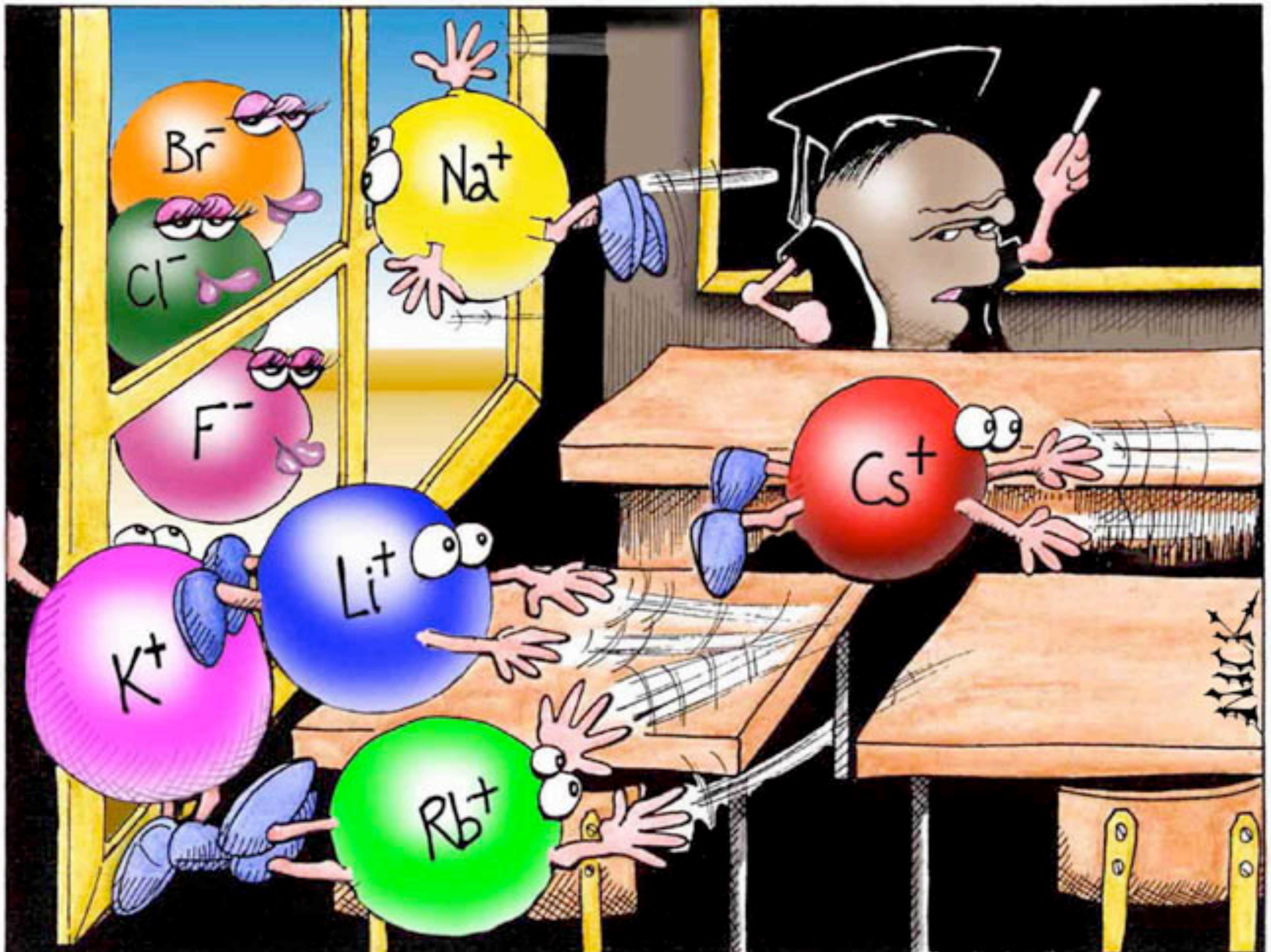
Forming Compounds

* Atom: Single unit of a chemical element.
  * C, N, Cl
* Ion: Charge atom.
  * Na^{+}, O^{2-}
* Compound: Compound: Two or more elements chemically combined.
  * H_2O, CO_2, NaCl

Don't write, just listen. :)

* Elements are satisfied when they have a full valence shell.
* Atoms attain a full shell by creating bonds, either ionic or covalent

Ionic Compounds



"Perhaps one of you gentlemen would mind telling me just what it is outside the window that you find so attractive..?"

