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: 20-30 minutes

The Competition:

1. Students should bring a pencil, 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:
        i. General physical properties (characteristics):
            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!!!
        ii. Solubility in water – does the substance dissolve, sink, or float when water is added to it?
        iii. Reaction with iodine: Does the iodine turn purple/black or remain brown when a few drops are put on the substance
        iv. Reaction with vinegar: Does the substance fizz or bubble when a few drops of vinegar are added to it?
    c. During the event students will be given water, iodine, and vinegar in dropper bottles, a magnifying glass, and containers to test solids in.
    d. 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.
    e. There will be 8 single substances and 2 mixtures of 2 substances to identify.
    f. Students should practice by testing substances and filling out the powders sheet.
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.

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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 question of why they believe this is the criminal (6 points total)

Resources:
Fingerprints:

- Science Spot Forensics at http://sciencespot.net/Media/FrnsScience/fingerprintbasicscard.pdf is a helpful resource.
- http://pbskids.org/zoom/activities/sci/fingerprints.html

Chromatography:

- A simple but adequate explanation: http://www.exploratorium.edu/afterschool/activities/docs/colorchromatography.pdf
- The following link has a detailed explanation of chromatography – how to do it and how it works. Do the "How to" but SKIP steps 4-10. Calculating Rf values is for a more advanced event. **http://www.msichicago.org/fileadmin/Education/learninglabs/lab_downloads/EvidenceLab_ink_act.pdf** A match can be made by looking at the pattern of separated colors.

Unknown Powders:

- *To test the reactions of powders with vinegar and iodine:*
  1. Put a small amount of the substance in a cup.
  2. Add a couple of drops of vinegar or iodine. Adding vinegar might cause bubbles and iodine could change the color of the iodine from light brown to purplish black.
- *To test if the substance dissolves in water:*
  1. Put a small amount of the substance in a cup.
  2. Add a spoonful of water – see if the substance dissolves, floats on the water, or sinks to the bottom.

  * 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.

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UNKOWN POWDERS CHART

Substance	**Appearance (describe how it looks)**	**Powder in the water?**	**Vinegar on the substance?**	**Iodine on the substance?**
Salt				
Sugar				
Flour				
Cornstarch				
Baking soda				
Sand				
Chalk				
Yeast				