INSTRUCTORS MANUAL FOR

FORENSIC SCIENCE

An Introduction to Scientific and Investigative Techniques

FOURTH EDITION

by

Stuart James
Jon J. Nordby
Suzanne Bell

CRC Press
Taylor & Francis Group

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An Important Message for Instructors

We at Taylor & Francis/CRC Press hope you are as excited about the ancillary package provided for *Forensic Science: An Introduction to Scientific and Investigative Techniques, 4th Edition.*

Most of what is contained in these folders is self-explanatory and easily explored. I do want to point out that we drew from some other books. For example, you will find six exercises on topics from crime scene mapping to use of a compound microscope. The books we used are listed below. If you would like to consider using the whole of any book as part of your course, please contact your sales representative.

Exercises 1 and 2: *Crime Scene Processing and Investigation Workbook* by Ramirez and Fisher, catalog number K12253

Exercises 3-6: *Forensic Science Laboratory Manual and Workbook* by Kubic and Petraco, catalog number 87193

Supplemental readings which may be assigned or used as a special lecture topic:

"A Flash in the Pan," and "See No Evil," from *Scientific Foundations of Crime Scene Reconstruction: Introducing Method to Mayhem* by Jon J. Nordby, catalog number 51687.

"Taphonomic Processes: Animal Scavenging," by Pokines and Tersigni-Tarrant from *Forensic Anthropology: An Introduction,* edited by Tersigni-Tarrant and Shirley, catalog number K10846.

"Cases of Neglect Involving Entomological Evidence," by Benecke, from *Forensic Entomology, 2nd edition,* catalog number 9215.

You will also find supplemental chapters from the prior 3rd edition of the textbook. These are provided to supplement content which may have been omitted (such as Forensic Nursing) or scaled back at the suggestion of our reviewers (Digital Photography). Similarly, we have included any photo images

from the 3rd edition that were eliminated for the sake of providing a more concise text.

Becky Masterman

Senior Acquisitions Editor

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Section 1 Setting the Stage
Chapter 1 Justice and Science
(Total Questions: 25)

Multiple Choice (20-30)

1. What were the scientists responsible for the early discoveries in forensic science considered due to the fact that they worked in many forensic disciplines?
    a. Specialists
    b. Generalists*
    c. Chemists
    d. Examiners
2. Who is the author of the first comprehensive book on hair analysis, *The Hair of Man and Animals,* published in 1910?
    a. Alphonse Bertillon and Victor Balthazard
    b. Calvin Goddard and Edmund Locard
    c. Hans Gross and Alphonse Bertillon
    d. Victor Balthazard and Marcelle Lambert*
3. Who is responsible for developing probability models, showing that fingerprints were unique?
    a. Alphonse Bertillon
    b. Calvin Goddard
    c. Victor Balthazard*
    d. Edmund Locard
4. Who is credited with developing the first classification system for fingerprints?
    a. Charles Darwin
    b. Sir Francis Galton*
    c. Edmund Locard
    d. Mathieu Orfila
5. Who is credited with establishing scientific examination of firearms in the United States?
    a. Calvin Goddard*
    b. Edmund Locard
    c. Mathieu Orfila
    d. Victor Balthazard
6. Who coined the term Criminalistics?
    a. Hans Gross*
    b. Sir Francis Galton
    c. Edmund Locard
    d. Mathieu Orfila
7. What is the English translation of the first forensic science textbook, published in 1893?
    a. Forensic Science the Beginning

b. Criminal Investigation*
c. Kriminologie
d. Forensic Science

8. What was Edmund Locard's main interest in forensic science?
    a. Chemistry
    b. Biology
    c. Trace Evidence*
    d. Toxicology
9. Who is considered the father of forensic toxicology?
    a. Hans Gross
    b. Sir Francis Galton
    c. Edmund Locard
    d. Mathieu Orfila*
10. What term describes when a laboratory has agreed to operate according to a professional or industry standard and has proven that it can and does operate this way?
    a. Accreditation*
    b. Certification
    c. Attestation
    d. Quality Assurance
11. How is an experts qualification to testify established?
    a. Direct Examination
    b. Cross Examination
    c. Voir Dire*
    d. Re-cross Examination

