

# CHAPTER 2

## Crime-Scene Investigation and Evidence Collection

### LESSONS FROM THE JONBENET RAMSEY CASE

The 1996 homicide investigation of six-year-old JonBenet Ramsey provides valuable lessons in proper crime-scene investigation procedures. From this case, we learn how important it is to secure a crime scene. Key forensic evidence can be lost forever without a secure crime scene.

In the Ramsey case, the police in Boulder, Colorado, allowed extensive contamination of the crime scene. Police first thought JonBenet had been kidnapped because of a ransom note found by her mother. For this reason, the police did not search the house until seven hours after the family called 911. The first-responding police officer was investigating the report of the kidnapping. The officer did not think to open the basement door, and so did not discover the murdered body of the girl.

Believing the crime was a kidnapping, the police blocked off JonBenet's bedroom with yellow and black crime-scene tape to preserve evidence her kidnapper may have left behind. But they did not seal off the rest of the house,



The Ramsey Home in Boulder, Colorado.

which was also part of the crime scene. Then the victim's father, John Ramsey, discovered his daughter's body in the basement of the home. He covered her body with a blanket and carried her to the living room. In doing so, he contaminated the crime scene and may have disturbed evidence. That evidence might have identified the killer.

Once the body was found, family, friends, and police officers remained close by. The Ramseys and visitors were allowed to move freely around the house. One friend even helped clean the kitchen, wiping down the counters with a spray cleaner—possibly wiping away evidence. Many hours passed before police blocked off the basement room. A pathologist did not examine the body until more than 18 hours after the crime took place.

Officers at this crime scene obviously made serious mistakes that may have resulted in the contamination or destruction of evidence. To this day, the crime remains unsolved. Go to the Gale Forensic Sciences eCollection for more information on this case.

## OBJECTIVES

By the end of this chapter you will be able to:

- 2.1 Summarize Locard's exchange principle.
- 2.2 Identify four examples of trace evidence.
- 2.3 Distinguish between direct and circumstantial evidence.
- 2.4 Identify the type of professionals who are present at a crime scene.
- 2.5 Summarize the seven steps of a crime-scene investigation.
- 2.6 Explain the importance of securing the crime scene.
- 2.7 Identify the methods by which a crime scene is documented.
- 2.8 Demonstrate proper technique in collecting and packaging trace evidence.
- 2.9 Describe how evidence from a crime scene is analyzed.

## VOCABULARY

**chain of custody** the documented and unbroken transfer of evidence

**circumstantial evidence** (indirect evidence) evidence used to imply a fact but not prove it directly

**class evidence** material that connects an individual or thing to a certain group (see individual evidence)

**crime-scene investigation** a multidisciplinary approach in which scientific and legal professionals work together to solve a crime

**crime-scene reconstruction** a hypothesis of the sequence of events from before the crime was committed through its commission



TOPICAL SCIENCES KEY

**direct evidence** evidence that (if true) proves an alleged fact, such as an eyewitness account of a crime

**first responder** the first police officer to arrive at a crime scene

**individual evidence** a kind of evidence that identifies a particular person or thing

**paper bundle** a folded paper used to hold trace evidence

**primary crime scene** the location where the crime took place

**secondary crime scene** a location other than the primary crime scene, but that is in some way related to the crime, where evidence is found

**trace evidence** small but measurable amounts of physical or biological material found at a crime scene

## INTRODUCTION

How is it possible to identify the person who committed a crime? A single hair or clothing fiber can allow a crime to be reconstructed and lead police to the responsible person. The goal of a **crime-scene investigation** is to recognize, document, and collect evidence at the scene of a crime. Solving the crime will then depend on piecing together the evidence to form a picture of what happened at the crime scene.

Obj. 2.1  
and 2.2

## PRINCIPLE OF EXCHANGE

Whenever two people come into contact with each other, a physical transfer occurs. Hair, skin cells, clothing fibers, pollen, glass fragments, debris from a person's clothing, makeup, or any number of different types of material can be transferred from one person to another. To a forensic examiner, these transferred materials constitute what is called **trace evidence**. Some common examples of trace evidence include:

- Pet hair on your clothes or rugs
- Hair on your brush
- Fingerprints on a glass
- Soil tracked into your house on your shoes
- A drop of blood on a T-shirt
- A used facial tissue
- Paint chips
- Broken glass
- A fiber from clothing

The first person to note this condition was Dr. Edmond Locard, director of the world's first forensic laboratory in Lyon, France. He established several important ideas that are still a part of forensic studies today. *Locard's exchange principle* states that when a person comes into contact with an object or another person, a cross-transfer of physical evidence can occur. The exchanged materials indicate that the two objects were in contact. Trace evidence can be found on both persons (and/or objects) because of this cross-transfer. This evidence that is exchanged bears a silent witness to the criminal act. Locard used transfer (trace) evidence from under a female victim's fingernails to help identify her attacker.

The second part of Locard's principle states that the intensity, duration, and nature of the materials in contact determine the extent of the transfer. More transfer would be noted if two individuals engaged in a fistfight than if a person simply brushed past another person.

# TYPES OF EVIDENCE

Obj. 2.3

Evidence can be classified into two types: direct evidence and circumstantial evidence (Figure 2-1). **Direct evidence** includes firsthand observations such as eyewitness accounts or police dashboard video cameras. For example, a witness states that she saw a defendant pointing a gun at a victim during a robbery. In court, direct evidence involves testimony by a witness about what that witness personally saw, heard, or did. Confessions are also considered direct evidence.

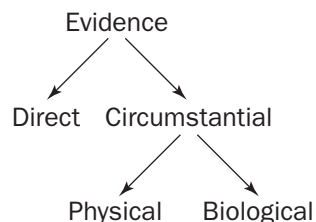
**Circumstantial evidence** is indirect evidence that can be used to imply a fact but that does not directly prove it. No one, other than the suspect and victim, actually sees when circumstantial evidence is left at the crime scene. But circumstantial evidence found at a crime scene may provide a link between a crime scene and a suspect. For example, finding a suspect's gun at the site of a shooting is circumstantial evidence of the suspect's presence there.

Circumstantial evidence can be either physical or biological in nature. Physical evidence includes impressions such as fingerprints, footprints, shoe prints, tire impressions, and tool marks. Physical evidence also includes fibers, weapons, bullets, and shell casings. Biological evidence includes body fluids, hair, plant parts, and natural fibers. Most physical evidence, with the exception of fingerprints, reduces the number of suspects to a specific, smaller group of individuals. Biological evidence may make the group of suspects very small, or reduce it to a likely individual, which is more persuasive in court.

