

Chapter 2 – Understanding the Nature of Physical Evidence

Learning Objectives

- Identify and discuss the major forensic evidence disciplines.
- Describe the differences between class and individual characteristic evidence.
- Define and give an example of mechanical fit.
- Describe the interrelationship and interdependency of crime scene processing and forensic analysis at the crime laboratory.

Chapter Questions and Answers

1. Describe the differences between class and individual characteristics of evidence.

Answer: A class characteristic allows an item to be compared to a group of items and either included or excluded from the group. An individual characteristic allows an item to be compared to another item and excluded or identified as having come from the item.

2. Of the available methods for DNA analysis, which is the best for individualization in forensic work and why?

Answer: Small Tandem Repeats (STR). STR technology allows high discrimination with small stains.

3. Describe how tape is used to collect hair and fiber evidence at the crime scene.

Answer: The investigator removes a strip of wide tape, 8 -10 inches in length.

Using a repetitive dabbing motion, they collect loose fibers and hairs from a surface by placing the adhesive side of the tape in contact with the surface.

4. When evaluating glass fractures for direction of force, which fragments can be used in the evaluation?

Answer: Fragments associated to primary radial fractures found within the inner concentric fracture.

5. How is paint layering used to differentiate two paint samples, such as when comparing a paint sample from a hit and run to a suspect vehicle?

Answer: The specific layers and sequence of paint, the depth of the layers (e.g. various primers, color, clear coat layers) allow at the very least a class comparison and in some instances may offer the opportunity for an individual comparison.

6. Comparison of soil samples is based on environmental variations from one sample to the next. What are some of the most significant forms of environmental variation?

Answer: Plant pollens allow the most significant form of environmental variation for soil sample comparison.

7. How would evaluating crime scene evidence involving a pistol differ from that involving a revolver?

Answer: The presence or absence of casings in and of itself may suggest the nature of the weapon (pistol versus revolver), since pistols eject casings into the scene and revolvers do not. The casings then provide additional information pertaining to the nature of the weapon that fired them.

8. Rifling refers to what two manufactured components of a barrel?

Answers: The lands and grooves manufactured into the barrel of a rifle or handgun are referred to as rifling.

9. How are bullets marked for evidence and why?

Answer: To prevent inadvertently damaging microscopic marks on the surface of the bullet which might lead to individualization, bullet and bullet fragments are not marked. They are containerized and the container marked.

10. Of the two methods used to collect tool mark evidence (collection of the entire item or casting of the mark) which is better and why?

Answer: Seizing the original evidence by either taking the item or by cutting the area containing the tool mark is the best method of recovery. Casting of the mark is a viable and functional method of recovery, but does not always result in recovering all of the microscopic variations present in the tool mark.

11. What is the most significant class characteristic in shoe mark examinations and why?

Answer: Tread design is the most significant class characteristic in shoe mark examinations. The level of variation present from one shoe to the next is significant. Databases exist from which the shoe mark examiner can often identify not only the brand but in some cases the specific model of the shoe.

12. What containers are used to collect fire scene evidence, in which accelerants are believed to be present?

Answer: Unlined clean paint cans and arson bags.

13. In terms of a forensic analysis, what is the difference between a forged writing and a traced writing?

Answer: When presented with a forged writing, which is typically a fluid writing attempt, the handwriting examiner may be able to conduct an analysis in an attempt to identify the writer. The examiner will likely recognize the tracing as a tracing, but it presents no opportunity to identify the writer as it is not a fluid writing effort.

14. What is the most appropriate response by the crime scene technician for collecting a computer for computer forensic analysis?

Answer: Contact a computer crime team for appropriate instructions.

Suggested Practical Exercises

6. Crime Lab Operations. If available schedule a field trip to a crime laboratory.
7. Understanding Forensics. Assign students/groups a category of forensic evidence and have them research the topic on the Internet and through various forensic television shows. Have each present their findings.
8. Examining Glass Fractures. Obtain a piece of pane glass. Mark one side of the glass with a sharpie in a manner that covers a significant area of the glass (a squiggly line). Place the glass in a cardboard box then break the glass, applying

force from the side of the mark. Have students locate primary radial fracture pieces and evaluate them using the 4R rule.* Practical directions included in Section 2.

From *Crime Scene Processing and Investigation Workbook*, by C. Ramirez and C. Parish-Fisher.

9. Exercise 2-1 Identifying Characteristics of Evidence.
10. Exercise 2-2 Fingerprint Pattern Examination.
11. Exercise 2-3 False Positive Exercise.
12. Exercise 2-4 Mechanical Fit through Evidence Reconstruction.

Suggested Exam Questions and Answers

9. True or False? Class characteristics are effective for eliminating an item for inclusion in a group, reducing the necessity of conducting further time or resource consuming examinations.

Answer: True. Once a class characteristic evaluation excludes the item there is no reason to conduct further examination.

10. Multiple Choice. Of the available methods for DNA analysis, which of the following is the best for individualization in forensic analysis?
 - a. RFLP.
 - b. PCR.
 - c. STR.
 - d. mDNA.

Answer: C. STR.

11. True or False. The 4R rule for glass fragment examination states that ridge lines are at right angles to the rear of radial fractures.

Answer: True

12. True or False. Cross contamination of serological evidence is never an issue when handling a single item of stained clothing.

Answer: False. Where different stains are on the item (the context of the stains) can be revealing; thus improper handling can result in cross contamination from

one point on the item to another.

13. Multiple Choice. Forensic analysis of a pistol casing includes evaluating:

- a. Ejector marks.
- b. Firing pin marks.
- c. Breech block marks.
- d. All of the above.
- e. A and B.

Answer: D. All of the above.

14. True or False. Fingerprints differ in every individual except identical twins.

Answer: False. Fingerprints are different in every individual, including identical twins.

15. True or False. Mitochondrial DNA (mDNA) is currently used as a class characteristic that allows a DNA source to be included or excluded in a blood line on the matriarchal side.

Answer: True.

16. True or False. Typical impression evidence includes shoe and tire marks, but also includes evidence such as tool marks.

Answer: True.