True False (10-)

1. Forensic science has moved more towards a generalists model in which forensic scientists work in various disciplines.
    a. True
    b. False* (Forensic science has moved towards a specialist model in which a forensic scientist specializes)
2. Anthropometry remained widely used into the early 1900's when fingerprints began to replace it.
    a. True*
    b. False
3. A space for fingerprints was not included on the data cards used in the early systematic method for identification of suspects and criminals?
    a. True
    b. False*
4. Sherlock Holmes stories were not influential or inspirational to pioneers of forensic science due to their lack of realism to the actual field of forensic science.
    a. True

b. False*

5. Locard's Exchange Principle, "every contact leaves a trace", is not an exact phrase used by Locard; it has been evolved from his writings and studies.
    a. True*
    b. False
6. Forensic scientists can only testify in criminal action suits and for the prosecution.
    a. True
    b. False* (Forensic scientists can testify in either type of legal action)
7. The difference of opinion between two experts indicates that one of the experts is unethical.
    a. True
    b. False*

Multiple Response (5-10)

1. What is the systematic method for identification of suspects and criminals; not based on fingerprints?
    a. Anthropometry*
    b. Angiopometry
    c. Bertillonage*
    d. Bertonage
2. Who is considered the trier-of-fact?
    a. Judge*
    b. Jury*
    c. Lawyer
    d. Forensic Scientist
3. What are the types of examination involved in a court hearing?
    a. Direct*
    b. Indirect
    c. Cross*
    d. Re-cross*

Matching (3-5)

1. a. Sir Francis Galton = *Finger Prints,* 1892
   b. Victor Balthazard = *The Hair of Man and Animals*, 1910
   c. Hans Gross = Criminal Investigation/Kriminologie
   d. Sir Arthur Doyle = Sherlock Holmes
2. a. Laboratories funded by governments such as states, counties, and cities = Public Laboratories
   b. Businesses that are designed to make a profit = Private Laboratories
3. a. A laboratory has agreed to operate according to a professional or

industry standard and has proven that it can and does operate this way = Accreditation

b. A forensic scientist has completed a written test covering his or her discipline and that the analyst participates in yearly proficiency testing to insure that their laboratory methods and techniques are sound = Certification

4. a. Between individuals or parties = Civil Law

b. Violation of criminal laws and involve the government as the charging individual = Criminal

c. The party that files the criminal charges = Prosecution

d. The party that files the civil action charges = Plaintiff

e. The party that is under the accusations = Defendant

Section 1 Setting the Stage
Chapter 2 Evidence: Origins, Types, and Admissibility
(Total Questions:26)

Multiple Choice (20-30)

1. What is considered court approved information that is used to determine a defendant's guilt or innocence?
   a. Expert Testimony
   b. Eye-Witness Testimony
   c. Evidence*
   d. Rules of Evidence
2. Admissibility or inadmissibility of trial information is determined by the application of what?
   a. Expert Testimony
   b. Eye-Witness Testimony
   c. Evidence
   d. Rules of Evidence*
3. What is the goal of generating forensic evidence from the gathered information?
   a. Establishing material facts before or at trial*
   b. Admissibility of evidence
   c. Demonstrate technological advances within the field
   d. Incarcerate defendants
4. What must admissible evidence be?
   a. Reliable and relevant*
   b. Testimonial evidence
   c. Expert approved
   d. Jury approved
5. What jurisdiction do the FRE apply to?
   A. All
   b. Federal*
   c. State
   d. Local
6. What name did the Daubert decision refer to the judge as?
   a. Gatekeeper*
   b. Trier of the fact
   c. Plaintiff
   d. King/Queen
7. What kind of evidence is forensic evidence considered?
   a. Direct
   b. Circumstantial*
   c. Both
   d. None of the above