Trace evidence is a type of circumstantial evidence, examples of which include hair found on a brush, fingerprints on a glass, blood drops on a shirt, soil tracked into a house from shoes, and others (Figure 2-2).

Evidence can also be divided into class evidence and individual evidence. **Class evidence** narrows an identity to a group of persons or things. Knowing the ABO blood type of a sample of blood from a crime scene tells us that one of many persons with that blood type may have been there. It also allows us to exclude anyone with a different blood type. **Individual evidence** narrows an identity to a single person or thing. Individual evidence typically has such a unique combination of characteristics that it could only belong to one person or thing, such as a fingerprint.

**Figure 2-1.** Classification of types of evidence.



It is relatively easy to recover DNA from cigarette ends found at the scene of a crime.

**Figure 2-2.** Common examples of trace evidence.

Animal or human hair
Fingerprints
Soil or plant material (pollen)
Body fluids such as mucus, semen, saliva, or blood
Fiber or debris from clothing
Paint chips, broken glass, or chemicals such as drugs or explosives



## Obj. 2.4 THE CRIME-SCENE INVESTIGATION TEAM

Who is involved in a crime-scene investigation? The team is made up of legal and scientific professionals who work together to solve a crime. Professionals at the scene of a crime may include police officers, detectives, crime-scene investigators, district attorneys, medical examiners, and scientific specialists. Who is at the scene?

- *Police officers* are usually the first to arrive at a crime scene. A district attorney may be present to determine whether a search warrant is necessary for the crime-scene investigators.
- *Crime-scene investigators* document the crime scene in detail and collect physical evidence. Crime-scene investigators include recorders to record the data, sketch artists to sketch the scene, photographers to take photos of the crime scene, and evidence collectors.
- *Medical examiners* (also called coroners) may be necessary to determine the cause of a death when a homicide has occurred.
- *Detectives* look for leads by interviewing witnesses and talking to the crime-scene investigators about the evidence.
- *Specialists* such as entomologists (insect biologists), forensic scientists, and forensic psychologists may be consulted if the evidence requires their expertise.



Crime-scene investigation teams do not clean up the scene. This dirty job often falls to the victim's family. Professional crime-scene cleaners can be hired in many places to do this job.

## Obj. 2.5, 2.6, 2.7, and 2.8 THE SEVEN S's OF CRIME-SCENE INVESTIGATION

### SECURING THE SCENE

Securing the scene is the responsibility of the first-responding police officer (**first responder**). The safety of all individuals in the area is the first priority. Preservation of evidence is the second priority. This means the officer protects the area within which the crime has occurred, restricting all unauthorized persons from entering. Transfer, loss, or contamination of evidence can occur if the area is left unsecured (Locard's exchange principle). The first officer on the scene will begin keeping a security log of all those who visit the crime scene. The officer will collect pertinent information and request any additional needs required for the investigation. He or she may ask for more officers to secure the area. Depending on the nature of the crime, the first-responding officer may request various teams of experts to be sent to the crime scene.

### SEPARATING THE WITNESSES

Separating the witnesses is the next priority. Witnesses must not be allowed to talk to each other. Their accounts of the events will be compared. This separation is done to avoid witnesses working together to create a story (collusion). The following questions need to be asked of each witness:

- When did the crime occur?
- Who called in the crime?
- Who is the victim?
- Can the perpetrator be identified?
- What did you see happen?
- Where were you when you observed the crime scene?

## SCANNING THE SCENE

The forensic examiners need to scan the scene to determine where photos should be taken. A determination may be made of a **primary crime scene** and **secondary crime scene** and priorities assigned regarding examination. A robbery in front of a store might be the primary scene, and the home of a suspect might be the secondary scene. A murder may have taken place at one location (primary scene) and the corpse found at another (secondary scene).

## SEEING THE SCENE

The crime scene examiner needs to see the scene. Photos of the overall area and close-up photos with and without a measuring ruler should be taken. Triangulation of stationary objects should be included in the photos as reference points. A view of the crime scene should be taken from several different angles and distances. Several close-up photos of any evidence and bodies should be taken.

## SKETCHING THE SCENE

An accurate rough sketch of the crime scene is made, noting the position of the body (if any) and any other evidence. All objects should be measured from two immovable landmarks. On the sketch, north should be labeled and a scale of distance should be provided. Any other objects in the vicinity of the crime scene should be included in the sketch. This includes doors, windows, and furniture.

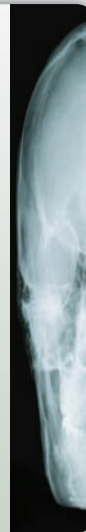
If the crime scene is outdoors, the position of trees, vehicles, hedges, and other structures or objects should be included in the sketch. Later, a more accurate, final copy of the crime scene should be made for possible presentation in court. Computer programs are available to later create a neater and more accurate sketch suitable for use in a court proceeding. The sketch should include the information indicated in Figure 2-3.

**Figure 2-3.** A blank crime-scene sketch form showing the information that must be provided with the sketch.

## Digging Deeper

with Forensic Science e-Collection

What happened to Natalee Holloway in Aruba in 2005? This is an unsolved case in which questions have been raised about why crime-scene investigators have not been able to find her body. In fact, investigators searched the island with an array of cutting-edge tools, from a remote-controlled submersible equipped with a video camera and sonar used for probing the water under bridges and in lagoons, to telescoping rods tipped with infrared sensors and cameras used for looking beneath manhole covers and into shadowy caverns. Go to the Gale Forensic Sciences eCollection on [school.cengage.com/forensicscience](http://school.cengage.com/forensicscience) and research the case. Make your own investigation by reading the primary sources available on the Web site. Write a brief explanation that summarizes the forensic tools used to find Holloway's body and any evidence that was discovered during the search.



