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Fingerprinting Lab

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INTRODUCTION

Description

After a lecture/discussion on fingerprinting techniques, students recover latent prints by iodine fuming, cyanoacrylate fuming, and dusting with powder. Each student will provide a fingerprint for identification by another student. A database of fingerprints of the class will be made to help in the identification of the unknown print.

Student Audience

This lab is intended for a high school class.

Goals for the Activity

The main goals for this activity are for students to obtain

- the general knowledge of fingerprints, including a brief history of fingerprint identification in solving crimes, a definition of fingerprints and how they are made, what is meant by a latent fingerprint, major types of fingerprint patterns, and methods of recovering latent prints;
- the ability to use iodine fuming, cyanoacrylate fuming, and dusting with powder to recover latents; and
- the ability to use a fingerprint database for analysis and identification.

Recommended Placement in the Curriculum

This activity can be conducted within a unit on forensic science in chemistry or applied chemistry classes. It can also be conducted in connection with a discussion of states of matter and sublimation in physical science or chemistry classes.

STUDENT HANDOUT

Fingerprinting Lab

Purpose

The purpose of this activity is to

- collect and preserve fingerprints using various techniques,
- analyze fingerprints by type, and
- identify unknown fingerprints using a fingerprint database.

Safety, Handling, and Disposal

It is your responsibility to specifically follow your institution's standard operating procedures (SOPs) and all local, state, and national guidelines on safe handling and storage of all chemicals and equipment you may use in this activity. This includes determining and using the appropriate personal protective equipment (e.g., goggles, gloves, apron). If you are at any time unsure about an SOP or other regulation, check with your instructor.

Procedure

I. Iodine fuming

1. Use forceps to pick up a piece of the clean bond paper. Be careful not to touch the paper.
2. Rub your right index finger against your nose, then SLOWLY roll that finger across the center of the paper. Use the forceps to hold the paper while you write your name on it.
3. Place the piece of paper in a jar with iodine crystals.
4. Seal the jar, and let it sit until the fingerprint "develops" (approximately 20 minutes).
5. Attach the paper to the data section of your lab report.

II. Cyanoacrylate (Superglue) fuming method

1. Obtain and clean two glass slides that have the same number. Write down the number immediately as indicated by your instructor.
2. Rub your right index finger against your nose.
3. Roll your right index finger once on the center of one of the glass slides.
4. Put one drop of glue on a small piece of aluminum foil and place the foil inside a jar. Carefully add the slide, close the lid, and put the jar on a hot plate that is set on "low."
5. Repeat steps 2–3 with the other slide, and then return it to your instructor for distribution to another student.

III. Dusting with powder

1. You will receive another student's slide. Write its number on your data sheet.
2. Lightly touch the brush to the black dusting powder. A small amount of powder works best.

3. Dust the slide using a gentle, circular motion; tap the slide on its edge to remove excess powder.
4. Put a piece of clear tape over the print, sticky side down; rub very lightly from top to bottom, and lift the tape.
5. Attach the tape to your data sheet.
6. Obtain the same-numbered slide from Part II when it is finished “developing”; dust it following steps 2–5.

IV. Making a fingerprint identification sheet of everyone in the class

1. Rub a thick spot of graphite on scratch paper with your pencil.
2. Place your right index finger in the graphite, rolling it firmly from right to left.
3. Hold up your right index finger so that your lab partner can place a strip of clear tape on the graphite-covered section of your finger.
4. Gently remove the tape and stick it to your fingerprint database. Label it with your name.
5. Repeat steps 1–4 for everyone in the class so that your database has an identified sample of everyone’s right index fingerprint.
6. Categorize each print by its type: arch, whorl, or loop. Record types on the database.

V. Identifying unknown fingerprints

1. Identify the fingerprints from the slides given to you in Part III by comparing them to your fingerprint database.
2. Complete the questions.

DATA

From Part I: Iodine fuming method (attach paper)
your print

From Part III: Number on slides [] (Attach tapes from Part III below.)

Dusting only

Cyanoacrylate Fuming plus Dusting

From Part IV: Fingerprint database (use separate sheet for additional prints)

Name _____

Type of Print _____

(attach tape)

Name _____

Type of Print _____

(attach tape)

Name _____

Type of Print _____

(attach tape)

Name _____

Type of Print _____

(attach tape)

Name _____

Type of Print _____

(attach tape)

Questions

1. What are the three main types of fingerprints?
2. What was the most common type of fingerprint in the class? Is this the same type that is the most common worldwide?
3. Which method showed the fingerprints most clearly?
4. Why is it necessary to use different fingerprinting methods at crime scenes?
5. What was the number on the slides you received in Part III? _____

Which classmate did you match to your given slides? _____

Which of the three main types of fingerprints did he/she have? _____

Suggested Reading

Noble, D. "The Disappearing Fingerprints," *ChemMatters*. February 1997, 9–12.

