**Identification of Unknown Substances I Lab**

**Background:**
The basis for identification of unknown substances always hinges upon using known standards for comparison. Without knowing exactly how a known substance reacts to all tests, it would be impossible to make a positive identification of an unknown substance. As new drugs and substances are created, standards for testing for these substances must also be developed. The FBI Crime Laboratory, for example, works very closely with pharmaceutical companies to produce tests for all new drugs as they are developed. The “standards,” which are kept on file, are critical for proper identification of “unknowns.”

In the first part of this laboratory, a set of standards will be established for the simulated drugs Scogaine, Davlate, Bradlin, Irenin, and Markopan. Once the standards have been established, tests will be run to identify an unknown. Though this simulation is clearly an oversimplification and cannot actually be used to test unknowns, the principles are the same as those utilized by a crime laboratory. In the criminal laboratory, the simple chemical reactions would be replaced by complex chemical analyses utilizing very expensive and sophisticated equipment.
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Lab Station #: ______________ ; Partner Name: ______________

Location:

Date/Time:

Purpose: The purpose of this laboratory is to demonstrate the development of a standard of comparison to identify an unknown substance.

Problem: Using the determined standard of comparison, what is the unknown substance?

Hypothesis: N/A

Materials: 1 - Hand lens, 5 - Graduated test tubes w/ screw tops, 1 tsp – Scogaine, 1 tsp – Davlate, 1 tsp – Bradlin, 1 tsp – Irenin, 1 tsp – Markopan, 1 tsp – Unknown chemical, 30 drops – 0.1M Hydrochloric acid, 1 – 1 ½ x 1 ½ Al foil, 60 ml – Distilled H₂O, 18 ml – 1.0M Sodium carbonate solution, 30 drops – Iodine solution, 30 drops – Silver nitrate solution, 5 – small cups, 5 – teaspoons, Paper towel, Tongs or forceps

Key Terms:

Procedure:

Part A: Laboratory Safety Precautions:
Step 1 Hydrochloric acid, silver nitrate, and iodine solutions are toxic by ingestion or inhalation and severely corrosive to the skin and eyes.
Step 2 Sodium carbonate is also a skin irritant.
Step 3 Iodine and silver nitrate solutions will stain the skin and clothing.
Step 4 Wear chemical splash goggles.
Step 5 Wash hands thoroughly upon completion of laboratory work.
Step 6 Discard materials as directed by instructor.

Part B: Development of a Standard of Comparison – Melting Point
Step 1 Using a clean teaspoon; obtain one level teaspoonful of each drug in separate labeled small cups.
Step 2 Make sure to use a clean spoon when obtaining each sample so as to avoid cross contamination.
Step 3 Make a small, flat cup/tray from a piece of aluminum foil.
Step 4 Label each cup/tray and then pour the contents of one of the test tubes into the aluminum cup/tray.
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Step 5  Repeat this procedure using a separate aluminum foil cup/tray for each chemical.

Step 6  Use tongs or forceps to place the cups/trays on a hot plate at the setting of 4.

Step 7  Observe the substances for 3 – 4 minutes once the hot plate has warmed up. Record observations on the “Standardized Tests for Substance Identification Data Table”

Step 8  Remove watch glass from the hot plate and continue making observations (e.g. which melted...). When no reaction is observable, write “NR” for no reaction.

Part C: Development of a Standard of Comparison – Reactivity with HCl

Step 1  Refill each test tube to the 0.5 mL mark again with a new supply of drug.

Step 2  Use a Beral-type pipette to add 5 drops of 0.1 M hydrochloric acid (HCl) to each test tube.

Step 3  As the acid is added, note any reaction(s) that occur and record observations on the “Standardized Tests for Substance Identification Data Table” for each drug.

Step 4  Thoroughly wash and dry the test tubes.

Part D: Development of a Standard of Comparison – Solubility in H$_2$O

Step 1  Refill each test tube to the 0.5 mL mark again with a new supply of chemical.

Step 2  Use a clean Beral-type pipette to add 5 mL of distilled water to each test tube.