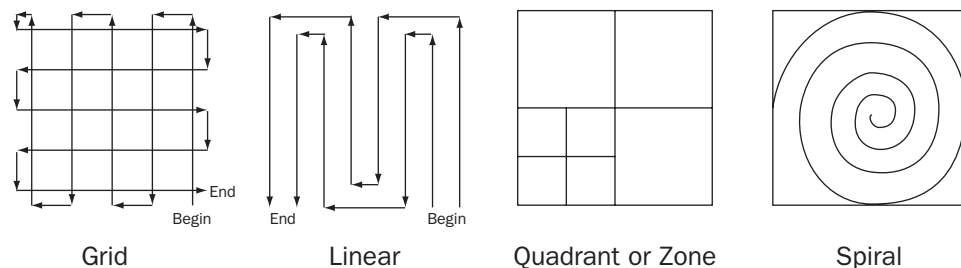
## SEARCHING FOR EVIDENCE

Depending on the number of investigators, a spiral, grid, linear, or quadrant pattern should be walked and location of evidence marked, photographed, and sketched. Single investigators might use a grid, linear, or spiral pattern. A group of investigators might use a linear, zone, or quadrant pattern. These patterns are

systematic, ensuring that no area is left unsearched (Figure 2-4).

Additional light sources might be needed to find hair and fibers. A vacuum cleaner with a clean bag is sometimes used to collect evidence but is not the method of choice. The use of a flashlight for examination and forceps for collecting are preferable, because this method avoids picking up extraneous materials.

**Figure 2-4.** Four crime-scene search patterns.



## SECURING AND COLLECTING EVIDENCE

All evidence needs to be properly packaged, sealed, and labeled. Specific procedures and techniques for evidence collection and storage must be followed. Liquids and arson remains are stored in airtight, unbreakable containers. Moist biological evidence is stored in breathable containers so the evidence can dry out, reducing the chance of mold contamination. After the evidence is allowed to air dry, it is packaged in a **paper bindle**. The bindle (or druggist's fold) can then be placed in a plastic or paper container. This outer container is then sealed with tape and labeled with the signature of the collector written across the tape. An evidence log and a **chain of custody** document must be attached to the evidence container.

The evidence log should contain all pertinent information, including:

- Case number
- Item inventory number

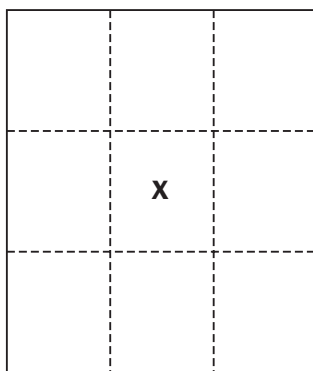
- Description of the evidence
- Name of suspect
- Name of victim
- Date and time of recovery
- Signature of person recovering the evidence
- Signature of any witnesses present during collection

## Packaging Evidence

The size of the bindle depends on the size of the evidence. If the evidence is small, the bindle can be constructed from a sheet of paper. If the evidence is large, the bindle might be constructed from a large sheet of wrapping paper. The packaging techniques are demonstrated in Figure 2-5. The steps are as follows:

1. Choose the appropriate-size sheet of clean paper for the bindle.
2. Crease the paper as shown in the figure.
3. Place evidence in the X location.
4. Fold left and right sides in.
5. Fold in top and bottom.
6. Insert the top flap into the bottom flap then tape closed. (Continued on page 28.)

**Figure 2-5.** Demonstration of packaging of dry evidence.



a. Placement of evidence.



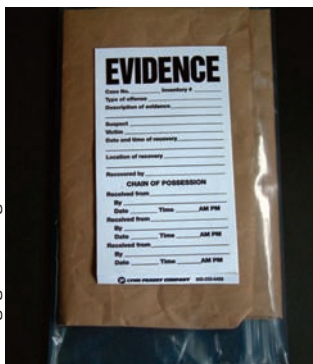
b. Allow evidence to dry.



c. Place dried evidence on bindle paper.



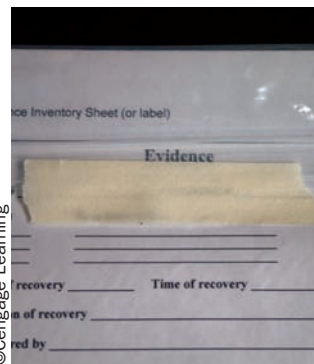
d. Fold bindle. Tuck the top flap into the bottom.



e. Secure bindle in labeled evidence bag using stick-on label.



f. Place evidence in a plastic bag with an inserted evidence label. (Note that this is a different evidence source than the bloody cloth above.)



g. Seal and tape the edge of the baggie.



h. Write the collector's signature across the baggie's taped edge.



7. Place bundle inside a plastic or paper evidence bag. Fold the bag closed.
8. Place a seal over the folded edge of the evidence bag.
9. Have the collector write his or her name over the folded edge.

If a wet object to be packaged is large, it should be placed in a paper container and sealed to allow it to air dry. Wet evidence should never be packaged in a plastic container while wet. Any DNA present will degenerate and evidence may become moldy and useless.

There are standards for collecting different types of evidence that describe how to collect and store the evidence. The Federal Bureau of Investigation and state police agencies publish descriptions of the proper procedures.

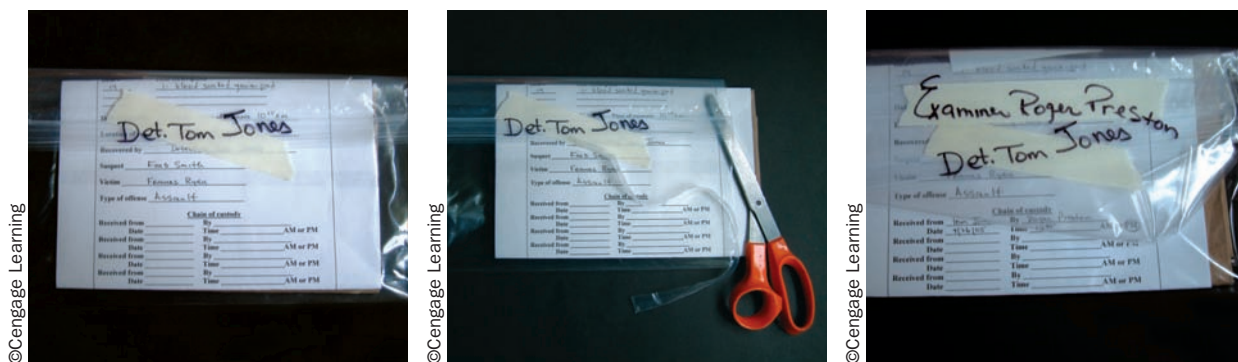
Control samples must also be obtained from the victim for the purpose of exclusion. For example, blood samples found on a victim or at a crime scene are compared with the victim's blood. If they match, the samples are excluded from further study. If the blood samples do not match, then they may have come from the perpetrator and will be further examined.

