Forensic Sciences

First Stage

First semester

1st Lecture

Introduction to Forensic Sciences

Assis. Prof. Yasir Al-Mawlah

Forensic science is known as using scientific rules and methods in criminal investigations. This science aims to collect, analyze, and explain physical and biological evidence from crime scenes. The goal is to provide reliable scientific evidence in courts to help solve crimes and identify criminals. Forensic science is a key part of the modern criminal justice system. It gives objective evidence that helps achieve justice and prevents innocent people from being convicted.

Forensic Science Branches:



1. Chemical Forensic Sciences:

Forensic science means using scientific rules and techniques in crime investigations. It aims to collect, analyze, and explain physical and biological evidence from crime scenes. The goal is to give reliable scientific evidence to courts to help solve crimes and find the criminals. Forensic science is very important in today's justice system. It gives clear evidence that helps justice happen and stops innocent people from being found guilty.

2. Physical Forensic Sciences

Example: Analyzing broken glass pieces from a crime scene window. Forensic physics experts use tools like microscopes to check the pieces, find out the type of glass, how it broke, and connect them to the broken window at the crime scene. How this helps in solving crimes: This analysis helps to understand what happened at the crime scene, figure out how the crime was done, and connect a suspect to physical evidence.

3. Biological Forensic Sciences

Example: Finding blood on a knife at a crime scene. Forensic biology experts use techniques like DNA testing to identify whose blood it is and compare it to the DNA of a suspect or victim. How this helps in solving crimes: DNA is very strong and clear evidence that can connect a suspect to the crime or prove someone is innocent.

4. Forensic Finger Print Branch

Example: Finding fingerprints on the weapon used in a crime. Fingerprint experts use special techniques to collect and analyze the fingerprints, and compare them with the fingerprints of suspects in a database. How this helps in solving crimes: Fingerprints are considered very strong evidence and are used to identify the criminal with certainty.

5. Forensic Documentation Branch

Example: Examining handwriting on a threatening note. Document experts use advanced techniques to check if signatures are real, examine types of ink and paper, and find any signs of forgery or erasing. How this helps in solving crimes: This analysis helps to identify who wrote the note or reveal any attempts to tamper with the evidence.

6. Forensic Medicine (Forensic Pathology) Branch

Example: Performing an autopsy to determine the cause of death. Forensic pathologists use autopsy techniques, examining tissues and organs to determine the cause of death, the type of injuries, and when they occurred. How this helps in solving crimes: Autopsy results provide key information about the crime and help determine the circumstances of death and identify the killer.

7. Forensic Entomology

Example: Finding insects on a decaying body. Forensic entomologists use the types of insects found on the body to estimate the time of death and the crime scene environment.

How this helps in solving crimes: This analysis provides scientific evidence to determine a possible time frame for when the crime occurred.

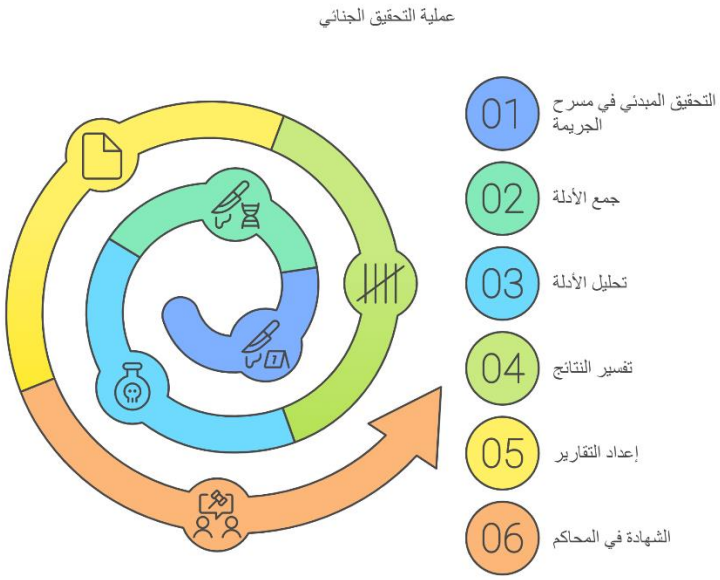
8. Forensic Toxicology

Example: Analyzing blood samples from the victim to check for poisons. Forensic toxicology experts use advanced techniques to find poisons or toxic substances in the victim's body and determine their type and amount. How this helps in solving crimes: This analysis helps to determine the cause of death and connect a suspect to the crime if a toxic substance is found.

