Dusting For Fingerprints

Topic

Detecting prints on various surfaces

Introduction

In section 3 you learned that the ridges and valleys on the ends of our fingers (the side opposite the finger nail) make up a unique fingerprint pattern. We leave traces of fingerprint patterns on everything we touch. You can see this pattern as a three-dimensional imprint in wet glue or paint, but more usually as a two-dimensional trace on the surfaces of things we touch. If our fingers are covered in substances such as paint or blood, these two-dimensional prints are visible. More often, the prints are invisible, or latent; we can only see them if something is done to make them visible. Latent prints are made because the human body releases perspiration and oil, which coat the skin. Perspiration, consisting of water and salt, leaves the body through pores on the ridges of fingerprints. Oil is released from sebaceous glands under the skin and moves up to the skin's surface. These substances mark surfaces with which they come into contact, leaving a fingerprint. Scientists have developed several methods to make latent prints visible; the method used depends on the surface on which the print is found. In this experiment, you will use the traditional powder method. In the first part of the experiment, you will consider the circumstances in which fingers make the most easily visible fingerprints. In the second part of the experiment, you will discover which of a range of different surface textures displays the best fingerprint patterns.

Time required

Part A: 20 minutes
Part B: 30 minutes (depending on the number of surfaces tested)

Materials

For Part A:
shiny dark surface such as a plastic plate or a laminated book cover
newspaper to protect surfaces
dust cloth
200 g talcum powder in shaker jar
a small wisp of absorbent cotton (alternatively, use a feather)

For Part B:
variety of different surfaces – hard plastic (such as that found on light switches), wallpaper, paint sample, glass, porcelain, rubber floor tile, cork, cardboard, fabric, metal (aluminum foil)
talcum powder in a shaker jar (about 5 g)

graphite powder in a shaker jar (about 10 g)
shaker jar
soft brush/absorbent cotton
newspaper to protect surfaces
hand cream
1 sheet white unlined paper ($8\frac{1}{2} \times 11$)
1 sheet black paper ($8\frac{1}{2} \times 11$)
white sticky labels
pen
clear tape (preferably wide)
scissors

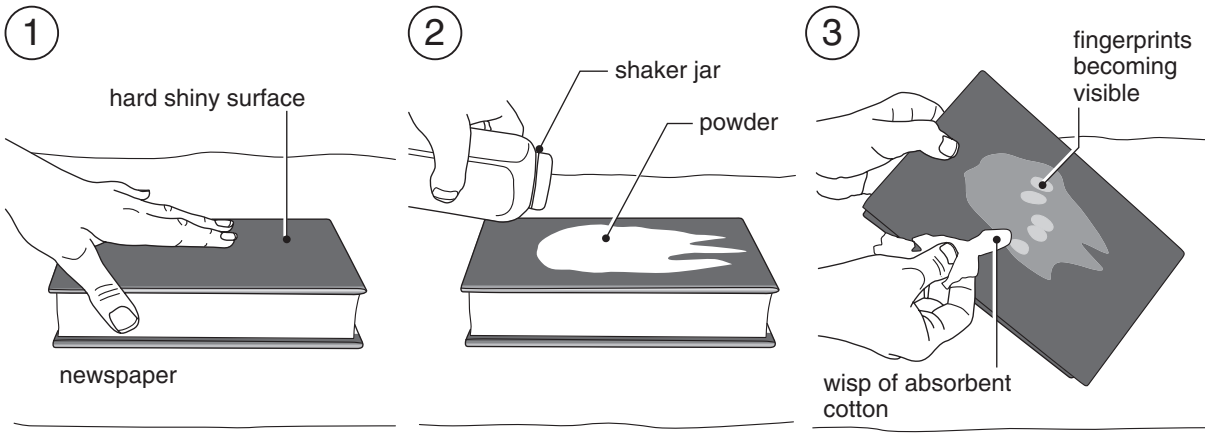
Safety note

Please read the general safety precautions.

Procedure

Part A: Making a fingerprint

1. Protect the work surface or table with newspaper.
2. Wipe the hard shiny surface with the dust cloth.
3. Touch the surface with the pad of your finger (the part opposite the nail) as in diagram 1 below. Do not press down too firmly.
4. Shake talcum powder over the surface (see diagram 2 below).
5. Dust the excess powder away from the surface very lightly with a few fibers of absorbent cotton (or a feather) as in diagram 3 below. Do not brush the surface too hard, or you will brush away the lines of the fingerprint.
6. Record in data table A on the next page if fingerprints are visible. Use the first row for "unwashed hands."
7. Wash your hands and repeat steps 2 to 6, recording the result in the second row of data table A.
8. Rub hand cream on your hands and repeat steps 2 to 6, recording the result in the third row of data table A.
9. Carefully dispose of the newspaper covering the table (try to avoid spilling the excess powder).

