Nomenclature

Naming Ions- Monatomic Ions and Ionic Compounds

How chemicals got their names

Table salt is called sodium chloride,

we all know but why?

Scientists have an entire system for naming ions and ionic compounds.

The system for naming chemicals is based on the original name of the element that formed each ion.

We will look first at monatomic ions, or ions formed from single atoms.

Cations

The naming of cations, or positive ions, is usually pretty stinking simple.

Most often, the ion has the same name as the element.

For example, a sodium atom forms a positive sodium ion, a lithium atom forms a lithium ion.

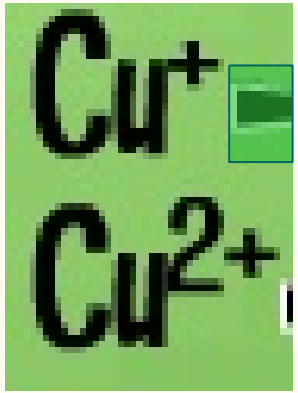
Special Cations

There are elements that have some trickery.

Like how some atoms can form more than one type of cation and with different charges too.

Generally, the elements that do this are transition metals, which are located in groups three through twelve.

Copper is a good example. It can form an ion with a charge of plus one, or a charge of plus two.

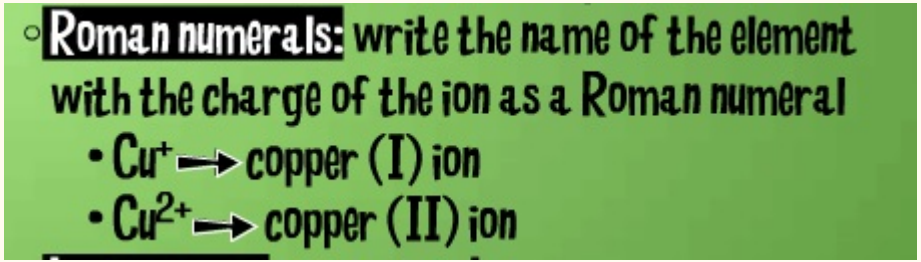


Special Cations-Roman Numerals

There are actually two different ways of naming these special ions.

The first uses Roman numerals to indicate the amount of charge on the cation. So like with the copper ion that has a charge of plus one that'd be a copper-one ion.

And likewise, the ion with a charge of plus two would be a copper-two ion. So that's the deal with the Roman numerals.

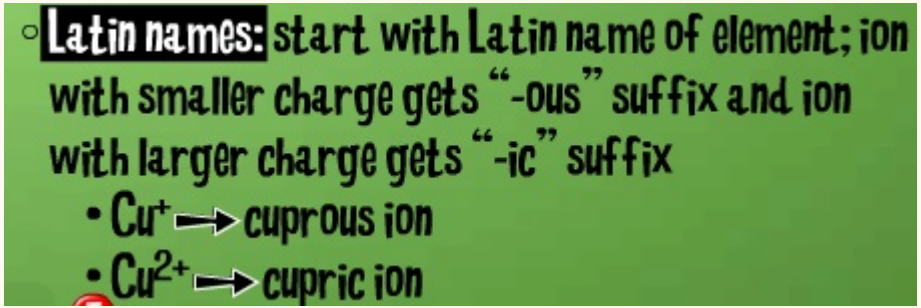


Special Cations- Old Latin Names

The other naming system uses old Latin names for the elements, along with the suffixes

“O-U-S” and “I-C”... More specifically, the ion with the smaller charge takes the “O-U-S”

suffix and the ion with the larger charge takes the “I-C” suffix.



Cation Chart

Formula of cation	Roman numeral system name	Latin system name
Cr^{2+}	Chromium (II) ion	Chromous ion
Cr^{3+}	Chromium (III) ion	Chromic ion
Mn^{2+}	Manganese (II) ion	Manganous ion
Mn^{3+}	Manganese (III) ion	Manganic ion
Fe^{2+}	Iron (II) ion	Ferrous ion
Fe^{3+}	Iron (III) ion	Ferric ion
Co^{2+}	Cobalt (II) ion	Cobaltous ion
Co^{3+}	Cobalt (III) ion	Cobaltic ion
Cu^{+}	Copper (I) ion	Cuprous ion
Cu^{2+}	Copper (II) ion	Cupric ion
Sn^{2+}	Tin (II) ion	Stannous ion
Sn^{4+}	Tin (IV) ion	Stannic ion
Hg_2^{2+}	Mercury (I) ion	Mercurous ion
Hg^{2+}	Mercury (II) ion	Mercuric ion
Pb^{2+}	Lead (II) ion	Plumbous ion
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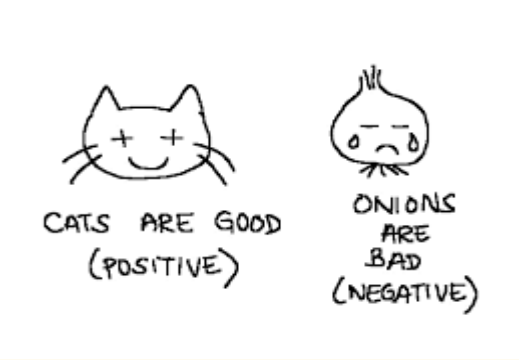
Anions