## CHAIN OF CUSTODY

In securing the evidence, maintaining the chain of custody is essential. The individual who finds evidence marks it for identification and bags the evidence in a plastic or paper container. The final container for the evidence is a collection bag, which is labeled with the pertinent information. The container is then sealed, and the collector's signature is written across the sealed edge.

The container is given to the next person responsible for its care. That person takes it to the lab and signs it over to a technician, who opens the package for examination at a location other than the sealed edge. On completion of the examination, the technician repackages the evidence with its original packaging, reseals the evidence in a new packaging, and signs the chain-of-custody log attached to the packaging. This process ensures that the evidence has been responsibly handled as it was passed from the crime scene to a courtroom (Figure 2-6).

**Figure 2-6.** Chain-of-custody procedures.



a. Original evidence bag

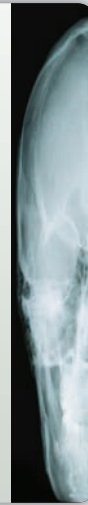
b. Opened evidence bag  
maintaining signature on first seal

c. Original evidence bag with  
uncut seal and signature, updated  
chain-of-custody log in a new  
sealed and signed evidence bag

## Digging Deeper

with Forensic Science e-Collection

O.J. Simpson is famous for having been tried and acquitted for the murder of his ex-wife Nicole Brown Simpson and her friend Ronald Goldman in 1994. The O.J. Simpson murder trial is often cited as a classic example of how crucial evidence was lost, altered, or contaminated. Go to the Gale Forensic Sciences eCollection on [school.cengage.com/forensicscience](http://school.cengage.com/forensicscience) and research the case. Cite specific examples of how evidence was damaged, lost, or contaminated by crime-scene personnel. Write a brief explanation summarizing your findings, making sure to back up your argument with sources. Carefully check the dates of the publications, and use applied logic to conclude whether you think the forensic evidence was improperly secured.



## ANALYZE THE EVIDENCE

Obj. 2.9

Following a crime-scene investigation, the forensic laboratory work begins (Figure 2-7). The FBI crime lab is one of the largest forensic labs in the world. A forensic lab processes all of the evidence the crime-scene investigation collected to determine the facts of the case. Unlike what television CSI programs portray, forensic lab technicians are specialized and process one type of evidence.

The laboratory results are sent to the lead detective. Test results eventually lead to crime-scene reconstruction; that is, forming a hypothesis of the sequence of events from before the crime was committed through its commission. The detective looks at the evidence and attempts to determine how it fits into the overall crime scenario. The evidence is examined and compared with the witnesses' statements to determine the reliability of their accounts. Evidence analysis can link a suspect with a scene or a victim, establish the identity of a victim or suspect, confirm verbal witness testimony, or even acquit the innocent. The evidence does not lie, but investigators must consider all possible interpretations of the evidence. Direct evidence is more compelling than circumstantial evidence.

**Figure 2-7.** A modern forensic laboratory.



©Dean Golja/Getty Images

## CRIME-SCENE RECONSTRUCTION

**Crime-scene reconstruction** involves forming a hypothesis of the sequence of events from before the crime was committed through its commission. The evidence is examined and compared with the witnesses' statements to determine the reliability of their accounts. The investigator looks at the evidence and attempts to determine how it fits into the overall crime scenario. The evidence does not lie, but it could be staged. It is important that investigators maintain an open mind as they examine all possibilities.

## STAGED CRIME SCENES

Staged crime scenes pose a unique problem. The evidence does not match the testimony of witnesses. Here is a list of some common situations in which a crime scene is staged:

- *Arson.* The perpetrator stages a fire to cover some other crime such as murder or burglary.
- *Suicide/murder.* A victim is murdered, and the perpetrator stages the scene to look like a suicide. The death may be caused by alcohol or drug overdose. The motive could be insurance money, release from an unhappy marriage, or simply theft.
- *Burglary.* A burglary is staged to collect insurance money. In the determination of whether a crime scene is staged, the following points should be considered:
  - Initially treat all death investigations as homicides.
  - Do the type(s) of wounds found on the victim match the weapon employed?
  - Could the wounds be easily self-inflicted?
  - Establish a profile of the victim through interviews with friends and family.
  - Evaluate the behavior (mood and actions) of the victim before the event.
  - Evaluate the behavior (mood and actions) of any suspects before the event.
  - Corroborate statements with evidential facts.
  - Reconstruct the event.
  - Conduct all forensic examinations to determine the facts of the case.

## SUMMARY

- Locard's exchange principle states that contacts between people and objects during a crime can involve a transfer of material that is evidence of the crime.
- Evidence may be direct, as in eyewitness accounts, or circumstantial, which does not directly prove a fact.
- Evidence may be physical or biological. Trace evidence is a small amount of physical or biological evidence.
- A crime-scene investigation team consists of police officers, detectives, crime-scene investigators, medical examiners, and specialists.
- A crime-scene investigation consists of recognizing, documenting, and collecting evidence from the crime scene.
- First-responding officers must identify the extent of a crime scene, including primary and secondary scenes, secure the scene(s), and segregate witnesses.
- After walking through the crime scene and identifying evidence, the crime-scene investigators document the scene by taking photographs and preparing sketches of the scene.

- Evidence must be properly handled, collected, and labeled so that the chain of custody is maintained.
- Evidence is analyzed in a forensic laboratory, and the results are provided to detectives, who fit the results into the crime scenario.

## CASE STUDIES

### Lillian Oetting (1960)

Three Chicago socialites were murdered in Starved Rock State Park, Illinois. All three women had fractured skulls. Their bodies, bound with twine, were found in a cave. Near the bodies of the women, a bloodied tree limb was found and considered to be the murder weapon. Because all three women had been staying at a nearby lodge, the staff of the lodge was questioned. Chester Weger, a 21-year-old dishwasher at the lodge, was asked about a blood stain on his coat. He said it was animal blood. He agreed to take a lie detector test and passed it. He was requestioned and took a second lie detector test and passed it as well. The blood was examined by the state crime lab and found to be animal blood as Weger had indicated at questioning. The case reached a dead end.

