Name:

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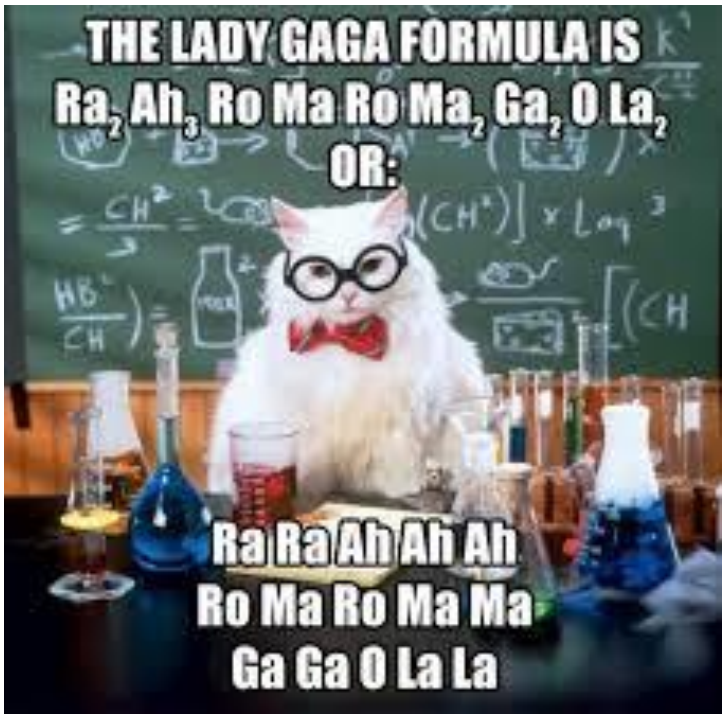
Practice Packet:

Unit 2: Naming & Formula Writing



Lesson 5: Naming and Formula Writing for Binary Compounds

Objective:

- ✓ ***Identify the various parts of a chemical formula***
- ✓ ***Identify binary compounds by name***
- ✓ ***Construct chemical formulas for binary compounds***

Ionic Compounds require two types of ions: **cations** which are positive and **anions** which are negative. All **metals** (on the left side of the periodic table) form cations and **nonmetals** (on the left side of the periodic table) form anions primarily. In order to determine the formula of the compound they create you must make sure their ions sum to zero. For example, table salt is sodium chloride. Using the periodic table's first set of ions, sodium forms $^{+1}$ ions and chlorine forms $^{-1}$ ions. Therefore their ions cancel out and the formula is NaCl. It is not always that easy. Calcium chloride is the salt we put on roads to melt ice. Calcium forms $^{+2}$ ions and Chloride forms $^{-1}$ ions. We need two chloride ions to balance the charges. The formula is $CaCl_2$. **Notice the metal, or positive cation is always written first**! Try the following examples:

1. Cesium fluoride: _____
2. Potassium oxide: _____
3. Magnesium iodide: _____
4. Barium sulfide: _____
5. Aluminum chloride: _____
6. Calcium phosphide: _____

There is a short cut called the **criss cross and reduce rule**. Simply "drop" the sign of the charges then criss cross down to form subscripts (if you can reduce by a common factor you must do so). In example 6, calcium phosphide had charges $^{+2}$ and $^{-3}$ respectively. Drop the charges to form uncharged subscripts $_2$ and $_3$ and criss cross down to form Ca_3P_2. Try the criss cross and reduce rule to find the formula:

	Chloride	Sulfide	Fluoride	Phosphide
Lithium				
Aluminum	$Al^{+3}Cl^{-1}$ $AlCl_3$			
Magnesium				
Zinc				

Now we know how to write formulas from their names but we also need to know how to write names from formulas. The rule is: write the whole name of the first element and the second element drop the ending and replace with "ide." For example: H_2S is hydrogen sulfide. In this case, the amount of each element doesn't affect the name of the compound. Use **table S** to help you find names. Try to name the following examples:

1. NaF _____
2. $MgCl_2$ _____
3. Al_2O_3 _____
4. MgI_2 _____
5. H_2O _____
6. NaH _____
7. K_3P _____
8. MgO _____
9. Li_2Te _____
10. $AlCl_3$ _____

Lesson 6: Naming and Formula Writing with Multiple Oxidation States

Objective:

- ✓ ***Identify binary compounds containing multiple charges by name using roman numerals***
- ✓ ***Construct chemical formulas for binary compounds containing multiple charges***

If the first substance in a compound has more than 1 oxidation state you must write the charge used (roman numerals in parenthesis).