9. Forensic Scene Invistegation

Example: Taking photos and drawing detailed maps of a burglary crime scene. Crime scene experts use photography, sketching, measuring distances, and collecting evidence in a systematic and organized way. How this helps in solving crimes: This work is essential for documenting the crime scene, collecting evidence correctly, and keeping it safe from contamination.

Working Steps (Protocols) of Forensic Sciences:



1. Crime Scene Investigation – CSI:

Goals: Secure the crime scene, prevent evidence contamination, document the scene accurately, and collect initial information.

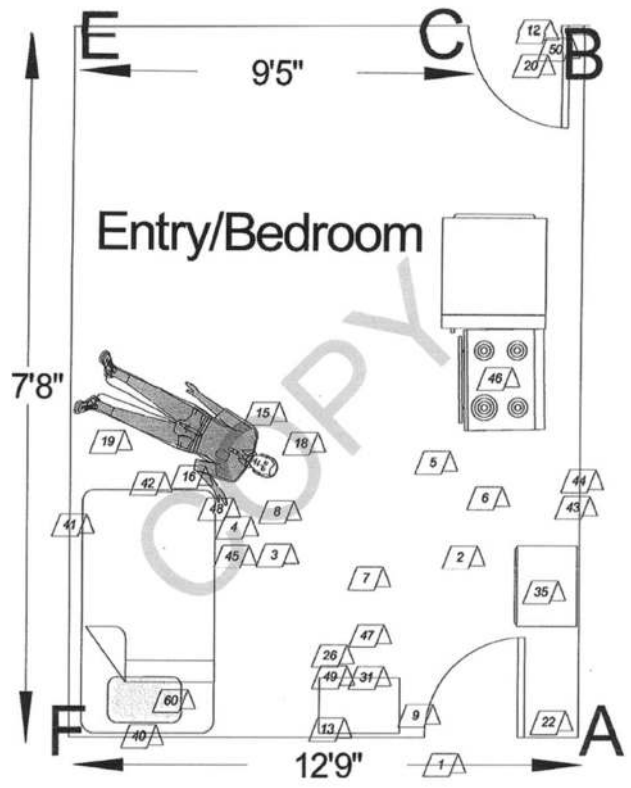
Procedures:

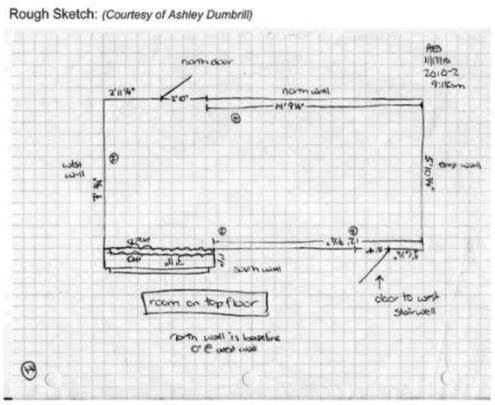
Securing: Isolating the crime scene to prevent unauthorized entry and setting up security barriers. Example: Closing an entire street after a car accident or murder.

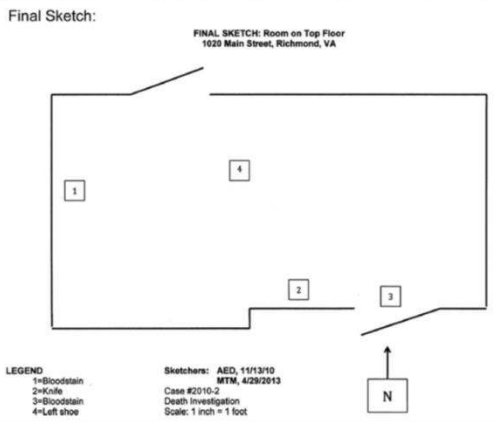
Documentation: Taking high-quality photographs and videos of the crime scene from different angles and creating accurate diagrams showing the locations of evidence. Example: Photographing footprints or tire tracks on the ground.

Initial Information Gathering: Talking to witnesses and collecting information related to the crime, such as its timing, method, and the people present. Example: Asking neighbors if they saw anything unusual.