Step 3  Place a screw cap on each tube and shake each tube for approximately one minute.

Step 4  Note which substances dissolve in water and which do not by recording observations on the “Standardized Tests for Substance Identification Data Table” for each chemical.

Step 5  Save the test tubes and solution for the next part of the experiment.

Part E: Development of a Standard of Comparison – Reactivity with Na$_2$CO$_3$

Step 1  Use a clean Beral-type pipette to add 3 mL of 1.0M sodium carbonate solution to each test tube from Part D.

Step 2  Observe each test tube carefully as the test solution is added and note any reactions on the “Standardized Tests for Substance Identification Data Table” for each chemical.

Step 3  Thoroughly wash and dry the test tubes.
Part F: Development of a Standard of Comparison – Reactivity with Iodine

Step 1 Relabel the test tubes, if necessary and refill each test tube to the 0.5 mL mark again with a new supply of drug.

Step 2 Using a clean Beral-type pipette; add 5 drops of iodine solution to each test tube.

Step 3 Note: Iodine solution is an orange/brown color and will stain skin and clothing.

Step 4 Record any color changes that occur as the iodine is added, as this would identify a reaction has take place, on the “Standardized Tests for Substance Identification Data Table” for each drug.

Step 5 Thoroughly wash and dry the test tubes.

Part G: Development of a Standard of Comparison – Reactivity with AgNO₃

Step 1 Relabel the test tubes, if necessary and refill each test tube to the 0.5 mL mark again with a new supply of drug.

Step 2 Use a clean Beral-type pipette to add 5 mL of distilled water to each test tube.

Step 3 Place a screw cap on each tube and invert the tube several times. Allow each tube to sit for 30 seconds.

Step 4 Use a clean Beral-type pipette to add 5 drops of silver nitrate solution to each test tube.

Step 5 Note: Silver nitrate will stain skin and clothing.

Step 6 As the silver nitrate is added, note the formation of any precipitate that may form on the “Standardized Tests for Substance Identification Data Table” for each drug.

Step 7 Thoroughly wash and dry the test tubes.

Part H: Clean Equipment and Lab Station

Step 1 Discard any solid material in the trash

Step 2 Wash and dry all of the vials and keep in lab drawer

Step 3 Wash down lab bench

Part I: Answer Post-Lab Application Questions
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Data/Observation:

## Part A.

<table>
<thead>
<tr>
<th>Property Examined</th>
<th>Scogaine</th>
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<th>Bradlin</th>
<th>Irenin</th>
<th>Markopan</th>
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<tbody>
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<td>General Appearance</td>
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## Part B. Analysis of Results & Identification of Standard/Reference Methods
Part C. Post Lab Questions

1. Did all of the powders have similar properties in common? If so, which ones?

2. Explain why obtaining a positive test was a vital part of this experiment.

3. Explain why forensic scientists must be very accurate when examining substances in the laboratory.

4. Create a flow chart showing how one could isolate and identify each substance being tested. (EXAMPLE – NOT NECESSARILY CORRECT)

**White Powders:**
Maropan, Irenin, Bradlin, Scogaine, Davelate

Silver Nitrate Test
- Cloudy
  - NR
  - Silver Nitrate Test
  - Iodine Test
    - Turned Black
      - NR
      - Sodium Carbonate
        - NR
        - Gave off gas
      - NR
    - NR
  - Heat Test
  - Iodine Test
    - NR
    - Turned Cloudy
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Conclusion:

Part 1. Conclusion Statement & Specific Evidence

Part 2. Evaluate Hypothesis with the Conclusion Statement & Specific Evidence is required

– NOT INCLUDED IN THIS LAB!!!

Part 3 Recognize Possible Expt. Error & Explain how Error(s) May have impacted Results

Part 4 Sample Problem/Question for a FUTURE Expt./Investigation

How does _______________ effect _______________?

Resources:

Godfrey-Lee Public Schools
Lee High School

Forensics
Instructor - Rierson
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**EXPECTED RESULTS:**

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