Investigators decided to revisit the evidence. The rope used to bind the women was examined more carefully. It was found to be 20-stranded twine sold only at Starved Rock State Park. Identical twine was found in an area accessible to Weger. He again became a prime suspect. The blood on his coat was reexamined by the FBI Crime Lab and found to be human and compatible with the blood of one of the victims. Weger submitted to another lie detector test and failed it. Weger was found guilty for the murder of one of the women, Lillian Oetting, and has spent more than 45 years in prison. He recently petitioned the Governor of Illinois for clemency, saying he was beaten and tortured into making the confession. He still maintains his innocence.

### The Atlanta Child Murders (1979–1981)

Wayne Williams is thought to be one of the worst serial killers of adolescents in U.S. history. His victims were killed and thrown into the Chattahoochee River in Georgia. Williams was questioned, because he was seen near where a body had washed ashore. Two kinds of fiber were found on the victims. The first kind was an unusual yellow-green nylon fiber used in floor carpeting. Through the efforts of the FBI and DuPont Chemical Company, the carpet manufacturer was identified. The carpet had been sold in only 10 states, one of them being Alabama, where Williams lived. Thus, the fibers found on the victims were linked to carpet fibers found in Williams' home.

Another victim's body yielded the second type of fiber. This fiber was determined to be from carpeting found in pre-1973 Chevrolets. It was determined that only 680 vehicles registered in Alabama had a matching carpet. Williams owned a 1970 Chevrolet station wagon with matching carpet. The probability of both types of fibers being owned by the same person was calculated. The odds against another person owning both carpet types were about 29 million to one. Williams was convicted and sentenced to two life terms.



**Think Critically** Review the Case Studies and the information on investigating crime scenes in the chapter. Then explain how evidence obtained at a crime scene is crucial to a successful case.



## 1 Crime-Scene Investigator

2 The crime-scene investigator has a challenging  
3 job. His or her specialty is  
4 in securing and processing a crime scene. To be  
5 well versed in the field, extensive study, training,  
6 and experience in crime-scene investigations are  
7 needed. He or she must be knowledgeable in the  
8 areas of recognition, documentation, and preservation  
9 of evidence at a crime scene to ensure that those  
10 recovered items will arrive safely at the lab. Investigators  
11 generally turn in the evidence to forensic specialists  
12 for analysis. However, they may have to testify in court  
13 about the evidence collected, the methods used to recover  
14 it, and the number of people who came into contact  
15 with the evidence.

16 Is the job of a crime-scene investigator the way it is  
17 portrayed on television? Let's ask a real-life CSI. Carl Williams of Jupiter, a retired Pennsylvania state police detective, has 25 years of crime-scene investigation experience. Carl says, "The television shows are for entertainment, not reality. The crime scene doesn't wrap up in an hour, never mind an entire investigation. That can take months. Also, television doesn't show the real horror of what one human being can do to another. Not a lot of people can stomach it. But if you take it, the job can be fascinating work. Every day was different. It was interesting. I helped stop the people who committed horrendous acts before they could



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*Crime-scene investigators at work in the field.*

do it again. I'm proud of the work I've done."

What is a typical day like? Here is one scenario: At the beginning of a shift, you might be given a list of calls that have come in from police officers overnight. You will need to prioritize them and plan to investigate them in a logical order. Once you arrive at the crime scene, you will work with the first-responding police officer and decide what the best methods are for you to obtain evidence. You will then record the scene using photography and video, and gather evidence such as shoe prints, clothing fibers, blood, and hair. You may discover fingerprint evidence by brushing surfaces with special powders and take

impressions of fingerprints from anyone who has accessed the crime scene. Finally, you will secure all of your samples in protective packaging and send them to forensic laboratories for analysis.

What does it take to become a crime-scene investigator? It is usually necessary to obtain a degree in crime-scene investigation through college degree programs or certification programs. The crime-scene investigator should have an associate's or bachelor's degree either in an area of science, with emphasis in law enforcement and crime-scene processing, or a criminal justice degree with an emphasis in science.



### Learn More About It

To learn more about crime-scene investigation, go to [school.cengage.com/forensicscience](http://school.cengage.com/forensicscience).

# CHAPTER 2 REVIEW

## Multiple Choice

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1. Locard's exchange principle implies all of the following **except** *Obj. 2.1*
  - a) Fibers can be transferred from one person to another.
  - b) Blood spatter can be used to identify blood type.
  - c) Cat hair can be transferred to your pants.
  - d) Soil samples can be carried from the yard into your home.
2. Transfer evidence can include all of the following **except** *Obj. 2.2*
  - a) the victim's own blood gushing from a wound
  - b) hair that was transferred to a hairbrush
  - c) the blood of the victim found on a suspect
  - d) a footprint
3. The reason it is important to separate the witnesses at the crime scene is to *Obj. 2.3 and 2.6*
  - a) prevent contamination of the evidence
  - b) prevent fighting among the witnesses
  - c) prevent the witnesses from talking to each other
  - d) protect them from the perpetrator
4. Correct collection of evidence requires which of the following? *Obj. 2.8*
  - a) documenting the location where the evidence was found
  - b) correct packaging of evidence
  - c) maintaining proper chain of custody
  - d) all of the above
5. A crime-scene sketch should include all of the following **except** *Obj. 2.5 and 2.7*
  - a) a scale of distance
  - b) date and location of the crime scene
  - c) a north heading on the diagram
  - d) the type of search pattern used to collect the evidence

## Short Answer

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6. Distinguish between circumstantial evidence and direct evidence, and provide an example of each type. *Obj. 2.3*

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7. Blood type is considered to be class evidence. Although it may not specifically identify the suspect, explain how it still could be useful in helping to investigate a crime. *Obj. 2.3*

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8. The recorder at the crime scene needs to work with all of the police personnel at the crime scene. What type of information would the recorder need to obtain from each of the following persons? *Obj. 2.4 and 2.7*

a. first-responding officer

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b. photographer

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c. sketch artist

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d. evidence collection team

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9. When the crime-scene investigators arrive at a crime scene, one of their duties is to try to collect all evidence from the victim's body. However, due to the location of the crime scene, some evidence will need to be collected off the body at a later time in the crime lab. For each type of situation below, describe the type(s) of evidence that could be obtained by: *Obj. 2.6, 2.7, 2.8, and 2.9*

a. transporting the body in a closed body bag

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b. taking nail clippings from the deceased

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- c. placing a plastic bag over the hands of the deceased before transporting the person to the morgue

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- d. brushing the clothing of the victim with a clothes brush

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10. Identify the error in each of the following scenarios: *Obj. 2.5, 2.7, 2.8, and 2.9*

### Case 1

A dead body and a gun were found in a small room. The room was empty except for a small desk and a chair. The room had two windows, a closet, and a door leading into a hallway. The crime-scene sketch artist measured the perimeter of the room and drew the walls to scale. He sketched the approximate position of the dead body and the gun. He sketched the approximate location of the chair and the desk. What did he forget to do?