8. What type of evidence comes into court and does not reference a particular suspect?
    a. Class characteristic*
    b. Individual characteristic
    c. Inculpatory
    d. Exculpatory
9. What is considered a common examination for questioned documents?
    a. Handwriting comparisons
    b. Alterations
    c. Obliterations
    d. All of the above*
10. What does the method in which a latent print it developed depend on?
    a. The latent print
    b. The surface
    c. Visibility of the print
    d. Both a and b*

True False (10-)

1. The federal rules of evidence serve as a screening function for all pieces of evidence.
    a. True*
    b. False
2. Testimony does not serve as a type of evidence.
    a. True
    b. False*
3. The federal rules of evidence are inclusionary in nature, meaning they serve to include all information presented by either side.
    a. True
    b. False*
4. The forensic part of forensic evidence refers to the scientific process through which facts are generated and the evidence part refers to a distinct set of procedures that are unique to the litigation process.
    a. True*
    b. False
5. A foundation consists of sufficiently supportive information presented to a judge to convince him/her that the proposed information has the potential to be true, and hence a jury could determine if it is or is not in fact true.
    a. True*
    b. False
6. Admissibility hearings do not allow new scientific test methods to be introduced as viable tools in forensic science.
    a. True

b. False*

7. The Daubert decision was one of two in the late 1990's that significantly impacted the way in which many jurisdictions addressed the admissibility of evidence.
   a. True
   b. False*
8. The criminalist is responsible to report conclusions in a timely and consistent manner and determine guilt.
   a. True
   b. False*

Multiple Responses (5-10)

1. Forensic science is the combination of the application of what?
   a. Scientific Theory*
   b. Laboratory Techniques*
   c. Federal Rules of Evidence
   d. Admissibility of Evidence
2. What science(s) are included in the field of forensic science?
   a. DNA Analysis*
   b. Anthropology*
   c. Entomology*
   d. Geology*
3. What disciplines associated with forensics are nontraditional in nature?
   a. Footwear impression techniques*
   b. DNA analysis
   c. Fingerprint analysis*
   d. Chemical testing
4. What must the court be assured about the methods in scientific analysis?
   a. Scientifically acceptable*
   b. Reliable*
   c. Most recent methodologies
   d. Implement the latest technological advances
5. What do the federal rule of evidence not address?
   a. How to qualify*
   b. Weight of qualifications*
   c. Validity of the science or technology*
   d. Who is considered a witness
6. What are possible conclusions based on class characteristic evidence?
   a. Questioned sample is indistinguishable from the known standard*
   b. Questioned sample came from the same source as the known

standard and thus excludes all other possible sources
c. Questioned sample does not match the known standard*
d. Comparison is inconclusive*

Matching (3-5)

1. Match the court decisions with their criteria.
   a. Frye v. United States = General Acceptance
   b. Daubert v. Merrell Dow Pharmaceuticals = Judge is the gatekeeper
   c. G.E. v. Joiner = Relevance
   d. Kumho Tire v. Carmichael = All experts
2. Match the scientific group with the type of evidence.
   a. Biological evidence = human tissues or fluids
   b. Chemical evidence = drugs, explosives, toxicological samples
   c. Trace evidence = microscopic physical evidence
   d. Impression evidence = footwear or tire impressions
   e. Firearm evidence = fired bullets, cartridge casings, and shot shells
   d. Tool mark evidence = striation-type markings

Section 2 The Crime Scene
Chapter 3 Crime Scene Investigation
(Total Questions: 30)

Multiple Choice (20-30)

1. Linkage of persons, scenes or objects is based on what?
    a. Edmond Locard's exchange principle*
    b. Hans Gross' principle on the value of physical evidence
    c. Sir Francis Galton's classification system
    d. Alphonse Bertillon's measurement system
2. The classification of the crime scene labels the site of the original or first criminal activity as what?
    a. Secondary crime scene
    b. Primary crime scene*
    c. Initial crime scene
    d. Minor crime scene
3. Duties of the First Responder consist of which of the following?
    a. Detain any witnesses
    b. Protect the crime scene
    c. Document any changes or alterations to the crime scene
    d. All of the above*
4. Videography of the crime scene should NOT include which of the following
    a. Crime scene team members
    b. Narration
    c. Crime scene member's equipment
    d. All of the above*
5. There are two basic types of sketches as part of crime scene investigation: Rough and what other?
    a. Final*
    b. Initial
    c. Perfect
    d. None of the above
6. A good example of a fixed point for sketching a crime scene would be?
    a. Recorded utility pole*
    b. Orange road cone
    c. Parked vehicle
    d. Piece of furniture
7. What do digital imaging tools do to the traditional video and still photography used in crime scene documentation?
    a. Replace
    b. Restore
    c. Complement*
    d. Compete with
8. What kind of documentation must be followed if any new items of evidence are found?
    a. Consistent with the other documentation*