Ionic Compounds

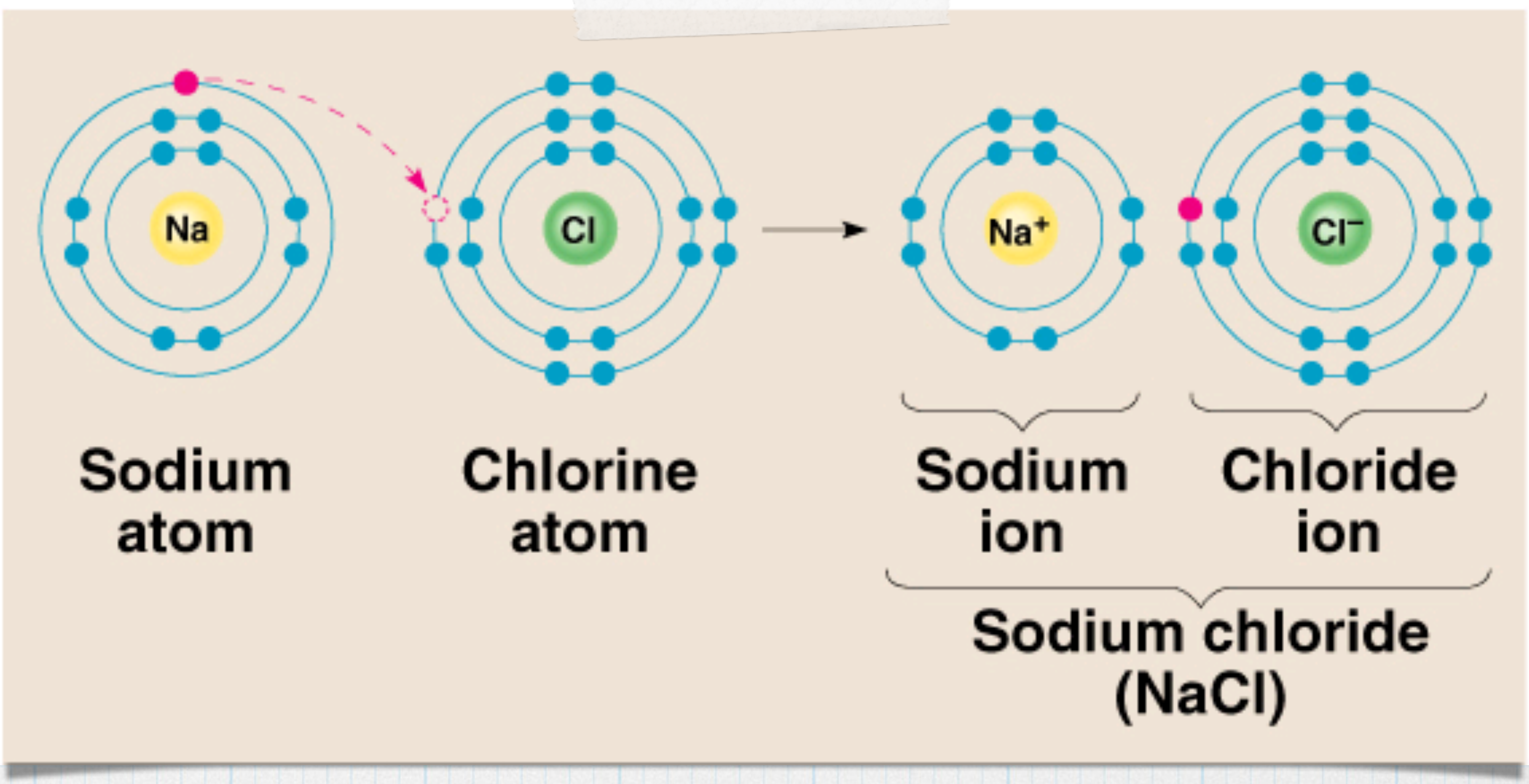
* Called an ionic compound because it is made up of <u>negative</u> and <u>positive</u> ions that have resulted from the transfer of electrons from a <u>metal</u> to a <u>non-metal</u>.