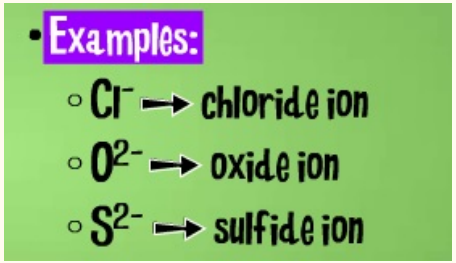


For naming anions, or negatively charged ions, it's a little more simple.

With these we start with the name of the element…like chlorine. Then we drop the suffix, which in this case is "I-N-E" and next we add the suffix "I-D-E."

So "chlorine" becomes a "chloride" ion. And "Oxygen" would become an "oxide" ion.

And "sulfur" would become? Yep a "sulfide" ion.



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Cations (positively charged ions):

Monatomic cations usually have the same names as their original elements.

Examples:

- Na^+ → sodium ion
- Li^+ → lithium ion

Some elements can form more than one type of ion.

- Generally, these elements are transition metals.
  - **Example:** Copper (Cu^+, Cu^{2+})
- There are two systems for naming (Roman numerals and Latin names).

Anions (negatively charged ions):

Monatomic anions have names that all follow the same rule.

- Take the name of the element, remove the original suffix and add the suffix "-ide".
- **Examples:**
  - Cl^- → chloride ion
  - O^{2-} → oxide ion
  - S^{2-} → sulfide ion

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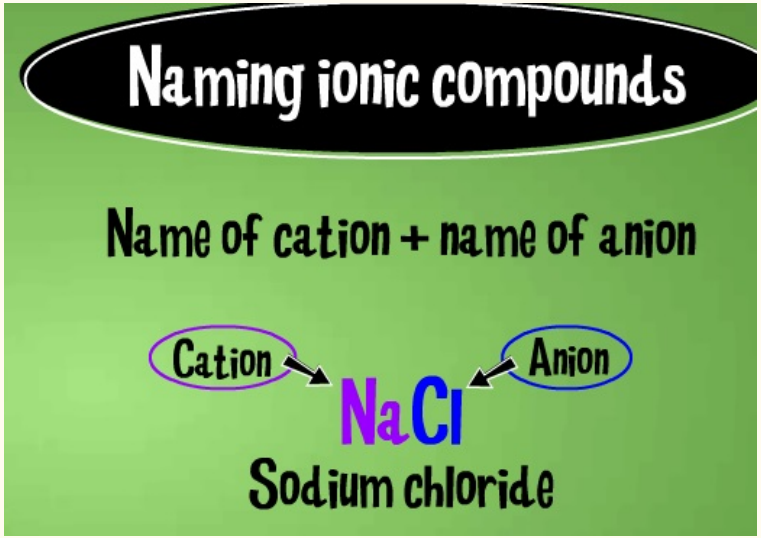
Naming Ionic Compounds

Now that we've discussed how to name monatomic ions, we can see how these ions are combined into ionic compounds.

An ionic compound is simply named by taking the name of the cation, followed by the name of the anion.

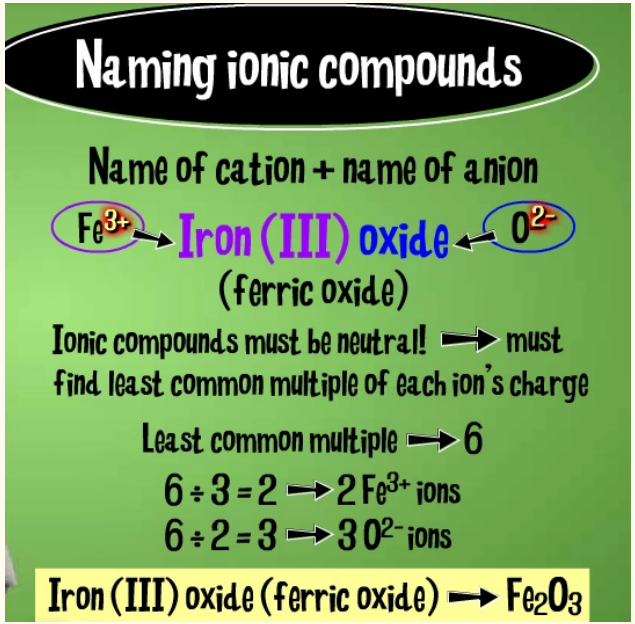
Naming Ionic Compounds-Form Compound from name

So for example, here we have sodium chloride: sodium is the cation, and chloride is the anion.