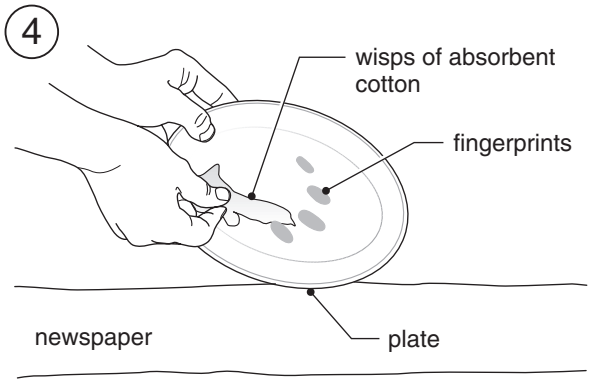


Touching the surface *Shaking powder over the surface* *Removing excess powder*

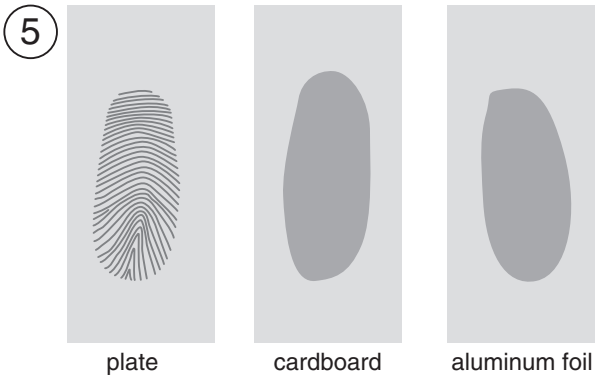
DATA TABLE A	
Condition of hands	**Is the fingerprint visible using powder?**
Unwashed	
Clean	
Hand cream applied	

Part B: Making the latent prints visible
Decide who is going to make the fingerprints and apply the powder to make them visible (this is person A), and who is going to be responsible for making a record of the prints (person B).

1. Protect the work surface or table with newspaper.
2. Person A rubs a little hand cream into his hands.
3. Person A selects the first item with which to work and writes its name in data table B on the next page. He then presses the pads of his fingers lightly onto the chosen surface. (Using more than one finger will give a better result for this part of the experiment.)
4. Choose the best color of powder to make the latent print visible. If the surface is dark in color, use talcum powder; if the surface is light in color, use graphite powder.
5. Person A shakes a little of the powder over the place touched by the fingers.
6. Person A dusts the excess powder away from the surface very lightly with a few fibers of absorbent cotton. The powder should outline the shape of the fingerprint (see diagram 4 on the next page).
7. Person B cuts a length of clear tape (4 – 5 cm long) and presses it carefully down over the print. She then lifts the tape carefully away from the surface.
8. If black powder was used, place the tape print on the sheet of white paper. Write the name of the object from which the print was taken next to it (see diagram 5 on the next page).
9. If white powder was used, place the tape print on the sheet of black paper. Write the name of the object from which the print was taken on a sticky label. Place the label next to the relevant print.
10. Look at the fingerprint on the tape. Estimate the quality of the fingerprint by judging the clarity of the lines of the fingerprint pattern (excellent/good/poor/non-existent). Enter this estimation in data table B next to the name of the surface used.
11. Repeat steps 2 to 10 for other surfaces.
12. Carefully dispose of the newspaper covering the table (avoid spilling the excess powder).



Fingerprints made visible by the application of powder



Labeled tape prints on the sheet of paper

DATA TABLE B	
Surface on which fingerprint made	**Quality of print (excellent/good/poor/non-existent)**

Analysis

Part A: Making a fingerprint

1. How did the fingerprints made with clean and dirty hands compare with those made after hand cream had been applied?

Part B: Making the latent print visible

1. Which surface gave the best print?
2. Which surfaces gave the worst or no prints?

Want to know more?

Part A: Making a fingerprint

1. Fingerprints made with dirty hands were clearer than those made with clean hands, but the clearest prints were made after hand cream had been applied. The extra grease in hand cream helps more powder stick to the latent print. Fortunately, a nervous criminal produces more sweat, causing fluid to appear on the skin. This helps forensic scientists take better fingerprints at the crime scene.

Part B: Making the latent print visible

1. The best quality visible prints appeared on hard shiny surfaces such as glass, porcelain, and shiny hard plastic.
2. The worst quality visible prints appeared on rough, dull surfaces.

Diagram 5 on page 7.03–4 shows that cardboard and aluminum foil (two very different surfaces) do not give usable results for this method of making latent prints visible.

Special Safety Note To Experimenters

Each experiment includes any special safety precautions that are relevant to that particular project. These do not include all of the basic safety precautions that are necessary whenever you are working on a scientific experiment. For this reason, it is absolutely essential that you read, copy, and remain mindful of the General Safety Precautions that follow this note. Experimental science can be dangerous, and good laboratory procedure always includes carefully following basic safety rules. Things can happen very quickly while you are performing an experiment. Things can spill, break, even catch fire. There will be no time after the fact to protect yourself. Be prepared for unexpected dangers by following basic safety guidelines the entire time you are performing the experiment, whether or not something seems dangerous to you at a given moment.

We have been quite sparing in prescribing safety precautions for the individual experiments. We made this choice for one reason: We want you to take very seriously every safety precaution that is printed in this book. If you see it written here, you can be sure that it is here because it is absolutely critical to your safety.

One further note: The book assumes that you will read the safety precautions that follow, as well as those in the box within each experiment you are preparing to perform, and that you will remember them. Except in rare instances, the general precautions listed below will not be repeated in the procedure itself. It is up to you to use your good judgment and pay attention when performing potentially dangerous parts of the procedure. Just because the book does not say **BE CAREFUL WITH HOT LIQUIDS or DON'T CUT YOURSELF WITH THE KNIFE** does not mean that you should be careless when boiling water or cutting a section of a stem for microscope work. It does mean that when you see a special note to be careful, it is extremely important that you pay attention to it. If you ever have a question about whether a procedure or material is dangerous, wait to perform it until you find out from a qualified adult that it is safe.

GENERAL SAFETY PRECAUTIONS

Accidents caused by carelessness, haste, insufficient knowledge, or taking unnecessary risks can be avoided by practicing safety procedures and being alert while conducting experiments. Be sure to check the individual experiments in this book for additional safety regulations and adult supervision requirements. If you will be working in a lab, do not work alone.

PREPARING:

—Clear all surfaces before beginning experiments
—Read the instructions before you start
—Know the hazards of the experiments and anticipate dangers

PROTECTING YOURSELF:

—Follow the directions step-by-step; only do one experiment at a time
—Locate exits, fire blanket and extinguisher, gas and electricity shut-offs, eyewash, and first-aid kit
—Make sure there is adequate ventilation
—Act sensibly at all times
—Wear an apron and safety glasses
—Do not wear open shoes, loose clothing, or loose hair
—Keep floor and workspace neat, clean, and dry
—Clean up spills immediately, being careful to follow the recommended procedure for dealing with the spilt substance
—Never eat, drink, or smoke in the laboratory or workspace
—Do not eat or drink any substances tested unless expressly permitted to do so by a knowledgeable adult

USING EQUIPMENT WITH CARE:

—Set up apparatus far from the edge of the desk
—Use knives and other sharp or pointed instruments with caution
—Pull plugs, not cords, when removing electrical plugs

—Don't use your mouth to pipette liquids; use a suction bulb
—Check glassware is clean and dry before use
—Check glassware for scratches, cracks, and sharp edges
—Report broken glassware immediately so that it can be cleaned up by a responsible person
—Do not use reflected sunlight to illuminate your microscope
—Use only low voltage and current materials such as lantern batteries
—Be careful when using stepstools, chairs, and ladders

USING CHEMICALS AND BIOLOGICAL MATERIALS:
—Never taste or inhale chemicals
—Label all bottles and apparatus containing chemicals
—Read labels carefully
—Avoid chemical contact with skin and eyes (wear safety glasses, lab apron, and gloves)
—Do not touch chemical solutions
—Wash hands before and after using solutions
—Wipe up spills thoroughly
—Use sterile procedures when handling even common and harmless microorganisms
—Avoid contact with human blood
—Treat all living organisms with appropriate respect

HEATING SUBSTANCES:
—Wear safety glasses, apron, and gloves when boiling water
—Keep your face away from test tubes and beakers
—Use test tubes, beakers, and other glassware made of Pyrex™ or borosilicate glass
—Use alcohol-filled thermometers (do not used mercury-filled thermometers)
—Never leave apparatus unattended
—Use safety tongs and heat-resistant mittens
—If your laboratory does not have heat-proof workbenches, put your Bunsen burner on a heat-proof mat before lighting it
—Take care when lighting your Bunsen burner; use a Bunsen burner lighter in preference to wooden matches
—Turn off hot plates, Bunsen burners, and gas when you are done
—Keep flammable substances away from heat
—Keep sheets of paper and other flammable objects away from your Bunsen burner
—Have a fire extinguisher on hand

FIELDWORK:
—Be aware of environmental dangers (e.g., do not carry out fieldwork near dangerous roads, cliffs, or water)
—Remember that strong sunlight can be dangerous – pack sunscreen and a good supply of drinking water if you will be outside all day
—Never carry out fieldwork in areas where you cannot find your way to safety easily and quickly and never wander off on your own in search of new areas to study

FINISHING UP:
—Clean your work area and glassware (follow any instructions given by a supervising adult)
—Be careful not to return chemicals or contaminated reagents to the wrong containers
—Don't dispose of materials in the sink unless instructed to do so
—Wash your hands
—Clean up all residues and put in proper containers for disposal
—Dispose of all chemicals according to all local, state, and federal laws
—Dispose of all microbiological cultures by treatment with an appropriate disinfectant

BE SAFETY CONSCIOUS AT ALL TIMES

Settings And Warning Signs

Settings and hazard warning signs are used throughout the experiments to indicate where they should take place and where particular care should be taken with the materials involved.

SCHOOL LAB

HOME

TOXIC

SPLASH

WARNING

IRRITANT

NAKED FLAMES

HOT LIQUIDS

CORROSIVE

CUT / STAB HAZARD