### Case 2

At the scene of the crime, the evidence collector found a damp, bloody shirt. The evidence collector quickly wrapped the shirt in a paper bundle. He inserted the paper bundle with the shirt into an evidence bag. The bag was sealed with tape, and the collector wrote his name across the tape. The evidence collection log was completed and taped to the evidence bag. What did he do incorrectly?

### Case 3

A single hair was found on the back of a couch. The evidence collector placed it in a paper bundle. He then inserted the paper bundle into a plastic evidence bag. Using tape, the evidence collector sealed the bag. After completing the evidence log and the chain-of-custody form, he brought the evidence bag to the crime lab. What did he do incorrectly?

### Case 4

Often, several different labs need to share a very small amount of evidence. It is important that the chain of custody be maintained. If the chain of custody is broken, then the evidence may not be allowed in a court proceeding. Identify the error in the following case. After obtaining the evidence, the first lab technician removed the tape that contained the signature of the crime scene evidence collector. On completion of her examination of the evidence, the lab technician put the evidence back into a paper bundle, and inserted the



bundle into an evidence bag. The technician resealed the bag in the same place as the original crime-scene investigator. After carefully sealing the bag, the lab technician signed her name across the tape. She completed the chain-of-custody form on the outside of the evidence bag and brought the evidence to the next lab technician at the crime lab.

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Also check state police Web sites for evidence handling guides.

## **ACTIVITY 2-1** *Ch. Obj. 2.5, 2.6, 2.7, and 2.8*

### **LOCARD'S PRINCIPLE**



#### **Introduction:**

Locard's exchange principle states that trace evidence can be exchanged between a crime scene, victim, and suspect, leaving trace evidence on all three.

#### **Objectives:**

*By the end of this activity, you will be able to:*

1. Demonstrate how transfer of evidence occurs.
2. Identify a possible crime-scene location based on trace evidence examination.

#### **Materials:**

(per group of four students)

Activity Sheet 2-1

- 3 fabric squares each about 2½ inches in a separate evidence resealable plastic bag
- 1 white sock in an evidence plastic bag
- 4 pairs of tweezers (forceps)
- 1 permanent marker
- 2 hand lenses or microscopes
- 1 roll of clear ¾-inch-wide adhesive or masking tape
- 2 pencils
- 4 sheets white paper (8½ × 11")
- 4 sheets of paper for bindling (8½ × 11")
- 4 pairs of plastic or latex gloves
- 4 resealable plastic bags
- 4 sheets of paper for bindles
- 1 pair of scissors
- 4 copies of the Evidence Collection label

#### **Safety Precautions:**

Wash your hands before starting work.

Refrain from touching hair, skin, or clothing when collecting evidence.

Wear gloves while collecting evidence.

#### **Scenario:**

A dead body has been found. The crime-scene investigators determined that the body has been moved after the killing. Trace evidence was found on the victim's sock. It was determined that the crime could have occurred in three possible locations. Can you match the trace evidence found on the victim's sock with trace evidence collected from three different locations and determine which location was the crime scene?



## Procedure:

### Part A: Evidence Collection

1. After washing your hands and putting on your gloves, visit the school library.
2. Open one of the resealable plastic bags, and rub the floor with a fabric square three times. Place the fabric square in a paper bindle, then into a plastic bag, and seal the plastic bag. Label your plastic bag with the location from which your sample was taken.
3. Complete the evidence label, and either attach the label to the plastic bag or place it inside the plastic bag. Seal the plastic bag.
4. Place a piece of adhesive or masking tape over the sealed edge of the plastic bag and write your name across the tape so that your signature begins on one side of the tape and ends on the other side.
5. Repeat steps 1 through 4 at collection site 2 (determined by your instructor).
6. Repeat steps 1 through 4 at collection site 3 (determined by your instructor).
7. Return to your classroom with the three labeled samples.
8. Be sure to maintain the chain of custody with all samples collected. When an evidence bag is opened for examination, the person handling the evidence must open the bag at a location other than the sealed edge (see Figure 2-6).
9. On completion of the examination, the cut plastic bag and all former contents must be resealed into another plastic bag, and the chain-of-custody log attached to the new evidence container must be updated and attached (see Figure 2-6).

### Part B: Evidence Examination and Data Collection

#### Examination of evidence samples

1. Students should wear gloves while examining all evidence.
2. Open a sample bag and bindle from location 1 as previously described by cutting along an edge other than the signed, sealed one.
3. Using forceps and a hand lens or microscope, examine and identify items found on the sample.
4. Record your findings on the data table provided. Be sure to include:
  - a. Who collected the sample
  - b. When it was collected
  - c. Why it was collected
  - d. Date
  - e. Exact site of collection
5. Press a piece of adhesive tape onto the surface of the fabric to remove any additional evidence that the tweezers cannot pick up. Tape the evidence on white paper and examine it. Add items found to your list of evidence.
6. Return the fabric square for location 1 and all evidence examined to the correct bindle and plastic bag. Seal the plastic bag, relabel it with the chain-of-custody list, and sign off on the plastic bag as described previously.
7. Repeat steps 1 through 7 for location 2 evidence plastic bag.
8. Repeat steps 1 through 7 for location 3 evidence plastic bag.

### Return to collect more evidence

1. Choose one member from your group to return to one of the three previous areas examined (i.e., location 1, 2, or 3).
2. The chosen group member should then decide which of the three previous sites should be considered the crime scene. He or she should then return to that location and put on gloves. This group member will not divulge the crime-scene location to his or her fellow examiners.
3. The group member puts on the sock from the plastic bag over his or her own sock. The group member walks around in the selected location. This sock will serve as the victim's sock, which is now covered with trace evidence from the crime scene.
4. While at the crime scene, the chosen team member carefully removes the sock and places it in a bindle and then a plastic bag. It should then be sealed and labeled with "crime scene," date, time, and collector's name, etc. as before.
5. The group member returns to the meeting room to have his or her partners examine the sock evidence.
6. Crime-scene trace evidence should now be treated as described in steps 1 through 7, "Examination of evidence samples."
7. Your team must try to determine which of the three original locations matches the crime-scene location.
8. Complete the Crime Scene report, listing all evidence collected from the sock with your partner investigators.



