Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date \_\_\_\_\_\_\_\_\_\_\_\_\_ Period \_\_\_\_

Background Information

Forensic Science Laboratory Activity – Locard’s Principle

***Read before the Lab!!***



Edmond Locard (1877-1966) in 1920 persuaded the police department in Lyons, France, to give him

two attic rooms and two assistants to start the world’s first police laboratory.

During his first years of work, the only instruments available to Locard were a microscope and a rudimentary spectrometer. However, his enthusiasm quickly overcame the technical and monetary deficiencies he encountered. From these modest beginnings, Locard’s research and accomplishments became known throughout the world b y forensic scientists and criminal investigators.

It was Locard’s belief that when a criminal came in contact with an object or person, a cross-transfer of evidence occurred (Locard’s Exchange Principle). Locard strongly believed that every criminal can be connected to a crime by dust particles carried from the crime scene. This concept was reinforced by a series of successful and well-publicized investigations. In one case, confronted with counterfeit coins and the names of three suspects, Locard urged the police to bring the suspects’ clothing to his laboratory. Upon careful examination, he located small metallic particles in all the garments. Chemical analysis revealed that the particles and coins were composed of exactly the same metallic elements. Confronted with this evidence, the suspects were arrested and soon confessed to the crime.

Every time you make contact with a person or object there is an exchange of materials. This could mean the transfer of fibers, hairs, wood shavings, metal filings, tidbits of paper, or any small, lightweight item adherent to the donor object. This exchange enables forensic scientists to determine where someone has been based on trace evidence. It is even possible to track a person’s daily movements by examining his or her clothing.

**Forensic Science Laboratory Activity – Locard’s Principle**

Objectives:

1. Demonstrate how transfer of evidence occurs

2. Identify a possible crime scene location based on trace evidence examination

Materials (per group):

*For Part 1*

Outer garment (sweater, wrap, pants) that has been worn at least once since being washed

Translucent tape

Hand lens

Spatula

Tweezers

Flashlight

Labels – masking tape

30 cm ruler

*For Part 2*

3 fabric squares in separate sealed evidence bags white Paper

1 white sock in sealed evidence bags tweezers scissors

Hand lenses gloves

1 role of clear tape or masking tape

Safety Precautions:

Wash your hands before starting work

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

Wear gloves while collecting evidence

**General Procedure**

Three methods are used in this experiment to separate traces of materials adhering to garments.

1. ***Lifting****:* Press lengths of translucent tape onto the surface of the garment, taking care not to allow materials stuck to the tape to fall off by overloading the tape. Place the tape lifts in a transparent container such as a Petri dish, where they can be studied with a hand lens.
2. ***Picking****:* Use clean forceps or tweezers to lift traces of materials from the garment onto a clean sheet of paper (to avoid loss of sample). Transfer the traces of materials to a transparent container such as a Petri dish, where they can be studied with a hand lens.
3. ***Scraping****:* Use a clean spatula or similar tool to dislodge the traces of materials adhering to the garment's surface directly onto a clean sheet of paper. Transfer the traces of materials to a transparent container such as a Petri dish, where they can be studied with a hand lens. (This technique is particularly useful for dried splatters of liquids.)

Label all traces of materials removed from garments with the identity of the garment's owner.

**Procedure**

You will need a partner for this experiment.

*Part 1: Examining clothes*

1. Observe the surface of the garment and identify any traces of materials adhering to the surface. If necessary, use a flashlight to illuminate the surface of the garment (traces of materials can be shown in greater detail if light is shone on the surface obliquely).
2. Remove traces of materials from the garment using the techniques described above, starting with lifting. *H* materials are found that cannot be removed in this way, move to picking: If the material adheres more strongly to the garment, use scraping.
3. Using a hand lens, identify the fragments of material found as far as is possible. For example, you should be able to identify hairs, threads of fabric, leaves, and seeds.
4. Identify the garment and its owner in data table A on the next page. Record the technique(s) used to remove the fragments of material and the part of the garment from which it was removed. If the traces of materials were in the form of stains (e.g., milk), use the ruler to measure the approximate area of the stain.

|  |  |  |
| --- | --- | --- |
| **DATA TABLE A** | | |
| Type of garment | | |
| Owner of garment | | |
| Date | | |
| **Evidence found** | | |
| Identification of fragment  (hair/thread/leaf/seed) | Method of collection  .(lifting/picking/scraping) | Number of traces of this type found (for fragments) Area covered  (if splashes or stains) |
|  |  |  |
|  |  |  |
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Part 2 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:

1. Open a fabric square evidence bag from location 1 by cutting along an edge other than the signed, sealed one.

2. Using forceps/tweezers and a hand lens, examine and identify items found in the sample.

3. Record your finding on the data table provided.

4. Press a piece of adhesive tape onto the surface of the fabric to remove any additional evidence that the forceps/tweezers cannot pick up. Tape the evidence on white paper and examine it. Add any items to your data table.

5. Repeat steps 1 though 4 with your other two fabric squares.

6. Open the white sock sealed envelope in the same manner as you opened your fabric square bags.

7. Use the same procedure as you did for the fabric squares to examine the white sock.

8. You must determine which of the three original location matches the crime scene location.

Data Table:

|  |  |  |  |
| --- | --- | --- | --- |
| **Fabric Square from**  **Location #1** | **Fabric Square from**  **Location #2** | **Fabric Square from**  **Location #3** | **White Sock** |
|  |  |  |  |

Name Date Period

Questions:

1. Based on your examination of the trace evidence, which of the three sites was probably the crime scene? Justify your answer!!

2. How might the adhesive tape interfere with your evidence collection?

3. Why were gloves necessary in the collection and handling of trace evidence?

4. What other instruments could be used to improve on your ability to identify evidence?

5. A suspect’s shoes and clothing are confiscated and examined for trace evidence. What kind of 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.

6. 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 as least **three examples** of trace evidence that might be found on the suspect.

7. Some examples of trace evidence are listed below. For each item, suggest a possible location where the trace evidence might have originated. For example, broken glass fragments – headlight from a hit- and-run accident.

|  |  |
| --- | --- |
| **Trace Evidence** | **Possible Source** |
| Example: glass fragment | Headlight from car accident |
| Sand |  |
| Sawdust |  |
| Pollen |  |
| Makeup |  |
| Hair |  |
| Fibers |  |
| Powders or residues |  |
| Metal filings |  |
| Oil or grease |  |
| Gravel |  |
| Insects |  |