b. Document in a different manner to distinguish
c. Does not matter
d. None of the above

9. When must documentation on found items be done?
    a. After everything is collected
    b. Before it is collected*
    c. Once it is in the laboratory
    d. After it is collected
10. What is the process of determining or eliminating the events that could have occurred at the crime scene by the analysis of the crime scene appearance, location and position of physical evidence, and the forensic laboratory examination of the physical evidence?
    a. Sketching the crime scene
    b. Photographing the crime scene
    c. Reconstructing the crime scene*
    d. Video recording the crime scene

True False (10-)

1. A crime scenes boundaries are permanent and cannot change once defined.
    a. True
    b. False*
2. The "who" of a crime scene is more important than the "how".
    a. True
    b. False*
3. The classification of a crime scene interferes with the priority or importance of that crime scene?
    a. True
    b. False*
4. All physical evidence at a crime scene will be directly linked to a suspect?
    a. True
    b. False*
5. A contamination or security log is kept as written record of all entry/exit into the secure areas of the crime scene?
    a. True*
    b. False
6. Documentation notes are taken as the activities are done so as to not be subjected to memory loss?
    a. True*
    b. False
7. When videoing a crime scene you should jump from one location to another?
    a. True
    b. False*
8. A crime scene investigator should limit the number of photos taken at a crime scene?
    a. True

b. False*

9. The six patterns of searching a crime scene are: link, line or strip, grid, zone, wheel or ray, and spiral methods?
    a. True*
    b. False

Multiple Response (5-10)

1. What are the objectives of crime scene investigation?
    a. Collect*
    b. Preserve*
    c. Interpret*
    d. Recognize*
2. Forensic examination is a process of recognition, reconstruction, and what other two steps?
    a. Identification*
    b. Association
    c. Correlation
    d. Individualization*
3. When taking notes for documentation of scene description information consists of which of the following?
    a. Date/Time
    b. Weather*
    c. Major Structures*
    d. Team Members
4. What proof of documentation of a photograph should be recorded in a photo log?
    a. Time taken*
    b. Roll and exposure number*
    c. Camera settings*
    d. Description of photo*
5. The advantages of digital imaging include which of the following?
    a. Instant access*
    b. Manipulation
    c. Integration into electronic technologies*
    d. Expensive processing equipment
6. What are the three techniques for obtaining measurements for the crime scene sketch?
    a. Triangulation*
    b. Base line*
    c. Polar coordinates*
    d. Fixed points
7. What are the stages of crime scene reconstruction?
    a. Data collection*
    b. Conjecture*
    c. Hypothesis formulation*

d. Testing*
e. Theory formulation*

Matching (3-5)