### Questions:

1. Based on your examinations of the trace evidence, which of the three sites was probably the crime scene? Justify your answer.
2. Did your team correctly identify the crime scene?
3. How might the adhesive tape interfere with your evidence collection?
4. Why were gloves necessary in the collection and handling of trace evidence?
5. What other instruments could be used to improve on your ability to identify evidence?
6. A suspect's shoes and clothing are confiscated and examined for trace evidence. What kind of trace evidence might be found on the clothes or shoes? List at least five examples of trace evidence from the shoes or clothing that might be useful in linking a suspect to a crime scene.
7. A home burglary has occurred. It appears the perpetrator entered after breaking a window. A metal safe had been opened by drilling through its tumblers. A suspect was seen running through the garden. Three suspects were interrogated and their clothing examined. List at least three examples of trace evidence that might be found on the suspect.
8. Some examples of trace evidence are listed. For each item, suggest a possible location where the trace might have originated. For example, broken glass fragments—headlight from a hit-and-run accident.



Example: glass fragment	car accident
sand	
sawdust	
pollen	
makeup	
hair	
fibers	
powders or residues	
metal filings	
oil or grease	
gravel	
insects	

### Evidence Inventory Label

Case # \_\_\_\_\_ Inventory # \_\_\_\_\_

Item #	Item description
_____	_____
_____	_____
_____	_____

Date of recovery \_\_\_\_\_ Time of recovery \_\_\_\_\_

Location of recovery \_\_\_\_\_

Recovered by \_\_\_\_\_

Suspect \_\_\_\_\_

Victim \_\_\_\_\_

Type of offense \_\_\_\_\_

#### Chain of custody

Received from _____	By _____
Date _____	Time _____ AM or PM
Received from _____	By _____
Date _____	Time _____ AM or PM
Received from _____	By _____
Date _____	Time _____ AM or PM
Received from _____	By _____
Date _____	Time _____ AM or PM

## **ACTIVITY 2-2** *Ch. Obj. 2.5, 2.6, 2.7, and 2.8*

### **CRIME-SCENE INVESTIGATION**



#### **Objectives:**

*By the end of this activity, you will be able to:*

1. Explain the correct procedure for securing and examining a crime scene.
2. Demonstrate the correct techniques for collecting and handling evidence.

#### **Introduction:**

The crime scene presents a wonderful hands-on way to review many of the skills described in this chapter. A crime has occurred, and you and your investigative team must secure the area and properly collect the evidence.

**Time Required to Complete Activity:** 60 to 90 minutes (six students per team)

#### **Scenarios:**

Two crime scenes prepared in advance by your instructor

#### **Materials:**

(Per group, with six students in each group)

- Checklists 1–5
- evidence Label
- 10 evidence inventory labels of sheets
- 10 resealable plastic bags, 6-gallon size
- 10 resealable plastic bags, 6-quart size
- 4 paper collection bags
- 2 marking pens
- 4 pairs plastic gloves
- 1 roll crime-scene tape
- 4 compasses
- 1 videocamera (optional)
- “bunny suit” (optional)
- 6 forceps (one pair per person)
- 4 flashlights or penlights (one per person)
- 2 floodlights
- 1 digital camera
- 10 bindle paper sheets, both large and small
- 6 hand lenses
- sketch paper
- 2 photographic rulers
- 1 25-foot tape measure
- 1 roll ¾-inch masking tape

#### **Procedure:**

Your crime-scene team is composed of six students. Each team of students has a first officer, a recorder, a photographer, a sketch artist, and two designated evidence collectors.



By the completion of this part of the activity, each team of students must submit the following:

- A log maintained by the first responder
- Checklists 1 through 5 completed, dated, and signed
- Two sketches—a rough sketch and a quality sketch, both with accurate measurements
- A series of 8 × 10 photographs that adequately encompass the crime-scene location; close-up shots of any evidence, evidence numbered and photographed next to a ruler
- Evidence bags properly packaged, labeled, and sealed

### **Part A: Securing and Preserving the Crime Scene**

1. The crime scene is secured by the first officer to arrive. His or her job is to limit access to the crime scene and preserve the scene with minimal contamination. He or she has primary responsibility for:
  - Securing the safety of individuals at the scene; approach the scene cautiously (look, listen, smell) and determine if the site poses any danger
  - Obtaining medical attention for anyone injured at the scene; call for medical personnel for the injured
  - Calling in backup help, including medical personnel to help the injured and/or lab personnel
  - Separating the witnesses so they may be interrogated separately to see if their stories match.
  - Performing an initial walk-through of the area (scan the scene) to provide an overview of the crime scene
  - Searching the scene briefly (scan the scene) to notify lab personnel what equipment is needed
  - Collecting information, including the crime-scene address/location, time, date, type of call, and the names and addresses of all parties involved and present
  - Securing the integrity of the scene by establishing the boundaries of the crime scene by setting up a physical barrier (tape) to keep unauthorized personnel (and animals, if present) out of the area
  - Protecting the crime scene by remaining alert and attentive
  - Documenting the entry and exit of all authorized personnel
  - Providing a brief update to the next-of-command officer to arrive on the scene

The first-responding officer can use checklist 1 to complete all necessary procedures.

**Note:** Later-arriving police or CSI will set up barricades to prevent unauthorized persons from entering the crime-scene area.

## Part B: Search and Evidence Collection

Once your designated crime-scene specialists arrive, evidence collectors will actually collect the evidence for processing back in the lab.