Forming Compounds from the name

Now suppose we're given the following ionic compound: iron three oxide, which is ferric oxide under the Latin system.



Well, from this name alone,

we can figure out the charges of each ion

and the chemical formula for this

ionic compound

Or Criss- Cross charges and drop + and - signs

Fe^{3+} O^{2-} ⟶ Fe_2O_3

Naming Ionic Compounds-Naming from the formula

We can go the other direction too by determining the name of an ionic compound based on its formula. So like if we had the chemical formula C-U-two O, we'd know that we have a metal and a non-metal, right? So we'd also know that it's an ionic compound.

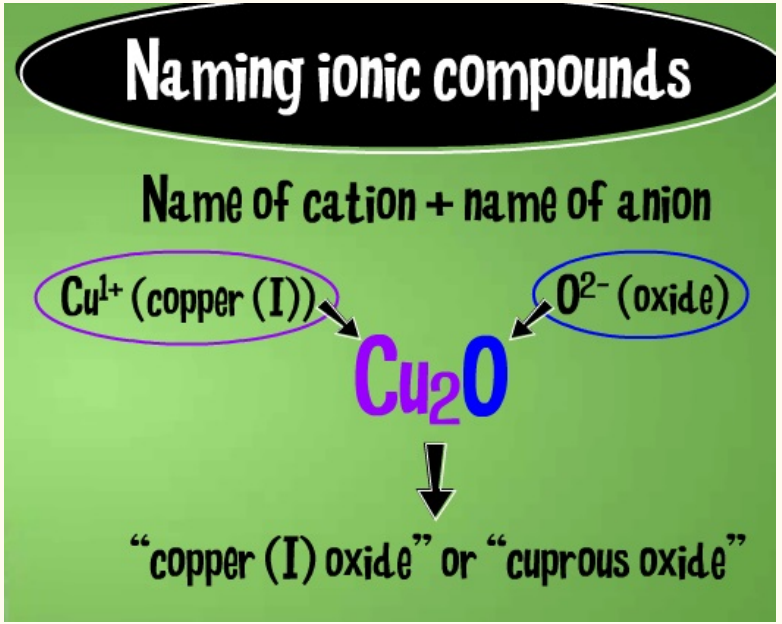
You know what else we know?

That an oxygen ion has a charge of

minus-two, and is called an "oxide" ion,

which takes care of the second part of our

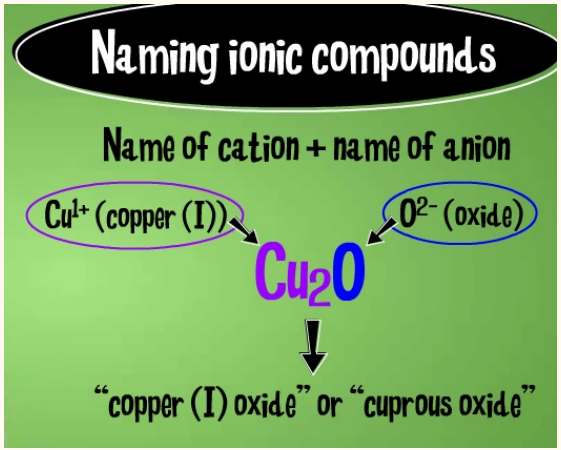
name.



Compounds have to be neutral in charge.

All of this brings us to the conclusion that the overall charge of the compound must be neutral. And since we have two copper ions, each copper ion has a charge of plus one.

There you have it. This compound is copper-one oxide, or cuprous oxide



Summary Chart

monatomic ion

cations

- positive ion
- atom name + "ion"
- exception: transition metals
  - Roman numerals
    or
  - Latin name with *-ous* or *-ic* ending

anions

- negative ion
- atom name - ending + *-ide* suffix + "ion"
- chlorine- *-ine* + *-ide* + "ion" = chloride ion

Writing formula of ionic compound from name:

1.) Write symbol and charge for cation.
2.) Write symbol and charge for anion.
3.) Write cation and anion next to each other.
4.) Find lowest common multiple for charges.
5.) Write formula using multipliers as subscripts.

Or use Criss-Cross Method

The end