1. Match the type of crime scene with the corresponding characteristics.
    a. Location according to criminal behavior = primary and secondary
    b. Size = macroscopic and microscopic
    c. Type = homicide, robbery, sexual assault
    d. Condition = organized, disorganized
    e. Physical location = indoor, outdoor, vehicle
    f. Associated criminal behavior = passive or active
2. Documentation of a crime scene should be done in what order?
    a. Notes = 1
    b. Sketching = 4
    c. Video Recording = 2
    d. Photographing/Digital Imaging = 3
    e. Crime Scene Searches = 5
3. What type of information is contained within the specific documentation note?
    a. Notification information = date/time, method of notification, and information received
    b. Arrival information = means of transportation, date/time, personnel present at the scene, and any notifications to be made
    c. Scene description = weather, location type and condition, major structures, and identification of transient and conditional evidence
    d. Crime scene team = assignments to team members, walk-thru information, beginning and ending times, and evidence handling results
4. What is done in the different stages of crime scene reconstruction?
    a. Data collection = Data including the condition of the physical evidence, patterns and impressions, condition of the victim, etc., are reviewed, organized, and studied.
    b. Conjecture = Before any detailed analysis of the evidence is accomplished, a possible explanation of the actions involved in the crime scene may be done.
    c. Hypothesis formulation = Scene examination and inspection of the physical evidence must be done. Interpretation of bloodstain and impression patterns, gunshot residue patterns, fingerprint evidence, and analysis of trace evidence will lead to the formulation of a reconstruction hypothesis.
    d. Testing = Additional experimentation after the hypothesis has been developed to confirm or disprove the overall interpretation or specific aspects of the hypothesis.
    e. Theory formulation = Formed once the hypothesis has been thoroughly tested and verified by analysis

Section 2: The Crime Scene
Chapter 4: Recognition of Bloodstain Patterns
(Total Questions:37)

Multiple Choice (20-30)

1. Who submitted an affidavit of his examination of bloodstain evidence and findings in the case of State of Ohio v. Samuel Sheppard in 1955 which became a significant milestone in the recognition of bloodstain evidence by the American legal system?
    a. Dr. Eduard Piotrowski
    b. Herbert Leon MacDonell
    c. Dr. Paul Kirk*
    d. Dr. Victor Balthazard
2. Herbert Leon MacDonell conducted his first bloodstain institute in Jackson, Mississippi in what year?
    a. 1973*
    b. 1985
    c. 1993
    d. 2003
3. Defined as the force that pulls the surface molecules of a liquid toward its interior, decreasing the surface area and causing the liquid to resist penetration?
    a. Viscosity
    b. Surface Tension*
    c. Molecular Forces
    d. Molecular Tension
4. What is the normal clotting time of blood that has exited the body from healthy individuals?
    a. 1-2 hours
    b. 30-40 minutes
    c. 3-15 minutes*
    d. 10-15 seconds
5. What are areas or patterns that result from the absence of bloodstains in otherwise continuous patters of staining?
    a. expirated patterns
    b. transfer patterns
    c. cast off patterns
    d. void patterns*
6. Luminol is best used in what kind of environment?
    a. Darkened*
    b. Extremely bright
    c. Over exposed
    d. Does not matter
7. In normal individuals what percentage of blood is comprised of cellular components?
    a. 10%
    b. 45%*

c. 50%
d. 95%

8. What is the range of the total volume of blood in healthy individuals?
    a. 1.0 – 3.0 liters
    b. 4.0 – 5.5 liters
    c. 4.5 – 6.0 liters*
    d. 8.0 – 9.0 liters
9. What is defined as the resistance to change of form or flow?
    a. Specific gravity
    b. Terminal velocity
    c. Viscosity*
    d. Surface tension
10. Blood with not break into smaller droplets or spatters unless what is disrupted?
    a. Specific gravity
    b. Terminal velocity
    c. Viscosity
    d. Surface tension*
11. What is determined by examining the edge characteristics of individual stains?
    a. Direction of flight*
    b. Area of origin
    c. Angle of impact
    d. Area of convergence
12. What degree of impact is associated with a circular shape?
    a. 30%
    b. 50%
    c. 80%
    d. 90%*
13. The misting effect is a pattern associated with what?
    a. Gunshot*
    b. Beatings
    c. Stabbings
    d. Blood dripping
14. What patterns have a linear directionality associated with them?
    a. Castoff*
    b. Satellite
    c. Drip
    d. Splashed
15. What is the correct series of color changes for a bloodstain as it ages?
    a. Blue→Red→Brown→Black
    b. Red→Reddish Brown→Black*
    c. Reddish Brown →Red→Black
    d. Brown →Black→Red
16. What bloodstain alteration results in bloodstains being diluted?
    a. Moisture*
    b. Voids
    c. Clotting

    d. Drying
17. What bloodstaining includes transfer, flow patterns, saturation stains, and stains from dripping blood?
    a. Active
    b. Passive*
    c. Castoff
    d. Satellite
18. What is always better when documenting bloodstain evidence?
    a. More*
    b. Less
    c. Photographs
    d. Video

