CP CHEMISTRY: Ion Cut-Out Lab Activity

BACKGROUND:

A chemical formula is a combination of symbols and numerical subscripts that represents the composition of a compound. The symbols indicate which elements are present and the numerical subscripts indicate the relative proportion of each element in the compound. These proportions can be predicted using the oxidation numbers of the elements and the charges of polyatomic ions. When atoms acquire a charge they are called ions. Ions consisting of more than one atom are polyatomic ions. Its oxidation number represents the apparent charge on an atom.

It is important that all scientists use the same system for writing chemical formulas. This helps to ensure clear and consistent transmission of information. Therefore, the following rules should be used for writing chemical formulas.

1. **In a neutral compound the sum of the oxidation numbers of the ions in that compound must equal zero.**
2. **One positive (+) charge will neutralize one negative (-) charge.**
3. **Atoms with positive oxidation numbers or ions with positive charges are written first.**
4. **When the relative proportion of an element in a compound is greater than one, the symbol for that element must be followed by a numerical subscript indicating its relative proportion, as in $MgCl_2$**
5. **When the relative proportion of a polyatomic ion in a compound is greater than one, the symbol for the polyatomic ion must be enclosed by parentheses, followed by the correct numerical subscript, as in $Al_2(SO_4)_3$.**

OBJECTIVES:

In this experiment you will use cut-out models of ions to form neutral compounds. The correct chemical formula will be determined by balancing oxidation numbers and charges. Created compounds will be named according to rules discussed in class.

MATERIALS:

scissors
pencil and paper
sheet of ion models
glue stick

PROCEDURE:

Part 1:

1. Using the sheets containing cation (yellow) and anion (blue) cut-outs, create compounds formed from the correct combination of the following ions:

    - aluminum and bromine
    - sodium and oxygen
    - iron(II) and sulfur
    - aluminum and nitrate
    - potassium and sulfate
    - iron(III) and chlorine
    - ammonium ion and sulfur
    - aluminum and oxygen
    - iron(III) and sulfate
    - sodium and phosphate

2. Glue the cut-out pieces to your "Part I" data chart. PLEASE…create the compounds in the in same order in which they appear in the list above.
3. Record the correct chemical formula for each compound, based on the number of each ion present.
4. Record the correct name of each compound.

Part II:

1. Using the ion cut-out pieces remaining, construct correct compounds based on the descriptions provided in the data table for "Part II" of the lab.
2. Glue the cut-out pieces to your "Part II" data chart.
3. Record the correct chemical formula for each compound, based on the number of each ion present.
4. Record the correct name of each compound.

CATIONS: Print on YELLOW paper (or IN COLOR)!

Fe^{+3}	Fe^{+3}	Fe^{+3}	Fe^{+3}	Fe^{+3}
Fe^{+2}	Fe^{+2}	Fe^{+2}	Fe^{+2}	Fe^{+2}
Na^{+1}	Na^{+1}	Na^{+1}	Na^{+1}	Na^{+1}
Mg^{+2}	Mg^{+2}	Mg^{+2}	Mg^{+2}	Mg^{+2}
K^{+1}	K^{+1}	K^{+1}	K^{+1}	K^{+1}
NH_4^{+1}	NH_4^{+1}	NH_4^{+1}	Al^{+3}	Al^{+3}
Al^{+3}	Al^{+3}	Al^{+3}	Ca^{+2}	Ca^{+2}
Zn^{+2}	Zn^{+2}	Zn^{+2}	Ca^{+2}	Ca^{+2}
Cu^{+2}	Cu^{+2}	Cu^{+2}	Cu^{+2}	
Cu^{+1}	Cu^{+1}	Cu^{+1}	Cu^{+1}	
Li^{+1}	Li^{+1}	Li^{+1}		

ANIONS: Print on BLUE Paper (or IN COLOR)!

S^{-2}	S^{-2}	S^{-2}	S^{-2}	S^{-2}
O^{-2}	O^{-2}	O^{-2}	O^{-2}	O^{-2}
Cl^{-1}	Cl^{-1}	Cl^{-1}	Cl^{-1}	Cl^{-1}
Br^{-1}	Br^{-1}	Br^{-1}	Br^{-1}	Br^{-1}
NO_3^{-1}	NO_3^{-1}	NO_3^{-1}	NO_3^{-1}	NO_3^{-1}
SO_4^{-2}	SO_4^{-2}	SO_4^{-2}	SO_4^{-2}	SO_4^{-2}
PO_4^{-3}	PO_4^{-3}	PO_4^{-3}	PO_4^{-3}	PO_4^{-3}
I^{-1}	I^{-1}	I^{-1}	I^{-1}	I^{-1}
P^{-3}	P^{-3}	P^{-3}	P^{-3}	P^{-3}
CO_3^{-2}	CO_3^{-2}	CO_3^{-2}	CO_3^{-2}	CO_3^{-2}

Name: _____ Date: _____ Class: _____

Ion Cut-out Data Table - Part I

Combining Ions	Chemical Formula	Name of Compound
Example: $[K^+][NO_3^{-1}]$	KNO_3	Potassium Nitrate

Name: _____ Date: _____ Class: _____

Ion Cut-out Data Table - Part II

Combining Ions	Chemical Formula	Name of Compound
Transition metal + Polyatomic anion		
Transition metal + Anion from family 15, 16, or 17		
Cation from family 1, 2, or 13 + Polyatomic anion		
Cation in family 1, 2, 13 + Anion in family 15, 16, or 17		

Conclusion Q 1:

Conclusion Q 2:

Conclusion Q 3: