

Experiments

You can collect your own samples of hairs, threads, bits of cloth, sand and other specks and study them with a hand magnifier. If you wish to study your own clues further, a student stereomicroscope is easy to use and you will see a lot more detail than with a hand magnifier. Good student microscopes can be bought from microscope dealers, specialty science product shops and through the Internet. Some stores sell used student microscopes. Never buy a microscope from a toy store! The quality of the lenses is poor and you will not be able to see your samples clearly. The price of a good quality student microscope is similar to that of student musical instruments.

The Clue is in the Writing

Forensic Scientists are always comparing known things to unknown things. Two pieces of evidence may look alike but may be made up of totally different ingredients. This experiment will help you tell the difference between inks that may look alike, and match inks that are chemically the same.

Chromatography is a colorful way to identify chemicals in a substance. Each different chemical looks different on the test strip.

Materials

Scissors

White coffee filters or white paper towels

Pens and markers of different brands and colors

Water in container

Ruler

Procedure

1. Find several different black felt-tip and ink pens to compare. Try to find two of each kind.
2. Cut a strip of white coffee filter or white paper towel measuring about one inch wide and six inches long for each pen.
3. Place a large black dot about one inch from the bottom of each strip.
4. Dip each strip into water to a level just below the dot. Make sure the dot stays above the water.
5. Allow the water to soak up the strip and watch what happens to the ink.
6. Take the strip out of the water and place it on paper. Above the test strip, write down a number corresponding to that strip of paper. On a separate sheet of paper record which pens you used to make the dot on each strip.
7. Repeat the experiment with the rest of the strips, pens and markers.
8. When you have made all your test strips, see if you can match up the pair made by each kind of pen. Check your results against your record of the pens.
9. Have a friend write a note using one of the pens. Can you identify which pen was used to write the note?
10. Try using different colored markers and pens. How do your results compare? What colors make up green ink? Red ink? Blue ink?

Explanation

Many rainbow effects (chromatography results) are observed when complex chemicals like ink are separated into the chemicals from which they are made. The word chromatography comes from *chromato*, which means "color" and *graphy* which means "writing or arranging by a special means". Inks contain different chemicals that travel at different speeds along a piece of paper.

The Clue is in the Fingerprint

At crime scenes, police look for fingerprints left behind. Some prints are visible like dirty hand prints. Most are invisible, or latent, which means they cannot be easily seen. In this experiment you will see how the Forensic Scientist makes these prints visible in the laboratory in order to compare them to the record fingerprints of the victim and suspect.

Materials

Magnifying glass
Pencil
Transparent tape, ¾ inch wide works the best
White paper/dark paper
Feather, soft cotton ball or very fine paintbrush
Sandpaper
Baby powder, talcum powder or cornstarch

Procedure

1. Rub the side of the sharpened end of a pencil on a clean sheet of white paper back and forth until a darkened spot is made.
2. Rub one fingertip over the pencil spot.
3. Place a strip of clear tape sticky side down on the coated fingertip.
4. Carefully remove the tape from your finger and stick to another clean sheet of white paper. The print should clearly show the ridge patterns of the fingertip. This may take some practice.
5. Repeat until each fingerprint is in place. You may need to rub the pencil point again between each fingerprint.
6. Wash your hands then label each print in your fingerprint record with the name of the finger it came from - for example: LT = left thumb, LI = left index finger, LM = left middle finger, LR = left ring finger, LP = left pinky finger. Use R instead of L for the right hand labels.
7. Use the same method to create record fingerprints of your family and friends.
8. Compare all of the fingerprints using a magnifying glass. How are they similar? How are they different?
9. Have someone make mystery fingerprints by first rubbing their fingers on their oily forehead or rubbing cooking oil in to their fingertips. They then press their fingers on smooth objects like dinner plates, drinking glasses or table tops.
10. Choose a contrasting powder to dust the print - baby powder, talcum powder or cornstarch for dark surfaces, black pencil powder (made by rubbing a pencil tip with sandpaper) for light surfaces. Carefully place some powder onto the surface near the print. Next using a feather, cotton ball or paintbrush gently brush the powder across the print in both directions.
11. Now lift the print using transparent tape and place it onto a piece of paper that contrasts in color with the powder.
12. Compare the lifted prints to your record fingerprints. Can you identify who made the mystery fingerprints?

Explanation

Each of us is born with a distinct set of fingerprints. If you look closely at your fingertips you can see these tiny raised lines, called friction ridges. Fingerprints can confirm the identity of a person. Fingerprints can be used to compare a suspect in custody with evidence found at a crime scene or with those of a known criminal whose fingerprints are on record.

The Clue is in the Dirt

Dirt and dust can be important evidence in an investigation. When all of the testing and observations are completed, it is possible for a Forensic Scientist to supply valuable information to indicate a likely source of this trace evidence. In this experiment see how dirt and dust can be used by a Forensic Scientist to solve a crime.

Materials

Dirt/sand/dust from different locations
Zip-lock-type plastic bags
Felt tip pen
White paper
Magnifying glass

Procedure

1. Collect dirt from different locations, for example your yard, playground, forest preserve. Place the sample in a plastic bag and label each bag with its location.
2. Place a sample from each bag on separate sheets of white paper.
3. Examine each sample with a magnifying glass.
4. Observe different characteristics of each sample – for example: color of each sample, moisture content (wet, dry, damp), size of the grains, stones or pebbles, plant material, bugs or insect activity? Make a chart to record your results.
5. How are the samples different? How are they alike? Can you tell what plants may be close by?
6. Try the same experiment using sand collected from different beaches.
7. Try the same experiment using dust collected from different rooms and different households.

Explanation

Dirt samples are mixtures of mineral, animal and plant origin at various levels of change and decay. Many of the components are common. Physical characteristics, such as color and particle size can be important. The size of the soil particles determines whether soil is sand, silt or clay. Sand has the largest soil particles and clay has the smallest. The great variations of these combinations lead some to believe that soil has a unique composition in any given area and changes detectably every few feet.

Sand is actually a collection of particles. It is a product of rock erosion by a number of processes like wind, water and glacial grinding. The natural occurrence of sand throughout the world in a wide variety of forms can provide an endless source of samples for the microscopist.

Dust samples contain combinations of trace evidence from the rooms where they were gathered. Dust can consist of human and animal hairs, fibers, dirt, sand, paint particles, plants, insect parts and any other items that the surroundings might contribute.

All of this information can be used to study dirt and dust samples found at a crime scene. Dirt and dust are common as trace evidence because they are easily carried from the scene of a crime in the soles of shoes, on clothing or on the tires of a vehicle. These materials can reveal important clues to suggest a person's occupation or workplace or where they have recently traveled. Forensic Scientists compare the dirt and dust found at a crime scene with selected samples to determine where they may have come from.