White Substance Analysis and Identification Lab

Target Audience 9-12

Background and Notes:
Chemistry is the study of matter and the changes that occur to matter. These changes can be chemical or physical. Physical changes can be tearing, grinding, melting, boiling, dissolving or any change that does not change the chemical identity of the substance. A chemical change is a process that alters the identity of the substance, creating one or more new substances. Release of a gas, production of a precipitate, a change in color or energy absorption or release can be examples of chemical change.

Fundamental understanding: What are physical and chemical characteristics (properties) of substances?

Essential Question: How does a physical or a chemical change affect the identity of a substance?

Purpose: As an inquiry based activity, this laboratory exercise involves experimental design and data analysis to compare and contrast chemical and physical changes of different white substances.

Safety Precautions:
Wear safety goggles and lab aprons.
Use caution when handling HCl (hydrochloric acid) and iodine. They can be harmful to your skin and clothing.
Be sure that there are no open flames when using methanol.

Materials:

Equipment and supplies:
1. Micro well plates
2. Droppers
3. Spatulas
4. Toothpicks
5. pH paper

Reagents and chemicals:
1. Distilled water
2. Methanol
3. Hydrochloric acid 3.0 M
4. Iodine (dissolved in isopropyl alcohol)
5. Iron (III) Nitrate 0.1 M
6. Benedict’s Solution
7. Universal Indicator
8. White substances
   A. Sugar
   B. Flour
   C. Alum (aluminum sulfate)
D. Sodium bicarbonate
E. Calcium carbonate (chalk)
F. Sodium chloride
G. Cornstarch
H. Benzoic acid
I. Aspirin
J. Tylenol
Procedure (s):

Design a Data Table (s) to record the following investigations:

I. Observations: Determine the physical characteristics of each substance on a (e.g. texture, odor, and color).

II. Melting Point Determination: Place each substance on a small piece of foil (approximately 5 cm square). Determine the amount of time it takes to melt (after 1 minute consider it not melting).

III. Test a small amount (no more than 0.5 cm size scoop) of each white substance in a micro well plate.

A. Solubility in water
B. Solubility Methanol
C. Hydrochloric acid 3.0 M
D. Iodine (dissolved in isopropyl alcohol)
E. Iron (III) Nitrate 0.1 M
F. Benedict’s Solution
G. Universal Indicator
H. pH paper

IV. Possible white substances
A. Sugar
B. Flour
C. Alum aluminum sulfate
D. Sodium bicarbonate
E. Calcium carbonate (chalk)
F. Sodium chloride
G. Cornstarch
H. Benzoic acid
I. Aspirin
J. Tylenol
K. Glucose
L. Unknown 1
M. Unknown 2

Conclusion:
1. Restate purpose.
2. What is a physical property?
3. What is a chemical property?
4. What is a chemical reaction?
5. What were the identities of the 2 unknowns?
6. What chemical properties match the unknown?
7. What physical properties match the unknown?
Evidence Sheet for White Powders

<table>
<thead>
<tr>
<th></th>
<th>Fe(NO₃)₃</th>
<th>Iodine</th>
<th>3.0 M HCl</th>
<th>Universal indicator Color and pH</th>
<th>Soluble in water</th>
<th>Soluble in methanol</th>
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</thead>
<tbody>
<tr>
<td>Cornstarch</td>
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<td>Benzoic acid</td>
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<tr>
<td>Crime Scene</td>
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<td>Suspect # 1</td>
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Which tests match the crime scene white powder? ______________
Check the matching tests below

Which suspect matches the crime scene evidence? _____
Would you send the unknown white substance out to the SBI for further testing?