Transition metals refer to the metals in groups 3-12 of the period table (elements Sc through Zn and down). These metals form various positive ions and therefore have more than one oxidation state (charge). It is important to identify which ion is used when naming the compound. We will work backwards to do this, meaning, we will look at the charge for the second ion in the formula to find that charge of the first. We will report the charge of the first ion in roman numerals (the numerals you need to memorize are listed to the right) in parenthesis after that ion. For example:

One	**I**	**Five**	**V**
Two	**II**	**Six**	**VI**
Three	**III**	**Seven**	**VII**
Four	**IV**		

CuO	*O is -2 so Cu needs to be +2*	*Copper (II) oxide*
Cu_2O	*O is -2 so each Cu must be +1*	*Copper (I) oxide*

These two compounds have different structures and properties and must have different names. Try to name the following compounds with transition metals:

1. $FeBr_2$ _____
2. $FeBr_3$ _____
3. PbS _____
4. PbS_2 _____
5. NiO _____
6. NiF_3 _____
7. CuCl _____
8. $CuCl_2$ _____
9. CuS _____
10. Cu_2S _____

Formula writing may seem easier. You can still use the drop and swap rule. Remember the number in roman numerals refers to the charge of the first ion. Try to give the formula of the following compounds:

1. Chromium (VI) oxide _____
2. Manganese (VII) chloride _____
3. Lead (IV) iodide _____
4. Silver (I) sulfide _____
5. Nickel (II) fluoride _____
6. Zinc (II) oxide _____
7. Iron (II) oxide _____
8. Iron (III) oxide _____
9. Gold (III) phosphide _____
10. Titanium (IV) sulfide _____

Lesson 7: Naming and Formula Writing Tertiary Compounds

Objective:

- ✓ ***Identify tertiary compounds containing polyatomic ions by name***
- ✓ ***Construct chemical formulas for tertiary compounds containing polyatomic ions***

Binary compounds have only two elements in their formula, as we saw in exercises above. **Tertiary compounds** have three or more elements in their formula and have a new system of naming. These compounds have a **polyatomic ion**, which is an ion that has a few elements grouped together with only one charge between them. A common example is OH^- which shows two elements with an overall charge of -1. As before, name the first element completely and then look up the rest of the compound on **table E** of the reference tables. Make sure you copy the right one, some are very similar! For example: NaOH is called sodium hydroxide. Also, beware of NH_4^+ which is the only polyatomic cation (that comes in front). Try naming the following examples:

1. $KHCO_3$ _____
2. $CaSO_4$ _____
3. $NaNO_3$ _____
4. $LiNO_2$ _____
5. $Cu(ClO_4)_2$ _____
6. $Al_2(SO_3)_3$ _____

To write the formula of a tertiary compound you can still use the drop and swap rule, however, you must be sure to only drop the superscripts and leave the subscripts alone. For example, aluminum carbonate:

Al^{+3} and CO_3^{-2} *Leave the $_3$ alone! Swap the ^{3} and ^{2}* *$Al_2(CO_3)_3$*

Remember, formulas don't show any charges. You can see that we use parenthesis around the polyatomic ion because the entire ion charge was -2 and must swap with aluminum so the entire ion gets aluminum's 3. Try to write the formula for the following compounds (write the formulas of the ions next to the name first):

	Hydroxide	**Nitrate**	**Carbonate**	**Phosphate**	**Acetate**
Sodium					
Calcium					
Ammonium					
Iron (II)					
Aluminum					

Try a few more:

1. Zinc Hydroxide: _____
2. Calcium chlorate: _____
3. Hydrogen acetate: _____
4. Magnesium oxalate: _____
5. Lead (IV) chromate: _____
6. Strontium cyanide: _____