Ionic Compounds

* Ions in ionic compounds are held together by the electrostatic force between oppositely charged bodies. In other words, positive and negative ions attract.

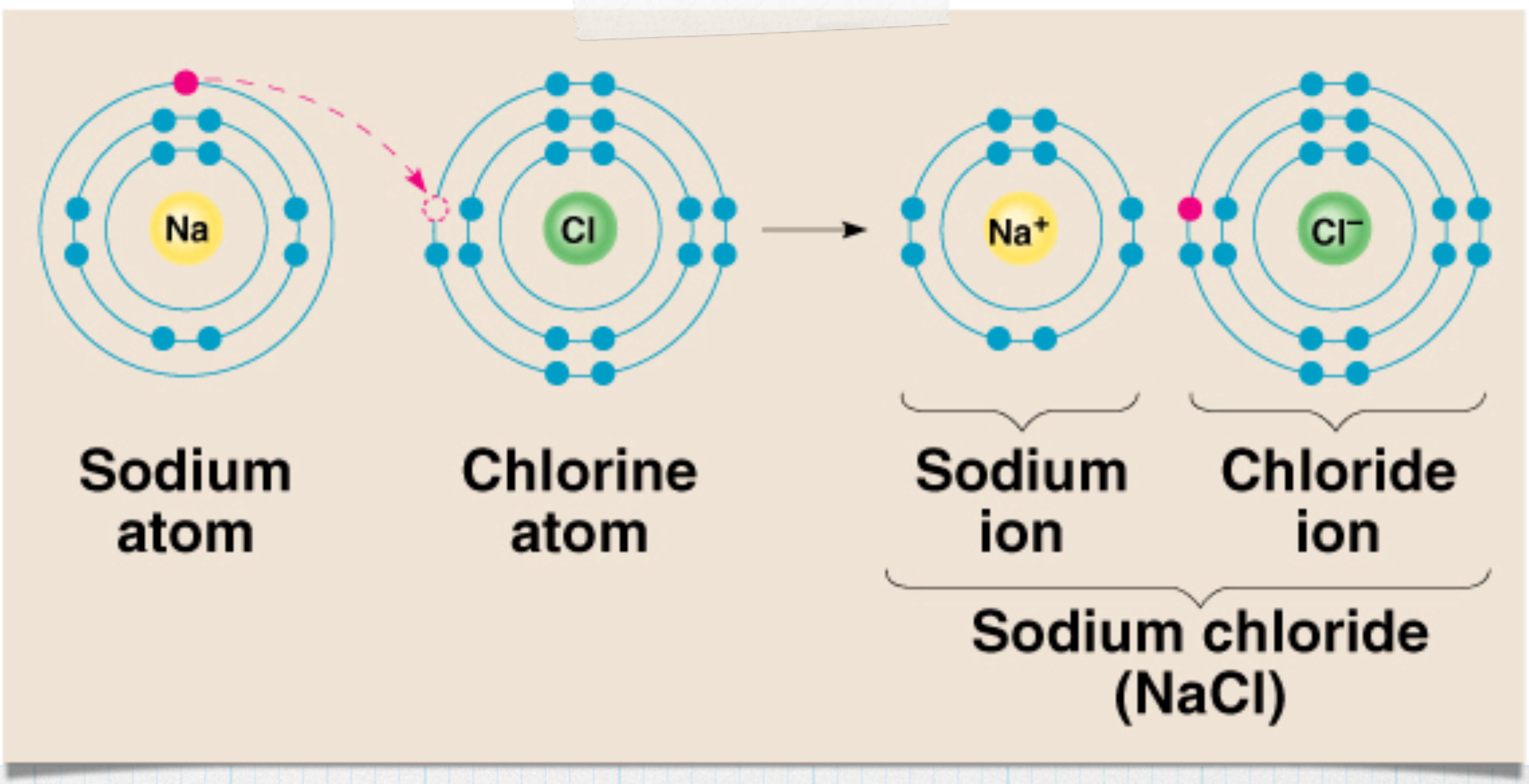
Electrostatic Attraction

* This electrostatic attraction is called an ionic bond.
* The resulting compound is an ionic compound.



