Chemical Names and Formula Lab; SC3e, SC1d

Chemical substances are described not only by unique names but also by chemical formulas. A chemical name will describe a unique chemical formula and a chemical formula will have a unique chemical name. We use this language to communicate about chemistry. All ions, of which some substances are made, have unique chemical names, as well. Most transition metals and the representative elements tin and lead form two or more cations. To distinguish between different cations of the same element, a Roman numeral is used in the name to indicate the numerical value of the charge. Cations and anions combine in a ratio that makes all ionic compounds electrically neutral. Formulas for ionic compounds are written so that the positive charge contributed by the cations exactly balances the negative charge contributed by the anions. For example, the formula for the ionic compound formed from Na+ cations and O2- anions is Na2O. The formula for the cation is always written first. The subscript, 2, refers to two Na+ ions that exactly balance the 2- charge on one O2- ion. To name an ionic compound, state the name of the cation and the name of the anion. Do not forget to use a Roman numeral to specify the numerical value of the positive charge of those atoms that form more than one cation. The purpose of this lab is to observe and describe the colors and textures of various ionic compounds and to familiarize yourself with chemical and formula nomenclature. In this lab either the names or the formulas of these compounds will be provided. If the name is given, you will write its formula, and if the formula is given, you will write its name. You will apply your knowledge of polyatomic ions throughout this lab.

Procedure: Please note that the general methodology for Part 2 of this lab is similar to the Chemical Reactions Inquiry Lab performed earlier in the year. Please read before you proceed and be very careful to avoid cross contamination of chemicals. You may choose to complete parts one and two in any order to avoid waiting for other groups. Transcribe data tables #1 and #2 unless copies are provided.

Part I: Observe the solid compounds listed in data table #1. These compounds will be located throughout the classroom and thus may be observed in any order to avoid waiting. Write the color and any other descriptive qualitative data. If the name is given, write the formula. If the formula is given, write the name. Record your results in table #1 and be thorough in your descriptions. You will need your polyatomic knowledge from summer assignment. Note that many of these compounds are subject to availability, so there may be some changes to the data table.

Part II: Place one drop of each of the indicated compounds on a small-scale reaction surface (petri dish) on top of the "X" on the reaction grid located above data table #2. You will perform each reaction in a small petri dish that must be rinsed with copious amounts of water after each reaction. In data table #2 you will need to record the color of the new compound along with the chemical formula and name of the new compound.

Post Lab Questions:

1. Write the formulas (with charges) and names of all the cations represented in this experiment.

2. Write the formulas (with charges) and names of all the anions represented in this experiment.

3. Write some simple rules for naming an ionic compound. Refer to the "Naming" podcast notes for help.

4. When is it appropriate to use Roman numerals in naming compounds?

5. What does a numerical subscript following an element in a chemical formula mean?

6. What does a numerical subscript following a set of parentheses in a chemical formula mean?

7. Write some simple rules for writing the formula for an ionic compound.

Data Table #1: Chemical Names and Formula Lab; SC3e, SC1d

Potassium iodide	Sodium chloride	Magnesium sulfate
Copper (II) sulfate	$NaHCO_3$	$AgNO_3$
$NaNO_2$	KF	Sodium carbonate
Lead (II) nitrate	Ammonium chloride	Sodium phosphate
Calcium hydroxide	Tin (IV) chloride	Potassium bromide
$CaCl_2$	$FeCl_3$	Na_2HPO_4

Reaction Grid and Data Table #2: Chemical Names and Formula Lab; SC3e, SC1d

You will perform each reaction over the reaction grid below. Then you will need to record the color and write both the name and formula for each new compound produced by the chemical reaction. Record this data in Data Table #2 (below reaction grid).

	$AgNO_3$ Ag^+	$Pb(NO_3)_2$ Pb^{2+}	$CuSO_4$ Cu^{2+}	$MgSO_4$ Mg^{2+}	$FeCl_3$ Fe^{3+}
$FeCl_3$ (Cl^-)	X	X			
KI (I^-)	X	X			
NaOH (OH^-)	X	X	X	X	X
Na_2CO_3 (CO_3^{2-})	X	X	X	X	X
Na_3PO_4 (PO_4^{3-})	X	X	X	X	X

	$AgNO_3$ Ag^+	$Pb(NO_3)_2$ Pb^{2+}	$CuSO_4$ Cu^{2+}	$MgSO_4$ Mg^{2+}	$FeCl_3$ Fe^{3+}
$FeCl_3$ (Cl^-)					
KI (I^-)					
NaOH (OH^-)					
Na_2CO_3 (CO_3^{2-})					
Na_3PO_4 (PO_4^{3-})					