Naming Inorganic Compounds for Artists
Activity 6

Why Do I Care?
Knowing how to name compounds gives you the language of chemistry and the names of chemicals used in paints and glazes.

Background:
- A compound is "**ionic**" if it is composed of a metal and one or more nonmetals
- A compound is "**molecular**" if it contains only nonmetals
- Two systems of naming exist:
    - One for ionic compounds and one for molecular

So, the first thing you must determine about a compound is if it is ionic of molecular!

Model:
The following table summarizes the formulas and names of some representative inorganic compounds, the types of chemicals we will be studying this year

Formula	Name	Ionic or Molecular?	Binary or Not	Metal w/ multiple charges
NaCl	Sodium chloride			
KCl	Potassium chloride			
$CaCl_2$	Calcium chloride			
LiI	Lithium iodide			
Al_2O_3	Aluminum oxide			
Mg_3P_2	Magnesium phosphide			
Ag_3N	Silver nitride			
Cu_2S	**Copper (I) sulfide**			
CuS	**Copper (II) sulfide**			
$PbBr_2$	**Lead (II) bromide**			
$PbBr_4$	**Lead (IV) bromide**			
$BaCO_3$	Barium carbonate			
$Al_2(CO_3)_3$	Aluminum carbonate			
$CsNO_3$	Cesium nitrate			
$Sr(NO3)_2$	Strontium nitrate			
$Mg_3(PO_4)_2$	Magnesium phosphate			
$Sn_3(PO_4)_4$	**Tin (IV) phosphate**			
CO	Carbon monoxide			
CO_2	Carbon dioxide			
SO_3	Sulfur trioxide			
N_2O_4	Dinitrogen tetroxide			
P_4Cl_{10}	Tetraphosphorous decachloride			

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Critical Thinking:

1. Based on the definition given in the background, identify each of the compounds as ionic or molecular in the appropriate column of the chart.

2. A binary compound is one that contains only 2 elements (it does not mean that there are only 2 atoms in the compound). Identify each of the compounds above as binary or not in the appropriate column.

3. Some ionic compounds contain metals that can take more than one charge in compounds. The list of these metals that I would like you to know:
Lead, Tin, Copper, Cobalt, Iron, Chromium, and Manganese
Identify each of the ionic compounds above containing a mental that can take multiple charges. Answer yes or no in the chart.

4. Where are most of the metals with multiple charges located in the periodic table?

_____

_____

5. What do you notice that is unique about the name of an ionic compound that contains a metal that can take more than one charge?

_____

_____

6. What is the ending for the names of binary ionic compounds? What is the first word in the name of a binary ionic compound?

_____

_____

7. Is there any indication in the formula about how many of each type of atom are present in an ionic compound? If yes, how is this number indicated? Is there any indication in the name about how many of each type of atom are present in an ionic compound? If yes, how is this number indicated?

_____

_____

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8. Is there any indication in the formula about how many of each type of atom are present in a molecular compound? If yes, how is this number indicated? Is there any indication in the name about how many of each type of atom are present in a molecular compound? If yes, how is this number indicated?

_____

_____

9. Look at the ionic compounds that are not binary. Do these compounds contain more than one type of metal or more than one type of nonmetal?

_____

10. What is the ending for the non-binary ionic compounds?

_____

Note: In the ionic compounds that contain more than one type of nonmetal, these nonmetals behave chemically as a "package" of nonmetals referred to as a polyatomic ion. The ending of most polyatomic ions (with a couple of exceptions) is "ate".

Polyatomic ion	Formula
NO_3^{-1}	Nitrate
CN^{-1}	Cyanide
OH^{-1}	Hydroxide
MnO_4^{-1}	Permanganate
ClO_4^{-1}	Perchlorate
HCO_3^{-1}	Bicarbonate
CO_3^{-2}	Carbonate
SO_4^{-2}	Sulfate
$Cr_2O_7^{-2}$	Dichromate
PO_4^{-3}	Phosphate
$C_2H_3O_2^{-1}$	Acetate

For molecular compounds the appropriate list of multiplicity prefixes is:

mono, di, tri, tetra, penta, hexa, hepta, octa, nona, deca

Exercise:

Using the model and the list of polyatomics, try to name the following compounds. You might find the list of element names in your book helpful as well.

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Some are used as pigments; these are indicated in the third column with their pigment name. HINT—first identify the compounds as molecular or ionic

Compound	Molecular or Ionic?	Pigment name	Chemical name
1. K_2O			
2. HgS		Vermilion	
3. Cs_3N			
4. Cs_3NO_3			
5. AlI_3			
6. SO_2			
Compound	**Molecular or Ionic?**	**Pigment name**	**Chemical name**
7. OCl_2			
8. IF_4			
9. Ag_2SO_4			
10. As_2S_3		King's Yellow	
11. $Mg(HCO_3)_2$			
12. $Cu(C_2H_3O_2)$		Verdigris	
13. PCl_5			
14. H_2O			
15. $NaClO_4$			
16. TiO_2		Titanium white	
17. $Mn_3(PO_4)_2$		Manganese violet	

THAT WASN'T SO BAD...

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