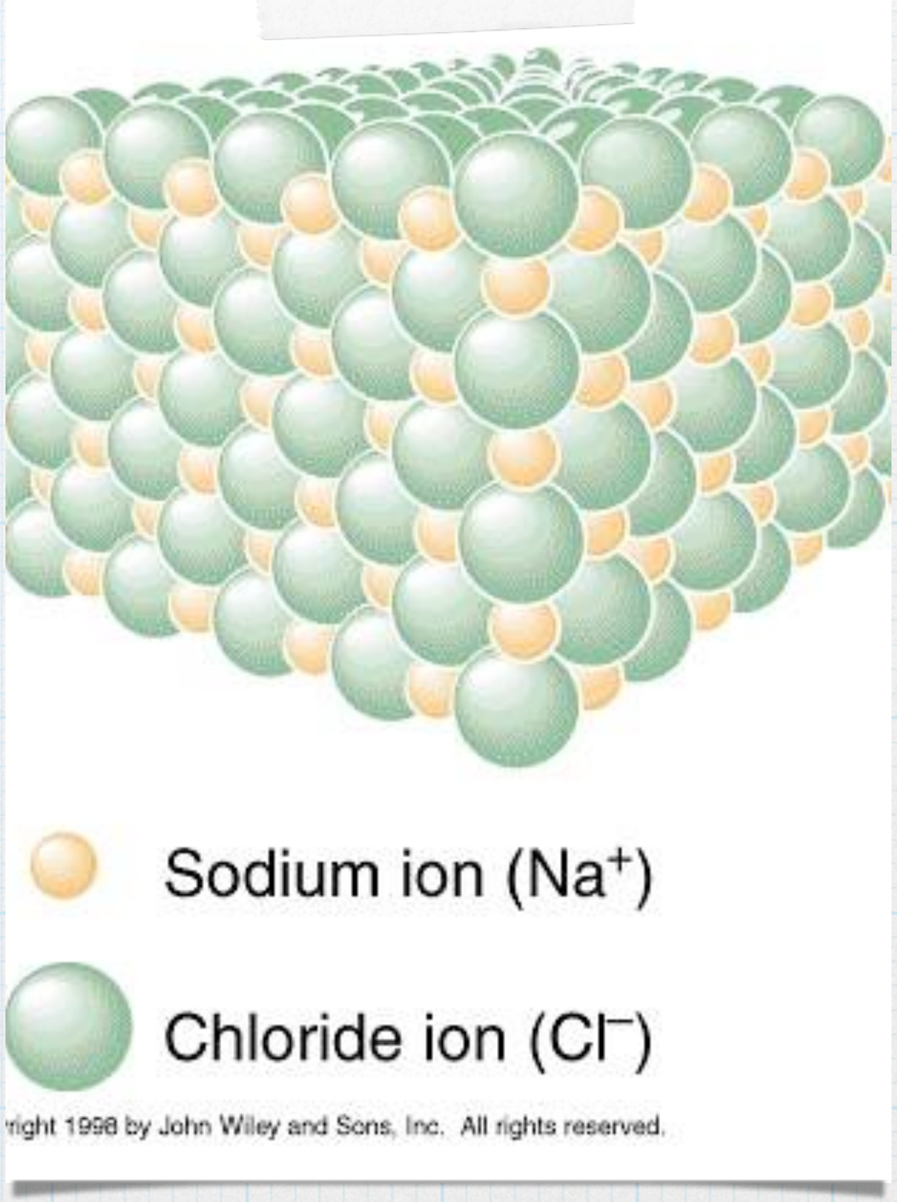
Electrostatic Attraction

* Note that the name of the positive ion is always written first in the name of the compound.



Properties of Ionic Compounds

* In nature, this electrostatic attraction produces regular crystal lattice structures:

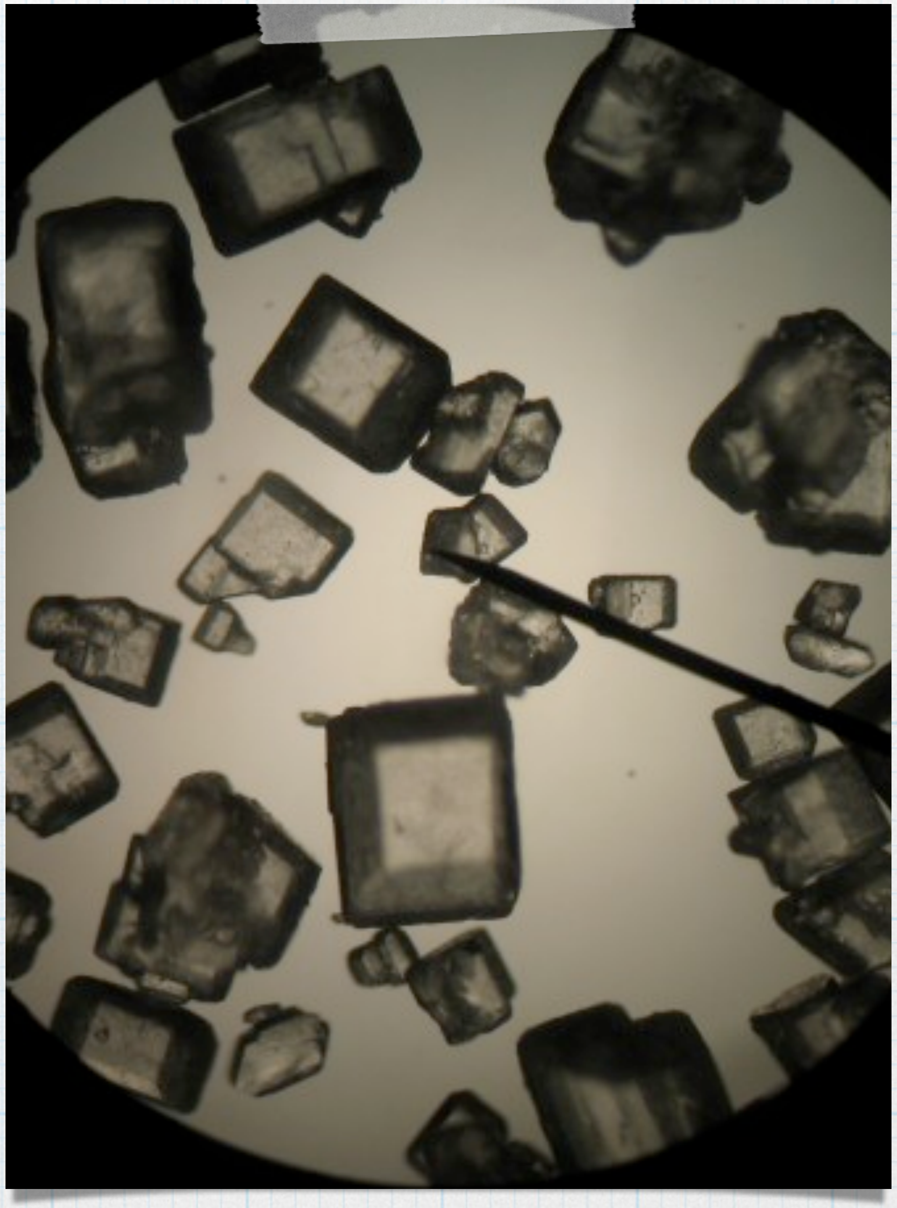


Properties of Ionic Compounds

* Ionic compounds:
  * at room temperature, are usually hard, brittle solids that can be crushed
  * have high melting and boiling points
  * (often) dissolve easily in water

