

Binary Compounds of Cations with Variable Charges

Given Formula, Write the Name

The Stock System

A binary compound is one made of two different elements. There can be one of each element such as in CuCl or FeO . There can also be several of each element such as Fe_2O_3 or SnBr_4 .

This lesson shows you how to name binary compounds from the formula when a cation of variable charge is involved. The four formulas above are all examples of this type.

The cations involved in this lesson have **AT LEAST TWO** charges. The anions involved have only one charge.

The type of naming you will learn about is called the Stock system or Stock's system. It was designed by Alfred Stock (1876-1946), a German chemist and first published in 1919. In his own words, he considered the system to be "simple, clear, immediately intelligible, capable of the most general application."

In 1924, a German commission recommended Stock's system be adopted with some changes. For example, FeCl_2 , which would have been named iron(2)-chloride according to Stock's original idea, became iron(II) chloride in the revised proposal. In 1934, Stock approved of the Roman numerals, but felt it better to keep the hyphen and drop the parenthesis. This suggestion has not been followed, but the Stock system remains in use world-wide.



Example #1: Write the name for: FeCl_2

Step #1 - the first part of the name is the unchanged name of the first element in the formula. In this example, it would be iron.

Step #2 - the result from step one **WILL** be followed by a Roman numeral. Here is how to determine its value:

1. multiply the charge of the anion (the Cl) by its subscript. Ignore the fact that it is negative. In this example it is one times two equals two.
2. divide this result by the subscript of the cation (the Fe). This is the value of the Roman numeral to use. In this example, it is two divided by one equals two.
3. The value of the Roman number equals the positive charge on the cation in this formula.

Since the result of step #2 is 2, we then use iron(II) for the name. Notice that there is no space between the name and the parenthesis.

Step #3 - the anion is named in the usual manner of stem plus "ide."

The correct name of the example is iron(II) chloride.

Example #2: name this compound: **CuCl₂**

In this example, I've explained it differently. Compare it to the one above. Example #4 is also explained this way.

- The first part of the name comes from the first element symbol: copper.
- The Roman numeral is II, because 2 chlorides equal -2, so the Cu must be +2. (It must be +2 so that the total charge equals zero.
- The second part of the name comes from the root of the second symbol plus 'ide,' therefore chlor + ide = chloride.

This compound is named copper(II) chloride.

Example #3: Write the name for: **Fe₂O₃**

Step #1 - the first part of the name is the unchanged name of the first element in the formula. In this example, it would be iron.

Step #2 - the result from step one **WILL** be followed by a Roman numeral. Here is how to determine its value:

1. multiply the charge of the anion (the O) by its subscript. Ignore the fact that it is negative. In this example, it is two times three equals six.
2. divide this result by the subscript of the cation (the Fe). This is the value of the Roman numeral to use. In this example, it is six divided by two equals three.
3. Note: this value of the Roman number equals the positive charge on the cation.

In this example, the result of step #2 is 3. That means that iron(III) will be used for the name. Notice that there is no space between the name and the parenthesis.

Step #3 - the anion is named in the usual manner of stem plus "ide."

The correct name of the example is iron(III) oxide.

Example #4: name this compound: **SnO**

- First symbol is Sn, so the first part of the name is tin.
- The Roman numeral is II, because one oxygen = -2, so the one tin equals +2.
- Second element is oxygen (from the symbol O), so the name is ox + ide = oxide.

This compound is named tin(II) oxide.

Practice Problems

Answer using the Stock system.

Write the correct name for:

1) CuS

2) PbBr₄

3) Pb₃N₂

4) Fe₂O₃

5) FeI₂

6) Sn₃P₄

7) Cu₂S

8) SnCl₂

9) HgO

10) Hg₂F₂

11) CuCl₂

12) CuBr

13) PbO

- 14) Fe_2S_3
- 15) PbCl_2
- 16) SnO
- 17) Cu_2O
- 18) PbO_2
- 19) FeO
- 20) SnO_2
- 21) Hg_2O
- 22) Hg_2I_2
- 23) AuCl_3
- 24) MnO
- 25) CrCl_3
- 26) CoO
- 27) Mn_2O_3
- 28) Co_2S_3
- 29) AuF
- 30) CrBr_2