2. The recorder has the responsibility of working with the primary officer to maintain updated records. The recorder will complete checklist 2. The recorder will:
  - Document by date, time, location, and name of collector all evidence that is found.
  - Work with the sketch artist to measure and document the crime scene.
  - Help search for evidence, if necessary.
3. The sketch artist has the responsibility of drawing accurate and detailed sketches of the area designated as the crime scene. At the crime scene, a rough sketch is made, complete with accurate measurements. At a later time, a neater (or computer-generated) sketch is completed. Checklist 3 outlines those responsibilities. The sketch artist working with the recorder will complete that checklist.
4. The photographer has the responsibility to:
  - Work with the sketch artist and recorder to document the crime scene.
  - Photograph any victims and possible suspects.
  - Take photos of the crime scene, noting the four points of the compass, the entrance and exit points in the area, any disturbances (damage) at the scene, etc.
  - Note and photograph any evidence encountered both with and without a ruler.
  - Complete photographer's checklist.
5. The evidence collectors have the responsibility to:
  - Mark off the area around the victim and keep all unnecessary spectators out.
  - Work within the crime scene, wearing gloves to collect evidence.
  - Walk an appropriate search pattern in the crime-scene area. The pattern will be chosen by your instructor. It may be a spiral, grid, or linear pattern, or the area may be divided into zones for examination.
  - Properly handle, bindle, and package any materials considered to be evidence. Remember that the size of the bindle can vary from very small to large enough to package evidence as large as an overcoat.
  - Complete evidence collector's checklist.
6. The proper handling of evidence includes being aware that:
  - Wet or damp evidence should be placed in a paper bag and sealed.
  - Dry evidence should be placed in a paper bindle and then packaged in plastic bags or envelopes and sealed.
  - Liquid evidence should be stored in sealed, unbreakable containers.
  - Care must be taken to prevent any contamination or damage to the evidence collected.





- Flashlights and penlights can be used to search for hair, fibers, and other small or fine trace evidence.
- All evidence containers should be identified with an evidence label or Evidence Inventory Sheet taped to the container or placed inside the container. Such labels or inventory sheets will be provided by your instructor. The name or initials of the collector should be written over the tape sealing the container. The last page in this activity has a copy of an evidence label.
- If for any reason an evidence container is opened, it should be opened at a location other than the sealed edge. It must be repackaged and resealed with the names of all those who have handled the evidence, along with the original packaging. The name of the new packager should be written over the new seal. This chain-of-custody information is also located on the Evidence Inventory Sheet.

### **Examining the Evidence**

Thorough examination of the crime scene will hopefully lead to a comprehensive collection of evidence. After careful examination of all the evidence and after interviewing the suspects, each team of investigators will collect information helpful in solving the crime.

### **Checklist 1: First Responder's Responsibilities**

Place a check mark by each of the following responsibilities as completed:

- I approached the scene cautiously (look, listen, smell) and determined if the site poses any danger.
- I checked to see if medical attention was needed by anyone injured at the scene.
- I called in backup to help the injured.
- I secured and separated any witnesses present.
- I completed an initial walk-through of the area (scan the scene) to provide an overview of the crime scene.
- I notified superiors of the need for additional police officers and CSI technicians at the crime scene.
- I secured the integrity of the scene by establishing the boundaries of the crime scene by setting up a physical barrier (tape) to keep unauthorized personnel (and animals, if present) out of the area.
- I collected and recorded information, including my name and badge number, case number, address/location of crime scene, time, date, type of call, names of all involved and present parties, as well as the names of everyone present.
- I protected the crime scene by remaining alert and attentive.
- I documented the entry and exit of all authorized personnel.
- I provided the next-in-command officer with a brief update of the situation.

Date \_\_\_\_\_ Signed \_\_\_\_\_

### Checklist 2: Recorder's Checklist

Place a check mark by each of the following responsibilities as completed:

- I documented by date, time, location, and name of collector all evidence that was found by completing an Evidence Summary Sheet for each piece of evidence recovered.
- I documented weather conditions, available light, unusual odors, and other environmental conditions.
- I worked with the sketch artist to measure and document the crime scene.
- I helped search for evidence.
- I helped document the location and direction of what was photographed.
- I helped document the location and direction of what was sketched.

Date \_\_\_\_\_ Signed \_\_\_\_\_



### Checklist 3: Sketch Artist's Checklist

Place a check mark by each of the following responsibilities as completed:

I will prepare two sketches of the crime scene—a rough sketch and a carefully detailed sketch—each of which includes:

- All directions of the compass correctly labeled
- All objects and landmarks within the crime scene labeled in correct position and to scale (each sketch should contain two immovable objects at a measured distance)
- A series of carefully measured distances to add to the accuracy of my sketches
- Working with the photographer to document the exact location and direction from which photographs were taken

Date \_\_\_\_\_ Signed \_\_\_\_\_



#### Checklist 4: Photographer's Checklist

Place a check mark by each of the following responsibilities as completed:

- I worked with the sketch artist, recorder, and evidence collectors to document the crime scene.
- I took photos of the crime scene, noting the four points of the compass, the entrance and departure points into the area, any disturbances (damage) at the scene, etc.
- I took photographs of any injured persons at the crime scene.
- I took close-up photographs of the victim and/or immediate location of the crime.
- I took a series of distance photos to give perspective to the crime scene.
- I noted and photographed any evidence encountered, both with and without a ruler, and had the recorder and sketch artist also record the location of the evidence.
- I took a series of at least eight to ten photographs pertinent to the crime scene. These are of sufficient quality that they could be used in a courtroom reconstruction.

Date \_\_\_\_\_ Signed \_\_\_\_\_

#### Checklist 5: Evidence Collector's Checklist

Place a check mark by each of the following responsibilities as completed:

- I marked off the area around the victim and kept all unnecessary spectators out.
- I worked within the crime scene, wearing gloves to collect evidence.
- I walked an appropriate search pattern in the crime-scene area. The pattern walked was \_\_\_\_\_.
- I properly handled and packaged all materials considered evidence into a bindle.
- I properly bindled and packaged all materials considered evidence into a bag or plastic bag and completed the Evidence Inventory Sheet for each evidence bag.
- I properly sealed and labeled all evidence containers.
- I wrote my signature across the seals on all evidence I collected.
- I completed the chain-of-custody information for each evidence bag.

Date \_\_\_\_\_ Signed \_\_\_\_\_

## Evidence



Case # \_\_\_\_\_ Inventory # \_\_\_\_\_

Item #	Item description
_____	_____
_____	_____
_____	_____

Date of recovery \_\_\_\_\_ Time of recovery \_\_\_\_\_

Location of recovery \_\_\_\_\_

Recovered by \_\_\_\_\_

Suspect \_\_\_\_\_

Victim \_\_\_\_\_

Type of offense \_\_\_\_\_

### Chain of custody

Received from _____	By _____
Date _____	Time _____ AM or PM
Received from _____	By _____
Date _____	Time _____ AM or PM
Received from _____	By _____
Date _____	Time _____ AM or PM
Received from _____	By _____
Date _____	Time _____ AM or PM