Solutions

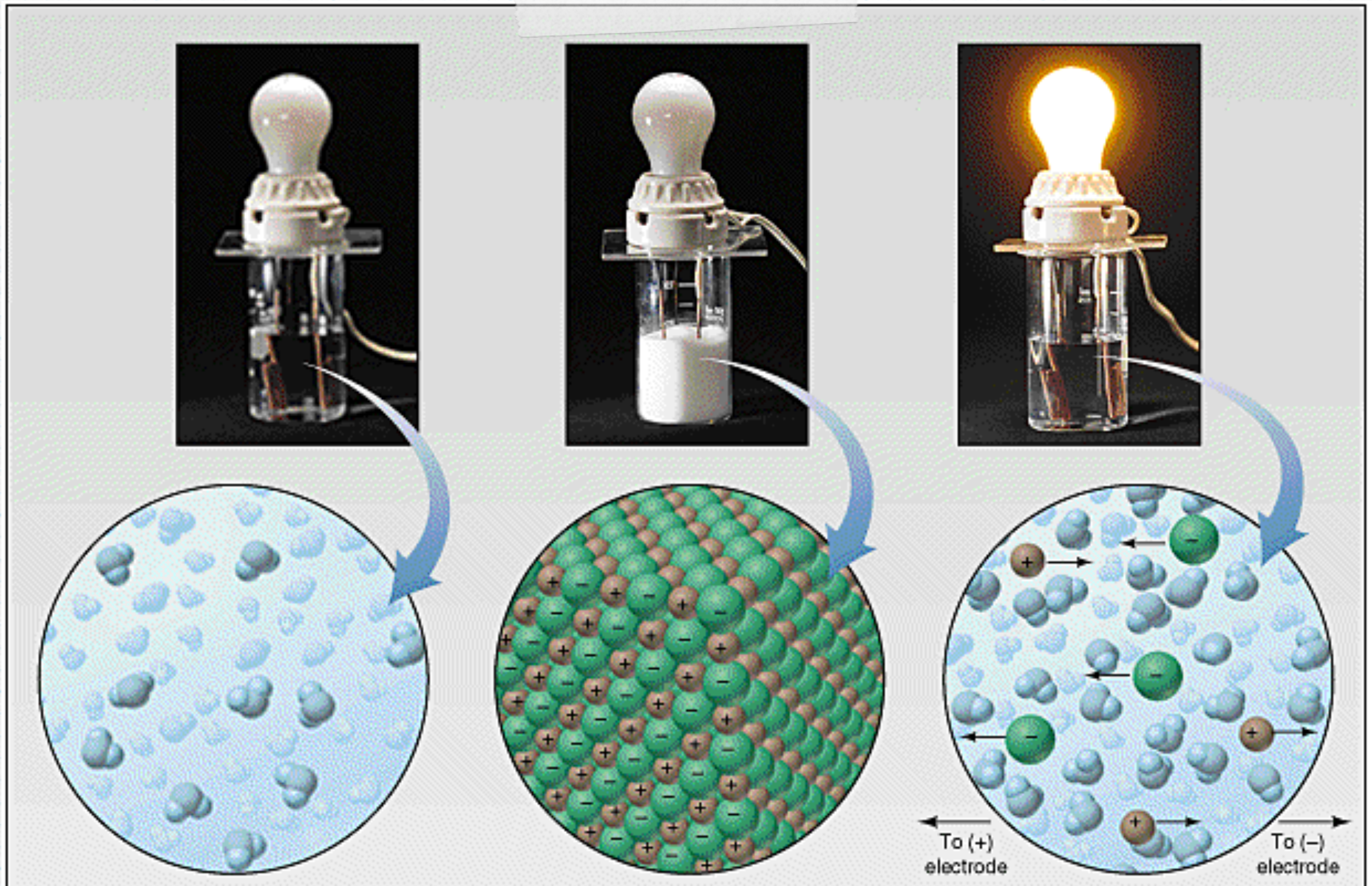
* An ionic compound dissolved in water is said to be aqueous (aq).



Solutions

* These compounds dissolve in water because one side of the water molecule (H_2) is positive and attracts the negative ions and the other side is (O) is negative and attracts the positive ions.

