

Exam name: Medical Forensics

Candidate Name: _____

Performance assessments may be completed and evaluated any time before the certification is issued. The following performance skills can be used in connection with the associated standards and exam. The evaluator will function as the subject matter expert to determine if the candidate meets the skills requirements with a Yes/No for passing.

Standard 2 – Fundamental Laboratory Skills - Maintain an accurate lab manual. - Follow standard operating procedures for maintaining a lab manual. - Document laboratory work following the steps of the Scientific Method.	Pass:
Standard 3 – Medical Forensics Investigation Collect and properly label evidence.	
Standard 5 – Fingerprint Identification Develop a latent fingerprint and identify 10 ridge characteristics.	
Standard 6 – Fundamental Laboratory Skills - Classify blood spatter by velocity. - High - Medium - Low	
Standard 7 – Fundamental Laboratory Skills - Identify the steps of an autopsy procedure by animal dissection. - Steps of an external examination - Proper Y-shaped incision technique - Steps of an internal examination	
Standard 9 – Fundamental Laboratory Skills - Identify the sex of an individual based on skeletal markers. - Skull - Jaw - Brow ridge - Pelvis - Femur - Match a bite mark from a victim to the perpetrator.	
Workplace Skills - Communication - Problem-solving - Teamwork	

- Critical Thinking
- Dependability
- Accountability
- Legal requirements/expectations

Evaluator Name:

Date: