White Powders – Forensic Toxicology

**Background**

The forensic scientist must have not only the means to analyze chemicals found at the scene and on suspects, but enough knowledge of the uses of the chemicals so that the meaning of finding a chemical somewhere is known. For instance is a crime is committed in a kitchen, then finding sodium bicarbonate on t eh floor says more about the cleanliness of the cooks than about the crime. On the other hand, if the crime is committed in the kitchen and Lithium Chloride was found at the scene, the forensic scientist would take note of that as a clue. If a suspect is a busboy, one should not be surprised to find cornstarch on him or her. On the other hand, one would have to wonder where a busboy picked up sodium acetate. Therefore as you investigate chemicals, you will not only want to become familiar with the best tests for each of the 15 substances, you will want to become familiar with their common names and uses so that you can evaluate which chemicals found at the scene and on the suspects are normal and hence not likely to be clues, and which are out of place and therefore likely to be clues. You also need to be able to explain the chemical basis for your identification. That is you need to be able to give the chemical equations for any chemical reactions that occur.

**Scenario**

Jackson High School has a drug problem. Over the past year, illegal drugs have been seized from student lockers on five occasions. All of these illegal drugs are white powders that look remarkably like table salt. During a recent locker search, investigators collected several ziplock bags filled with white powder. Before charges can be pressed on the individual in possession, the identity of the powders must be established.

You are a member of a forensic science lab team that has been sent to Jackson High School. A temporary lab facility has been prepared at the high school. The unknown white powders are delivered to you in the lab for identification. Due to limitations in equipment you have been asked to perform simple tests to determine the identity. To enable you to do this you have samples of many possible known white powders to compare your unknown powder to. You will identify each powder found in the ziplock bags, and determine if the white powder is a reasonable substance for students to have at school, or if it is dangerous. Your findings will determine the charges (if any) brought against the students in possession of drugs.

**Knowledge Probe**:

1. Research and determine the uses of each of the known powders. Write your findings in the Observation section.
2. Follow the Investigation Plan below to determine the how each powder reacts in various chemical tests. Accurate and careful testing will be crucial for you to identify the unknown powders. Record all of your results in the Observation section.

**Investigation Plan:**

1. Put a small amount of each known powder in a clean well on the spot plate. Observe the distinguishing characteristics, i.e., texture, color, size of the particles. **Record your results.**
2. Add 10 drops of distilled water to each well. Stir with a toothpick. **Record your results.**
3. Dip the end of a piece of pH paper into each well and determine the pH using the color chart.  **Record your results.**
4. \*\*Clean out your wells.
5. Put a small amount of each chemical in a well of the spot plate. Add 2 drops of HCl to each well. **Record your results**.
6. \*\*Clean out your wells.
7. Put a small amount of each chemical in a well of the spot plate. Add 2 drops of NaOH to each well. **Record your results**.
8. \*\*Clean out your wells.
9. Put a small amount of each chemical in a well of the spot plate. Add 2 drops of iodine to each well. **Record your results**.
10. \*\*Clean out your wells.
11. Observe the test tubes that have been tested with Benedict’s solution on the front table. **Record your results.**

**Observations:**

Record the results of each test on the data table provided.

**Question**: What are the identities of the white powders confiscated from the lockers?

**Investigation Plan:**

Follow the Investigation Plan from the previous page for the 3 UNKNOWN powders.

**Observations:**

Record the observations for the 3 unknowns in the same data table as the known white powders.

**Explanation:**

*Claim*: What are the identities of the 3 unknown white powders?

*Evidence*: What data supports your claim?

*Reasoning*: Why can you differentiate each white powder by chemical analysis? What makes each powder react differently to each chemical?

**Application:**

Based on your results, is it reasonable for any of the unknown white powders to be found at the school, or are the findings suspicious? Explain your answer.