Objectives:
- You will perform a series of tests to determine the physical and chemical properties of several unknown powders
- You will utilize your test results to identify an unknown substance

Background Information:
Nada 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 bags filled with a white powder. Before charges can be pressed on the individuals 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 Nada High School. A temporary lab facility has been prepared at the high school. The unknown white powders are delivered to you in the lab so you can determine their identity.

Due to limitations in equipment at the school, you have been asked to use a simple series of tests to determine the identity of the powders. To enable you to do this, six known white powders have been provided. You will run tests on each of the six known powders and record your results. Later you will compare results with those from tests of unknown powders collected during locker seizures. Your findings will determine the charges (if any) brought against the students in possession of drugs.

A brief overview of the white powders previously discovered at Nada High School includes the following:

**Brograine:** Mild hallucinogen. First offense is usually probation

**Speclate:** Mild stimulant; often results in psychological dependence. First offense results in 6 months to 1 year in prison

**Rotaran:** Strong stimulant; causes physical dependence. First offense results in 1 year to 3 years in prison

**Barrop:** Moderate depressant; causes physical dependence. First offense results in 1 year to 3 years in prison

**Lixonin:** Strong narcotic that causes physical and psychological dependence. First offense results in 5 year to 10 years in prison

**Table salt:** Found in one student’s locker as a joke. Prank resulted in expulsion from school
Procedure, Part A:

*Developing a positive test for the six known powders*

1. Record your results for test conducted on the six known powders in Data Table 1. If nothing happens in a specific test on a known substance, record **ND (No Data)** in the proper location on the data table. At the end of Part A, you should have something written in each box on the chart.

2. Place a small amount of sample A on the black paper and observe its appearance (color and texture) with a hand lens. Record your results. Repeat this for samples B through F.

3. Place ½ teaspoon of sample A in the reaction plate. Add 10 drops of acetic acid to the reaction plate. Record your observations. Repeat this test with the remaining five powders.

4. Place ½ teaspoon of sample A in a test tube. Add 10 mL of distilled water. Stopper the test tube and shake for a few seconds. Record your observations. Repeat this for the remaining samples. Do not dispose of these samples. You will use them in the next step.

5. Using the six test tubes from step 4, add 5 mL of sodium carbonate solution to each test tube. Observe and record what occurs in each test tube.

6. Place ½ teaspoon of each sample in the reaction plate. Add 10 drops of Lugol’s solution to each sample. Record your results. Wash out the test tube.

**Data Table 1:**

<table>
<thead>
<tr>
<th>Name of known substance</th>
<th>Color</th>
<th>Texture</th>
<th>Addition of Acetic Acid</th>
<th>Addition of Water</th>
<th>Addition of Sodium Carbonate</th>
<th>Addition of Lugol’s Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>A – Brogaine</td>
<td></td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>B – Speclate</td>
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<td></td>
<td></td>
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<tr>
<td>C – Rotaran</td>
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<tr>
<td>D – Barrop</td>
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<tr>
<td>E – Lixonin</td>
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<tr>
<td>F – Table Salt</td>
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</tbody>
</table>
Procedure, Part B:  
*Identification of unknown substance*

You now have the test results for each white powder on Data Table 1. These results will help you to determine the identity of an unknown substance by comparison. Several unknown substances were discovered in student lockers today. Different forensic teams have been asked to identify some of the unknowns. In Data Table 2, write down the number of the beaker whose contents you will analyze. This number indicates the locker from which the powder was taken. Compare your results with those in Data Table 1 to determine what substance the students had in his or her locker. Be careful; your results will determine whether or not charges should be pressed against the student.

1. Write down the locker number on the beaker in Data Table 2
2. Perform all the tests you performed in Part A on this unknown substance. Record your findings on Data Table 2.
3. Compare the results in Data Table 2 with the results in Data Table 1.

**Data Table 2:**

<table>
<thead>
<tr>
<th>Unknown Sample</th>
<th>Color</th>
<th>Texture</th>
<th>Addition of Acetic Acid</th>
<th>Addition of Water</th>
<th>Addition of Sodium Carbonate</th>
<th>Addition of Lugol’s Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td># ______</td>
<td></td>
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</tr>
</tbody>
</table>

*Your hypothesis on the substance:*
Conclusions:

1. Was the powder you examined in Part B one of the illegal drugs or was it table salt? EXPLAIN how you arrived at this conclusion.

2. Explain why forensic scientist must be very accurate when examining substances in the laboratory.

3. Explain why Part A was a vital part of this experiment.

4. Of the properties you examined in Part A and Part B, which ones are PHYSICAL PROPERTIES and which ones are CHEMICAL PROPERTIES?

   Color ____________________________________________

   Texture __________________________________________

   Reaction with Acetic Acid ____________________________

   Reaction with Water _________________________________

   Reaction with Sodium Carbonate _______________________

   Reaction with Lugol’s Solution _________________________