

# Lab 1: Unknown White Powder Lab

## Goals:

The goal of this lab is to identify all three of the unknown white powders you are given as a mixture. Each of these powders can be superficially described as a “dry white powder”, but they have different chemical and physical properties.

You will need to develop your own procedure for this lab by reading the material given in this hand out. The possibilities of the unknown solids are given in the table.

FORMULA	NAME	USE
NaCl	sodium chloride	Table salt
NaHCO <sub>3</sub>	sodium bicarbonate	Baking soda
C <sub>12</sub> H <sub>22</sub> O <sub>11</sub>	sucrose	Table sugar
(C <sub>6</sub> H <sub>12</sub> O <sub>6</sub> ) <sub>n</sub>	cornstarch	Thickener
MgSO <sub>4</sub> ·7H <sub>2</sub> O	magnesium sulfate (hydrated)	Epsom Salts
Na <sub>2</sub> B <sub>4</sub> O <sub>7</sub>	sodium borate	Borax
NaOH	sodium hydroxide	Lye, drain cleaner

## Tests You Can Perform:

### I. Solubility

#### A. Water Solubility

Seven of the eight possible powders are soluble in water (dissolve in water). The insoluble one is cornstarch.

To test water solubility, add a pea-sized sample to a test tube, and about 5 mL of water, stopper and shake the test tube. Even if the solid does not completely dissolve, decide if it is soluble or insoluble.

#### B. Solubility in Vinegar (dilute acetic acid)

Bicarbonates and carbonates react with acetic acid to form carbon dioxide bubbles.

### II. pH Test

We will use universal indicator to test the pH of the solutions. Add a few drops of indicator to the test tubes in which the samples proved to be water-soluble. Record any color.

Sodium bicarbonate should appear blue-green, sodium hydroxide should be aqua (but may appear violet at first), magnesium sulfate should be blue-green or yellow, and sodium borate should be blue-violet. The rest should be yellow.

### III. Iodine (I<sub>2</sub>) Test

Starch reacts with I<sub>2</sub> to form a blue complex. Put a pea-sized amount of powder that you suspect to be cornstarch in a test tube. Add two drops of tincture of iodine (a solution of iodine dissolved in alcohol) to the test tube, add a few drops of water, and mix the contents. Record your observations.

### IV. Reaction with Sodium Hydroxide (NaOH)

Recall the precipitation reactions from the qualitative analysis lab. Magnesium sulfate reacts with sodium hydroxide (NaOH) to form insoluble magnesium hydroxide (a solid). Add a pea-sized amount of powder you suspect to be magnesium sulfate to a test tube, add about 5 mL of water, stopper and shake the test tube (to dissolve the magnesium sulfate). Add about 20 drops of 0.2 M NaOH to the solution, and record your observations.

### V. Conductivity Test

Compounds that form ions in aqueous (water) solution will conduct electricity. Sucrose is water soluble, but do not form ions in water. Dissolve a pea-sized amount of powder that you wish to test in about 20 mL of *deionized* water in a 50 mL beaker. Use the conductivity apparatus provided to test the solutions. Record your observations.

**Report:**

You have been given three different white powders as a mixture from the seven listed. Write a report explaining what tests you performed, your observations, and the identity of each of the powders in the mixture. These mixtures are numbered when given to you. As part of your report, construct a table as shown below. Be sure to include the unknown number given to you in the lab for each of the three white solids.

Test	Unknown #
Water Solubility	
Vinegar	
pH Test	
Iodine Test	
Conductivity Test	