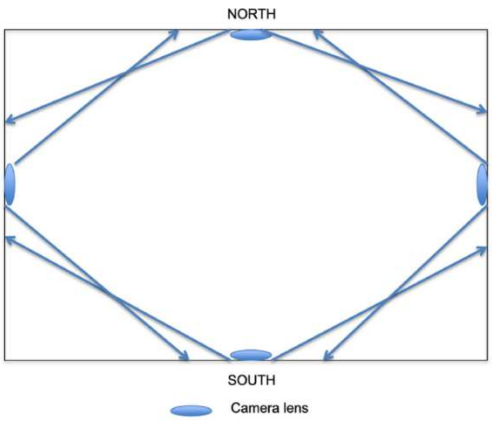
Protecting Evidence: Avoiding touching or moving evidence as much as possible, except after documenting and photographing it, and using appropriate protective equipment (gloves, protective clothing). Example: Covering the victim's body with a sheet to protect the evidence on it.







Evidence Found	Category of Evidence Found	Second Category	Information to be Obtained from Evidence



2. Evidence Collection:

Goals: Collect all relevant evidence very carefully while maintaining the chain of custody.

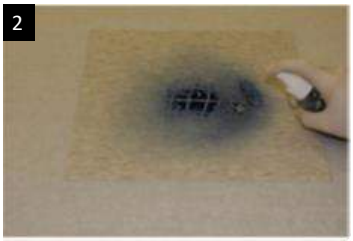
Procedures:

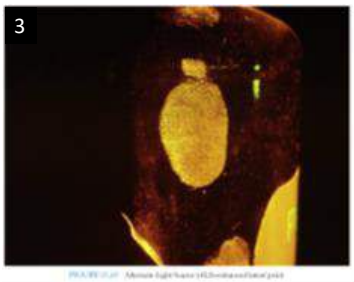
Identification and Classification: Identifying the type of evidence (blood, hair, weapons, etc.) and classifying it according to its nature.

Collection: Using appropriate tools and techniques to collect each type of evidence. Example: Using cotton swabs to collect blood samples and special bags to collect clothing or weapons.

Packaging: Packaging each piece of evidence in a separate bag (paper or plastic, depending on the type of sample) and labeling it correctly, stating its location, time, and the full name of the collecting officer. Example: Packaging each piece of broken glass in a separate bag.











Category	Photo	Lifted	Cast	Collect from surface	1°	2°	Controls
Imprints	X, EQP	X				X	Elimination prints
Indentations	X, EQP		Dental Stone		X	X	Possible sources
Striations	X, EQP		Silicone Rubber		X	X	Possible sources
Trace	X	Tape, Gel		X	X	X	Possible sources
Hair	X			X	X	X	Possible sources
Fibers	X			X	X	X	Possible sources
Glass	X			X	X	X	Possible sources
Paint	X			X	X	X	Possible sources
Firearms	X				X	X	
Gunshot residue	X			X	X	X	
Physiological fluids	X, EQP			X	X	X	Possible sources
Accelerants	X					X, airtight	Possible sources
Drugs	X				X	X	
Explosive residues	X			X	X	X	
Questioned documents	x				X	X, Window envelopes	Possible sources

3. Evidence Analysis:

Goals: Examining the evidence in specialized laboratories to determine its identity and characteristics.

Procedures: The collected evidence is sent to specialized laboratories for analysis by specialized experts using appropriate scientific techniques for each type of evidence. Example: DNA analysis of a blood sample, fingerprint examination on a weapon, or analysis of explosive residue.

4. Interpretation of Results:

Goals: Understanding the meaning of the analysis results and connecting them to the crime committed.

Procedures: Experts analyze the test results and develop hypotheses about how the crime was committed and the people involved. Example: If the suspect's fingerprints match fingerprints found on the crime weapon, this supports the hypothesis of their involvement in the crime.

5. Report Writing:

Goals: Documenting all procedures taken, analysis results, and conclusions clearly and in detail.

Procedures: Experts prepare detailed reports that include an accurate description of the evidence, the techniques used, the analysis results, and chain of custody data. Example: A DNA testing report showing the degree of matching between the DNA found and a specific person's DNA.

6. Court Testimony:

Goals: Explaining the experts' scientific results to the court in a clear and understandable way to answer the lawyer's questions.

Procedures: Experts provide expert testimony about their analyses and answer questions from defense and prosecution lawyers. Example: A DNA expert explaining how DNA matching works and the accuracy of the results.

Importance of Forensic Science:

Revealing the truth

Evidence of guilt or evidence of innocence

Crime reduction

Paternity testing

Family tree

Mass graves

Rape crimes

Illegal immigration

Kinship and ethnicity.