# CRIME BUSTERS

**Description:** Participants will identify unknown powders, match fingerprints, and use paper chromatography to identify who wrote a note in a mock crime scene.

**Number of Participants:** 2
**Approximate Time**: 25 minutes

**The Competition:**

1. Students should bring a pencil, 1 side of notes that should include their unknown powders chart, and goggles if they own a pair.
2. Students will use physical and chemical properties to identify an unknown powder.
    a. Possible powders are: salt, granulated sugar, flour, cornstarch, baking soda, sand, yeast and chalk*See note
    b. Powders can be identified using physical and chemical properties:

**WHAT YOU USE TO IDENTIFY A SUBSTANCE:**

**A. General physical properties:** Observe each substance and note each of the following

1. What is the color?
2. Is the substance made of crystals or a powder?
3. Are the crystals all the same shape?
4. What does the powder smell like
5. NO TASTING or TOUCHING ALLOWED!!!

**B. Solubility in water**:Add water to a very small amount of the substance - a “dash” or 1/16 t.

1. Does the substance dissolve
2. Does the substance sink, or float if it does not dissolve?

**C. Reaction with iodine:** Add 2 drops of iodine to about 1/16 t of the substance

1. Does the iodine turn purple/black?
2. Does the iodine or remain brown when a

**D. Reaction with vinegar:** Add 2 drops of vinegar to about 1/16 t of the substance.

1. Does the substance fizz or bubble

The best way to learn to identify the substances is to first make observations on the physical properties and then test solubility, reaction with iodine and vinegar. Make a chart that organizes this information. You are allowed to bring in one page of notes ...this could be part of your notes.

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**DURING THE EVENT ...**

1. During the event students will be given water, iodine, and vinegar in dropper bottles, a magnifying glass, and containers to test solids in.
2. There will be 8 single substances and 2 mixtures of 2 substances to identify.
3. Students will be given fingerprints from the suspects. Students will need to match the fingerprint found at the crime scene to a suspect. They should also be able to tell what type of fingerprint the unknown is (a loop, an arch, or a whorl).
4. Students will be asked to make a chromatogram from a pen to identify who left the note at the scene of the crime. The chromatograms will be turned in with the test sheet.
5. After all the evidence is collected students will be asked to identify which suspect they think committed the crime and why they think that.

SAFETY NOTE: Students should wear safety goggles when testing the substances. DO NOT TASTE, TOUCH, OR FEEL the substances. Goggles will be available to borrow.

**Scoring:** The score will be based on the following categories:

• 50% - Identification of the powders: 1 point per correctly identified powder (mixtures will be worth two points). (12 points total)

• 12.5% Fingerprints 2 points for correctly matching the print to the suspect, 1 point for identifying the type

• 12.5% - Chromatography 2 points for correctly matching the chromatogram to the suspect's pen, 1 points for a labeled chromatogram.

• 25% - Identification of the criminal and answers to questions of why they believe this is the criminal (6 points total)

## Resources:

**Fingerprints:** Only arch, loop , and whorl need to be known

- Science Spot Forensics at http://sciencespot.net/Media/FrnsScience/fingerprintbasicscard.pdf is a helpful resource.
- Principles of Fingerprint Analysis http://www.forensicsciencesimplified.org/prints/principles.html

**Chromatography:** See the next pages

**Unknown chart:** On the last page

* NOTE: Chalk should be made out of Calcium Carbonate and crushed to a powder. You can tell if your chalk is made from Calcium Carbonate if it fizzes in vinegar. Many antacid tablets are also made out of calcium carbonate and can be used. Check the ingredients. Crayola sidewalk chalk does NOT contain calcium carbonate.