SNC1D

Chemistry

White Solid Crime Lab

The Crime

There has been a murder in the classroom! There were white footprints left behind at the scene of the crime.

The Suspects

There are 5 suspects. Each of their shoes have been collected and dusted for analysis. Each shoe has a white substance on its sole.

The Mission

Your assignment is to identify the prime suspect by determining which shoe has the white substance that matches the substance at the crime scene.

The Crime Lab

Observe the samples from the 5 suspects that will be used for analysis. Use table 1 to help you determine the PHYSICAL and CHEMICAL properties of the 5 samples. Do any of the samples have the same properties? If they have some but not all properties, will that allow you to figure out which shoe left the footprint on the floor of the crime scene?

Profile of Suspects

- Suspect #1: Ms. Batras, who was angry with the victim for continually using his cell phone in class.
- Suspect #2: Mr. Bouttell, who disliked the victim because he said that the homefun was no fun.
- Suspect #3: Ms. Law, who owed the victim three McDonald's Happy Meals.
- Suspect #4: Ms. Lorenowicz, who was found outside the classroom drinking coffee.
- Suspect #5: Ms. Stopnicki, who came to the classroom to investigate the crime.

Materials

- Safety Goggles
- 12 or 15-well Spot plate
- Toothpicks
- Hand lens
- Crime scene sample
- Numbered samples of the 5 suspects
- Distilled water in dropper bottle
- 1M hydrochloric acid (HCl) in dropper bottle

Procedure

1. Wear your goggles at all times.
2. Obtain a spot plate. You can clean it with soapy water if necessary.
3. Using a scoopula, place a small amount of EACH suspect's sample and the crime scene sample into TWO clean wells on the spot plate. See Figure 1 for a sample setup with a 15-well spot plate.
   - For powdered substances and small crystals: add the tip of a scoopula filling the wells about 1/8 full
   - For large crystals: use ~5 crystals
4. Use the hand lens to study the samples. Make observations about the physical properties of the 5 samples. Record your observations in Table 2.
5. Add several (10-20) drops of water to each suspect and crime scene sample. Stir with a toothpick if necessary.
6. Make observations about each sample's solubility in. Record your observations in Table 2.
7. Add several (10-20) drops of HCl to the second set of wells containing the suspect and crime scene samples. Stir with a toothpick if necessary.
8. Make observations about each sample in the acid. Record your observations in Table 2.
9. Clean up: Rinse your plate into a waste beaker as directed by your teacher. Wash and dry the spot plate. Return all materials. Wipe down your workstation.
10. Compare your observations in table 2 with the information provided in table 1 to identify each sample.
11. Compare your suspect's samples with the crime scene to determine who the prime suspect is.

Figure 1. Sample setup with 15-well spot plate

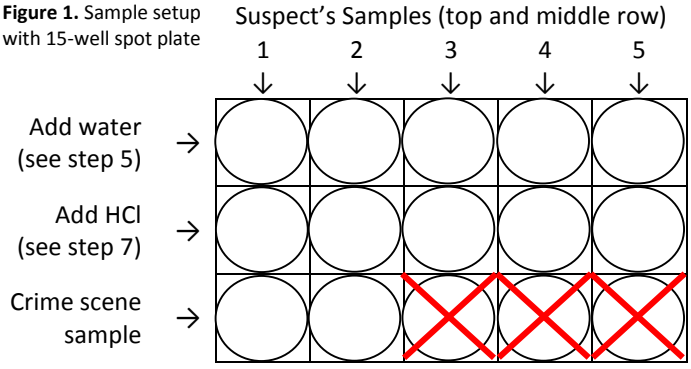

Table 1 – Physical and Chemical Properties of Known White Solid Substances

Property	Calcium Carbonate	Sodium Bicarbonate	Sodium Nitrate	Sodium Chloride	Magnesium Sulphate	Sodium Thiosulphate
State (@ room temperature)	Solid	Solid	Solid	Solid	Solid	Solid
Colour	White	White	White	White	White	White
Clarity	Opaque	Opaque	Clear	Clear	Clear	Clear
Crystal Shape	Powder	Powder	Granular	Small Cubes	Large crystals	Hexagons
Solubility	Insoluble	Soluble	Soluble	Soluble	Soluble	Soluble
Behaviour in Acid	Fizzes & some dissolves	Fizzes and Dissolves	Dissolves	Dissolves	Dissolves	Turns Cloudy Yellow

Table 2 – Physical & Chemical Properties of Suspect and Crime Scene Samples

Property	Crime Scene	Suspect #1	Suspect #2	Suspect #3	Suspect #4	Suspect #5
Clarity						
Crystal Shape						
Solubility						
Behaviour in Acid						
Identity of Solid						

Analysis & Discussion

a. Who is/are your prime suspect(s)? Provide evidence from the observations to support your choice. _____

_____

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b. Which physical properties did you examine in this crime lab? _____

c. Which chemical properties did you examine in this crime lab? _____

d. Which of your 5 senses is the only one you can use for the observations of physical properties? Why? _____

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e. What other physical property could have helped to identify the suspect? Why was this property not tested during this investigation? _____

_____

f. Which samples were the most difficult to identify? Explain why. _____

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g. Answer this question on a separate sheet of paper: In this crime lab, you identified suspect samples using the properties of matter to solve the crime. Describe 3 other real life situations where we need to identify unknown substances using the properties of matter.