Walker, P.; Wood, E. "Lesson 2–5: Print Patterns"; *Crime Scene Investigations*, Center for Applied Research in Education: West Nyack, NY, 1998; pp 102–107.

Brown, E.W. "The Cyanoacrylate Fuming Method."

<http://www.ccs.neu.edu/home/feneric/cyanoacrylate.html> (accessed Apr 17, 2000).

Dale, M.; Proctor, A.; Williams, J. "Evidence: The True Witness." <http://www.thinkquest.org/library/17049.shtml> (accessed Apr 17, 2000).

INSTRUCTOR NOTES

Fingerprinting Lab

Time Required

Approximately 60 minutes are required to complete the lab. Pre-lab discussion time will vary with instructor.

Group Size

This lab should work well with class sizes ranging from 15–25 students. The database of class fingerprints becomes less valuable with smaller classes, and identification of the unknown fingerprints is less challenging.

Materials

Iodine fuming

Per student

- small square of white paper (approximately 5 cm x 5 cm)
- forceps
- glass jar with 2 or 3 iodine crystals
The jar and crystals may be used repeatedly.
- clear tape

Cyanoacrylate fuming

Per student

- 2 glass slides
- small piece of aluminum foil
- drop of Superglue
- glass jar with lid
The jar may be used simultaneously by more than one student.
- hot plate

Dusting with powder

Per student

- dusting brush
- black dusting powder
- clear tape or hinge lifter
The above materials may be obtained from SIRCHIE, phone orders, 800/356-7311; fax orders, 800/899-8181; e-mail, sirchie@nand.net.

Fingerprint database

Per student

- scratch paper
- graphite pencil
- clear tape

Safety, Handling, and Disposal

As the instructor, you are expected to provide students with access to SOPs, MSDSs, and other resources they need to safely work in the laboratory while meeting all regulatory requirements. Before

doing this activity or activities from other sources, you should regularly review special handling issues with students, allow time for questions, and then assess student understanding of these issues.

The iodine in the glass jar may be saved for later use or disposed of according to local ordinances. The glass slides used with the Superglue cannot be reused because the Superglue forms a permanent fingerprint.

Points to Cover in the Pre-Lab Discussion

Students need a discussion of the history of the fingerprint as a crime-solving tool, the definitions of fingerprints and latent fingerprints, the major fingerprint patterns, and the various techniques used to recover latent fingerprints. Students should be reminded not to inhale iodine or Superglue vapors.

Procedural Tips and Suggestions

- Students should do Parts I and II first since these methods require time for developing: approximately 20 minutes for the iodine and 30–60 minutes for the Superglue.
- Explain that the purpose of rubbing the finger against the nose is to provide plenty of oil for a clear print. (Criminals generally don't do this, but the students are in the process of learning, and it is easier to learn with clear prints.)
- Caution students to roll their fingers once, not to go back and forth or to smear their prints when placing their fingerprints on the paper or slides.
- Remind students that when dusting prints, **less** powder is better.
- Remind students to write down the number on their unknown slides immediately and not to spoil the fun by sharing their fingerprint number with other students.

Sample Results

Fingerprint results will vary, but most of the class will probably have loop fingerprint patterns.

Plausible Answers to Questions

1. What are the three main types of fingerprints?
Loop, whorl, and arch.
2. What was the most common type of fingerprint in the class? Is this the same type that is the most common worldwide?
Answers may vary, but the loop is found in 65% of the population.
3. Which method showed the fingerprints most clearly?
Answers will vary; depends on the student.
4. Why is it necessary to use different fingerprinting methods at crime scenes?
Fingerprints may be left on different types of surfaces at a crime scene. Some methods work better for recovering prints from hard, smooth surfaces; other methods work better when the print is left on a porous surface.

5. What was the number on the slides you received in Part III? Which classmate did you match to your given slides? Which of the three main types of fingerprints did he/she have?
The answers given should match the instructor list of the numbered slides.

Extensions and Variations

This lab may be done as part of a crime-scene scenario, or after having completed the lab successfully, students may have to use their knowledge and skill at recovering fingerprints in a later case study that requires the students to look at various kinds of evidence to solve a crime.

References

- Brown, E.W. "The Cyanoacrylate Fuming Method."
<http://www.ccs.neu.edu/home/feneric/cyanoacrylate.html> (accessed Apr 17, 2000).
- Carter, A. (instructor at Adirondack Community College, Queensbury, NY) Class lecture.
June 28–July 2, 1999.
- Dale, M.; Proctor, A.; Williams, J. "Evidence: The True Witness." *<http://www.thinkquest.org/library/17049.shtml>* (accessed Apr 17, 2000).
- Noble, D. "The Disappearing Fingerprints," *ChemMatters*. February 1997, pp. 9–12.
- Walker, P.; Wood, E. *Crime Scene Investigations*, Center for Applied Research in Education: West Nyack, NY. 1998, pp. 102–107.