

## Crime Scene Investigation Chemistry 101 - Can you identify the suspect and bring them to justice?

### Background -

**Imagine you have just walked into the scene of a crime. As a newly appointed CSI Detective with NYPD's finest, you stride confidently past the reporters with their obnoxiously probing microphones and cameras flashing. You flash your badge to the uniformed officers on guard, while you lift the yellow "DO NOT CROSS - CRIME SCENE" tape up and over you and your partner's heads. What you see next is chilling. You've arrived to find the scene of a most heinous crime. The victim is face down draped with a white linen. You are tasked with collecting evidence which might help convict or capture the perpetrator. You lift the linen to peer at the victim and immediately notice a white powdery substance on the victim's clothing. As you collect a sample, your partner exclaims, "Hey, we have several suspects down at the *precinct* whom were discovered to have similar white powdery substances on their person too!" Perhaps this evidence could link the murder to the crime. If only we could analyze it somehow to determine if it is a match...**

### Vocabulary Exercise (Matching) Write letters on the lines.

- |                                    |   |
|------------------------------------|---|
| Physical properties: _____         | A. This occurs when a substance combines with another to form a new substance. Observable examples include bubbling or fizzing (gas produced), color change, odor produced, light or heat emitted, or the formation of a solid (precipitate).                         |
| Physical Change: _____             |   |
| Chemical properties: _____         | B. These are changes affecting the form of a substance, but not the chemical composition (formula). Examples include changes between gas, liquid or solid, changes in volume, or shape.   |
| Chemical Change (reaction): _____  | C. This is described by a substance's reactivity. These are properties that are determined by the reaction of substances with other substances.   |
| Law of Conservation of Mass: _____ | D. These are properties of matter that can be observed with any of the senses. Examples include; color, odor, density, hardness, solubility, phase of matter, melting point or boiling point. They provide clues to a substance's chemical composition.               |
|                                    | E. Matter can neither be created nor destroyed. Any physical or chemical change in matter never results in a net loss or gain of matter. When two substances react chemically to create a new substance, the total mass of reactants and products remains in balance. |

Task - Properly identify each of three substances on various suspects so that they can be compared to the substance found on the victim. If you succeed, it could be used as evidence in the case being built by the DA's Office.

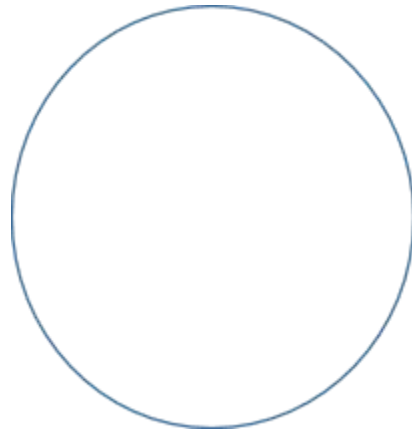
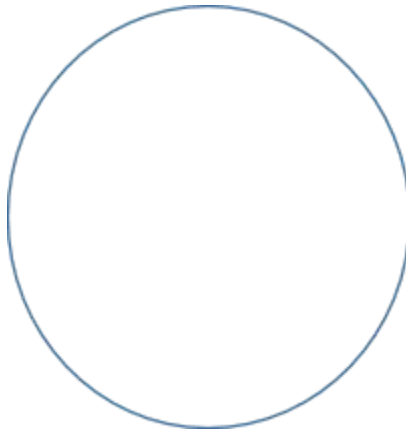
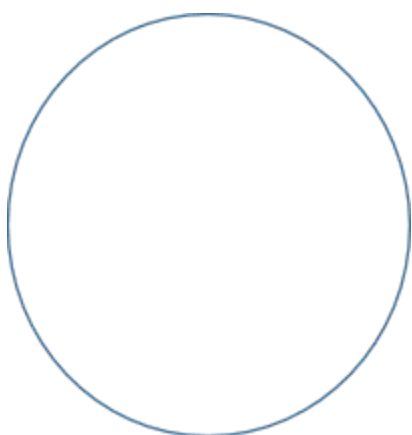
Procedure: You have a limited amount of physical evidence so use it sparingly. **Only place a  $\frac{1}{2}$  teaspoon into each petri dish.**

Describe the **physical properties** of each of the following substances in the petri dishes below. Simply list descriptors as previously done in class.

**Washing soda**

**Cornstarch**

**Baking Soda**



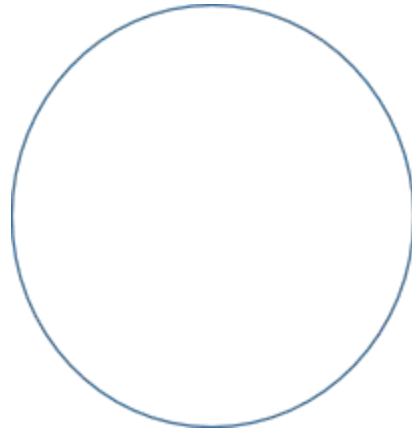
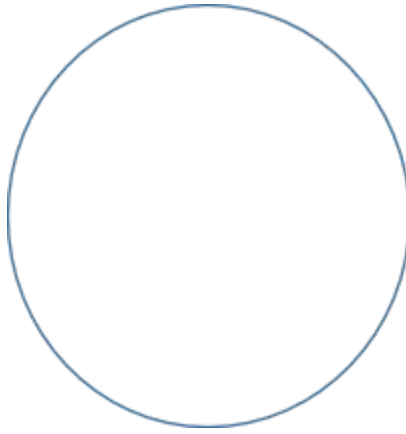
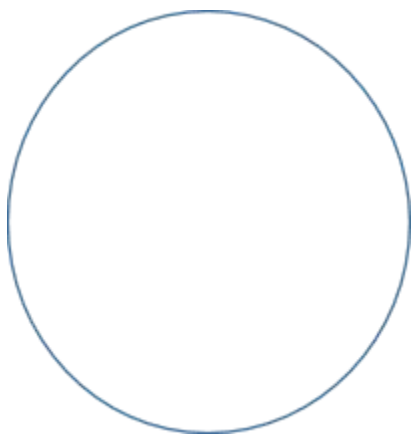
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**Vinegar test** - Place a few drops of acid reactant on each of the substances. Then record and describe results in each of the corresponding Petri dishes.

**Washing soda**

**Cornstarch**

**Baking Soda**



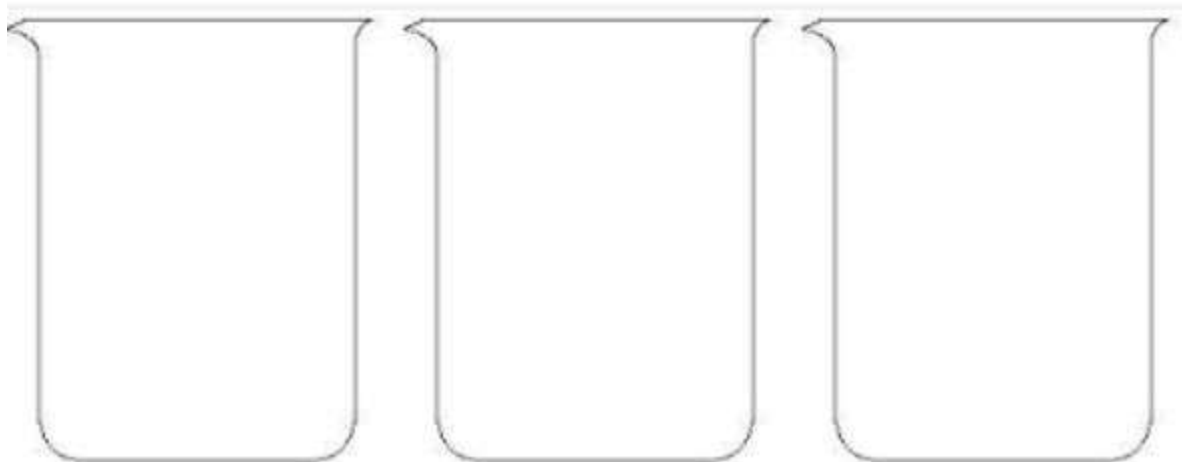
**Solubility test** - Place  $\frac{1}{2}$  **teaspoon** of the substances into each of the three beakers with a 100ml of water. Record your results in the beakers below. Report soluble or insoluble in the beaker on the page here.



**Washing soda**

**Cornstarch**

**Baking Soda**

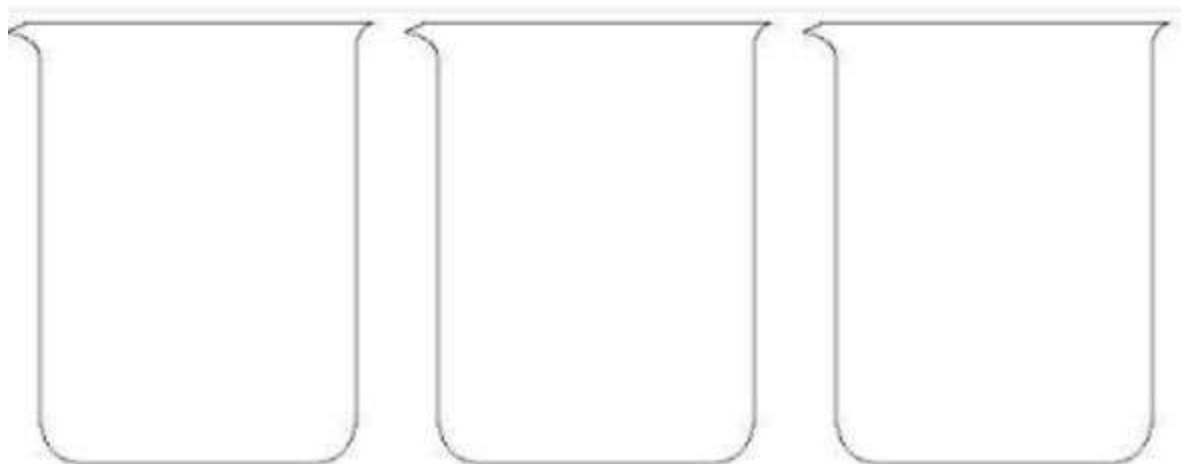


**Iodine test** - Now in the same beakers, add a single drop of iodine with a pipette, **being careful to stir after each drop, up to, but not to exceed 10 drops**. Then stop and record results in the beakers below. Describe what you see. (Write what you see in the beaker on page)

**Washing soda**

**Cornstarch**

**Baking Soda**



**Results:**      **check – yes**

**x – no**

Mark a check if positive for reaction	Washing soda	Cornstarch	Baking soda
Reaction with acid? (1. vinegar test)			
Dissolves in water? (2. solubility test)			
Reacts with iodine? Starch present yes or no Color change yes or no (3. iodine test)			

## Crime Lab Results: Story line continued (read carefully)

Your partner has gotten back to you with their lab results from the victim. The crime lab discovered that the substance **reacts with acids (1. vinegar test), dissolves in water (2. solubility test)** and shows little to **no color change & no starch present when tested with iodine (3. iodine test).**

### Carefully review each suspect's whereabouts.

**Suspect A** is known to have been at a laundromat washing clothes just prior to the crime. His shirt was found to have a substance on it, which dissolves in water, has no color when tested with iodine and reacts mildly with acids like vinegar.

**Suspect B** is a corn farmer. He was returning from delivering corn to a corn processing plant at or around the time of the murder. The substance discovered on his boots does not dissolve in water. Rather, it formed a suspension and turned purple during the iodine test and does react with acids like vinegar.

**Suspect C** works as a baker not far from where the crime took place. The substance found in his hair dissolves in water, turns an amber color when tested with iodine and reacts with acids like vinegar.

1. \_\_\_\_ Compare the (**story line**) partner's results to the data recorded results on the previous page. Which substance most clearly fits the results you found?
  - A. Washing soda
  - B. Baking soda
  - C. Cornstarch
  - D. cannot be determined
2. \_\_\_\_ What substance was found on Suspect A?
  - A. Washing soda
  - B. Baking soda
  - C. Cornstarch
  - D. cannot be determined
3. \_\_\_\_ What substance was found on Suspect B?
  - A. Washing soda
  - B. Baking soda
  - C. Cornstarch
  - D. results inconclusive
4. \_\_\_\_ What substance was found on Suspect C?
  - A. Washing soda
  - B. Baking soda
  - C. Cornstarch
  - D. cannot be determined
5. \_\_\_\_ Carefully compare your (**Student Results**) with the (**Crime Lab Results**). Which suspect should the DA's Office pursue in their case? Who is the likely killer?!?!?
  - A. Suspect A
  - B. Suspect B
  - C. Suspect C
  - D. results inconclusive

## Crime Lab Results:

## Story line continued (read carefully)

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**Suspect C** works as a baker not far from where the crime took place. The substance found in his hair dissolves in water, turns an amber color when tested with iodine and reacts with acids like vinegar.

1. \_\_\_\_ Compare the (story line) partners results to the data recorded results on previous page. Which substance most clearly fits the results you found?

- |                |                         |
|----------------|-------------------------|
| A. Baking soda | C. Washing soda         |
| B. Cornstarch  | D. cannot be determined |

2. \_\_\_\_ What substance was found on Suspect A?

- |                |                         |
|----------------|-------------------------|
| A. Baking soda | C. Washing soda         |
| B. Cornstarch  | D. cannot be determined |

3. \_\_\_\_ What substance was found on Suspect B?

- |                |                         |
|----------------|-------------------------|
| A. Baking soda | C. Washing soda         |
| B. Cornstarch  | D. results inconclusive |

4. \_\_\_\_ What substance was found on Suspect C?

- |                |                         |
|----------------|-------------------------|
| A. Baking soda | C. Washing soda         |
| B. Cornstarch  | D. cannot be determined |

5. \_\_\_\_ Carefully compare your (**Student Results**) with the (**Crime Lab Results**). Which suspect should the DA's Office pursue in their case? Who is the likely killer?!?!?!?

- |              |                         |
|--------------|-------------------------|
| A. Suspect A | C. Suspect C            |
| B. Suspect B | D. results inconclusive |

