

Writing Chemical Formulas (Multicharged Ions)

You have learned how to write the formulas for many kinds of compounds. In this lesson we will learn how to write the formulas for compounds containing ions that can have different charges.

For example; you could write the formula for a compound like calcium chloride. But what about iron chloride? The problem here is that when you look up the charge for the iron ion in a table you see that iron can have either a +2 or a +3 charge... depending on the conditions it is in.

To let you know which of the two irons we are talking about there are a couple of things chemists do. The method we will look at is not the preferred method, but it is still in use at times and you should understand how it works. In this method the suffixes -ous and -ic are used to tell you which of the forms of an ion is involved. These suffixes are attached to the Greek or Latin name of the element. If the element ends in -ous it means that it has the lowest of the possible charges. If it has the -ic ending then the ion has the highest of the possible charges.

Remember: [o = low and i = high]

EXAMPLE 1

What is the formula for stannic chloride?

SOLUTION

Stannic pertains to tin. In your chart you see that tin can be either +2 or +4. The -ic ending on stannic means that the tin is in the higher of the two states... it is +4. If the tin is +4 and the chloride is -1, then the formula for stannic chloride using the crisscross method must be:



EXAMPLE 2

What is the formula for cuprous nitrate?

SOLUTION

Cuprous pertains to copper. Copper can be +1 or +2. The "ous" ending on cuprous tells you that it is in the lowest state which is +1. Nitrate is -1, Thus the formula for cuprous nitrate is



STUDENT PRACTICE PROBLEMS

The following Latin and Greek names for elements may help you determine the formulas involved...

NAME	SOURCE	ELEMENT	LOW	HIGH
ferrum	Latin	iron	+2	+3
cuprum	Latin	copper	+1	+2
stannum	Latin	tin	+2	+4
chroma	Greek	chromium	+2	+3
mercury	Named after planet		+1	+2

mercury is a bit of a problem...

Mercuric means Hg in the highest state which is +2 (Hg^{+2})

Mercurous means mercury in the lowest state which is +1.

However, mercury does not form Hg^{+1} ions... it forms Hg_2^{+2} ions. In this state there are two mercury atoms and a +2 charge... thus each mercury atom has a +1 charge. A compound such as mercuric chloride would then be HgCl_2 while mercurous chloride would be Hg_2Cl_2 .

Write the formula for each of the following...

- chromic chloride
- stannous fluoride (found in some toothpaste)
- mercuric nitrate
- stannic oxide
- cupric nitrate
- cuprous carbonate
- mercurous nitrate
- ferric chloride
- ferrous sulfate
- Plumbous Chloride