**3.2 Multivalent Metals** (p. 88–90)

Some metals have more than one possible ***ion charge***. These metals are multivalent (\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_). Most \_\_\_\_\_\_\_\_\_\_\_\_\_\_metals have this characteristic. The periodic table lists the charges for ions. The most common charge is listed first.

To distinguish between ions, \_\_\_\_\_\_\_\_\_numerals are used to name the ion.

|  |
| --- |
| **ROMAN NUMERALS USED TO REPRESENT METAL ION CHARGES FROM 1+ TO 7+** |
| I | II | III | IV | V | VI | VII |
|  |  |  |  |  |  |  |

Eg. Iron (Fe) can form ions with charges 3+ or 2+: \_\_\_\_ioniscalled iron(\_\_) or Fe2+  ion is called iron(\_\_)

**WRITING FORMULAS:** Must still put the metal first followed by non-metal!

The \_\_\_\_\_\_\_\_\_\_\_\_\_\_ tells you which ion to use when balancing the charges.

|  |  |  |
| --- | --- | --- |
| **NAME OF COMPOUND** | **CHEMICAL****FORMULA** | **ORDER** |
| **copper(I) sulphide** | **Cu2S** | **Metal Non-metal** |

|  |  |
| --- | --- |
| Steps for writing the formula for multivalent compounds containing a multivalent metal |  Examples |
| iron(III)sulphide | iron (II) sulphide |
| 1. LOOK UP ion symbols and identify charges
 | iron(III): sulphide:  | iron (II): sulphide:  |
| 1. BALANCE the positive and negative charges
 |  |  |
| 1. Determine the RATIO of positive to negative ions
 |   |  |
| 1. CHEMICAL FORMULA
 |  |  |

TRY THESE:

|  |  |
| --- | --- |
| copper(II) chloride  LOOK UP BALANCE RATIO :  CHEM. FORM.  | copper (I) chloride LOOK UP BALANCE RATIO : CHEM. FORM.  |

**DO pg. 89 Practice Problems**

**NAMING MULTIVALENT COMPOUNDS**

Given the formula, we can figure out the name. If the metal is multivalent, we MUST write a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to represent the \_\_\_\_\_\_\_\_\_\_\_ on the metal ion.

**NAME: METAL (ROMAN NUMERAL) NON-METAL {IDE ENDING}**

|  |  |  |
| --- | --- | --- |
|  |  | EXAMPLE **Cu3P** |
| Step #1 LOOK UP  | LOOK UP & write down the names of elements in the formula. | Cu P |
| Step #2 ENDING  | cross out the ENDING of the non-metal name and replace with “ide” |  |
| Step #3 CHECK | CHECK for metals with more than one ion charge.  | Possibilities for copper ions: vs  |
| Step #4 BALANCE CHARGES | The subscripts in the chemical formula determine the number of metal ions vs non-metal ions “X” this by the charge value. + charge = - charge |

|  |  |  |
| --- | --- | --- |
| Metal  |  | Non-metal  |
| \_\_\_x \_\_\_+\_\_\_ | = | \_\_\_ x \_\_\_-\_\_\_ |

 |
| Step #5 ROMAN NUMERAL | give the metal ion name used to balance the charges | 🡪  |
| Step #6 STATE NAME  | Metal ion name (use ROMAN NUMERALs to show charge of metal ion) non-metal name {ide ending} |  |

Eg. WRITE THE NAME FOR: **MnO2** 🡪 **\_\_\_\_\_\_\_\_\_\_\_\_\_( ? ) \_\_\_\_\_\_ide**

Ion Possibilities: Mn\_\_\_and O2- **OR** Mn and O2- **OR** Mn and O2-

 Which metal ion creates MnO2?

 Balance the charges to figure it out:

This is the charge of the two oxide ions in the compound

|  |  |  |
| --- | --- | --- |
| Which Metal ion ?-**Mn\_+ Mn\_+ Mn\_+**  |  | Non-metal **O2-** |
| \_\_\_\_ x \_\_\_\_This “?” must be +\_\_\_\_, so we are using Mn--+ to form MnO2+ | = | \_\_\_\_x \_\_\_\_- |

 **NAME: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**How many atoms are in MnO2?\_\_\_\_ and Cu3P\_\_\_\_\_\_**

**DO pg. 90 Practice Problems; Worksheet “BLM 1-37”**

 **Quiz next class!!**