True False (10-)

1. The interpretation of bloodstain patterns will only be as valid as the information available and the ability of the examiner performing the analysis.
    a. True*
    b. False
2. The nuclei of the red blood cells are the sources of DNA in the blood.
    a. True
    b. False*
3. Calculated area of impact is always lower that the actual origin of the bloodstains because of the gravitational attraction affecting the spatters while in flight.
    a. True
    b. False*
4. Spattered blood is defined as a random distribution of bloodstains that vary in size and may be produced by a variety of mechanisms.
    a. True*
    b. False
5. To create spatters of blood, the surface tension of the blood must not be overcome by an external force.
    a. True
    b. False*
6. Passive bloodstaining includes transfer, flow patterns, saturation stains and stains resulting from dripping blood.
    a. True*
    b. False
7. The degree of significance that may be attached to a given bloodstain pattern is compromised due to insufficient documentation.
    a. True*
    b. False
8. The surface tension of blood is slightly more than that of water.
    a. True
    b. False*

Multiple Response (5-10)

1. What forces affect a single drop of blood falling through the air but do not overcome the surface tension of the blood?
    a. gravity*
    b. molecular forces
    c. air resistance*
    d. intermolecular forces
2. What type of target surface a drop of blood strikes will create little if any spatter?
    a. smooth tile*
    b. glass*
    c. wood
    d. concrete
3. The size, quantity, and distribution of blood spatters vary depending on what?
    a. quantity of blood subjected to impact*
    b. quality of blood subjected to impact
    c. force of the impact*
    d. texture of the surface impacted by the blood*
4. Bloodstains should be categorized relative to what?
    a. the events that produced them*
    b. the person who caused them
    c. the reverse order in which they were produced
    d. the possible sources and movement of these sources*
5. What does active blood staining consist of?
    a. transfer
    b. impact spatter*
    c. arterial spurts*
    d. expirated blood*
6. What governments does the Scientific Working Group on Bloodstain Pattern Analysis (SWGSTAIN) serves as a professional forum in which bloodstain pattern analysis (BPA) practitioners can share, discuss, and evaluate methods, techniques, protocols, quality assurance, education, and research relating to BPA?
    a. Federal*
    b. State*
    c. Local*
    d. None of the above
7. What are some biological properties of blood?
    a. Red blood cells*
    b. White blood cells*
    c. Platelets*
    d. Hormones*

Matching (3-5)

1. Match the terms with the correct definitions.
    a. Blood = transports oxygen, electrolytes, nourishment, hormones, vitamins and antibodies to tissues and transports waste products from tissues

    b. Plasma = a fluid protein that contains cellular components consisting of red blood cell, white blood cell, and platelets
    c. Serum = fluid or liquid portion of clotted blood
2. Match the terms with the correct definitions.
    a. direction of travel/directionality = determined by the narrow end of an elongated bloodstain
    b. area of convergence = relative location of the blood source in a two-dimensional perspective
    c. area of origin = location of the blood source in a three- dimensional perspective
    d. angle of impact = can be calculated by using a mathematical relationship that exists between the width and length of an elliptical bloodstain
3. Match the different bloodstain spatters with the correct statement.
    a. satellite spatter = created by blood dripping into blood
    b. back spatter = impact spatter associated with the entrance wound from a gun shot
    c. forward spatter = impact spatter associated with the exit wound from a gun shot
4. Match the different bloodstain patterns with the correct statement.
    a. drip pattern = results from blood drops falling into previously deposited wet bloodstains or small pools of blood
    b. expirated pattern = results from blood being forcefully expelled from the nose or mouth in order to free the airways
    c. transfer pattern = results when an object wet from blood comes into contact or wiping with an unstained object of secondary surface
    d. castoff pattern = results when the centrifugal force generated by swinging the weapon is great enough to overcome the adhesive force that holds the blood to the object and the blood is flung from the object