Solutions



A Distilled water does not conduct a current

B Positive and negative ions fixed in a solid do not conduct a current

C In solution, positive and negative ions move and conduct a current

* Because the charged ions can move freely, solutions of ionic compounds are good conductors of electricity.

Testing for Ions

* It is possible to test samples of water for the presence of particular ions because these ions will react in predictable ways with testing solutions of other ionic compounds.

Writing Ionic Formulas

Ionic Formula

You don't need to write, just listen. :)

* An ionic formula
  * consists of positively and negatively charged ions.
  * is neutral.
  * has charge balance.
  * total positive charge = total negative charge
* The symbol of the metal is written first, followed by the symbol of the non-metal.

You don't need to write, just listen. :)

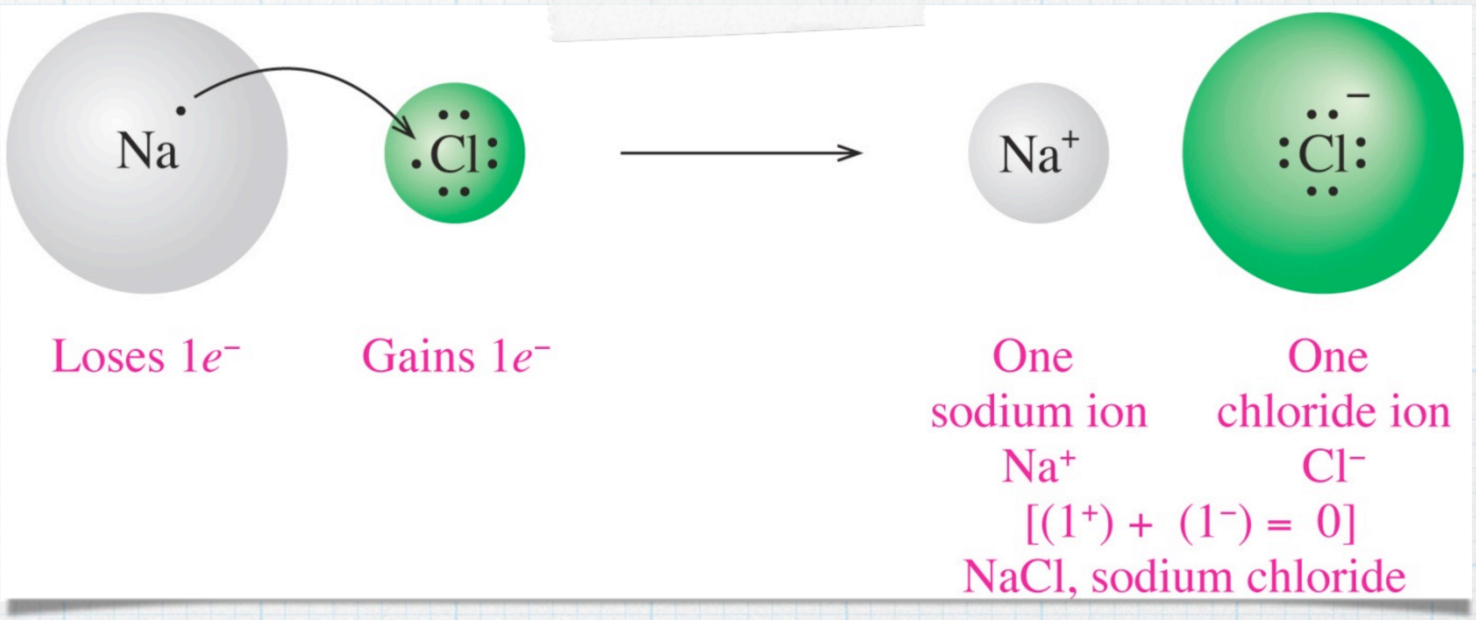
Ionic Formula

* In the chemical formula the symbols of elements are written with a subscript which indicates how many of that element are present in the compound
* Only numbers above one are written

Example: Charge Balance for Salt

You don't need to write, just listen. :)

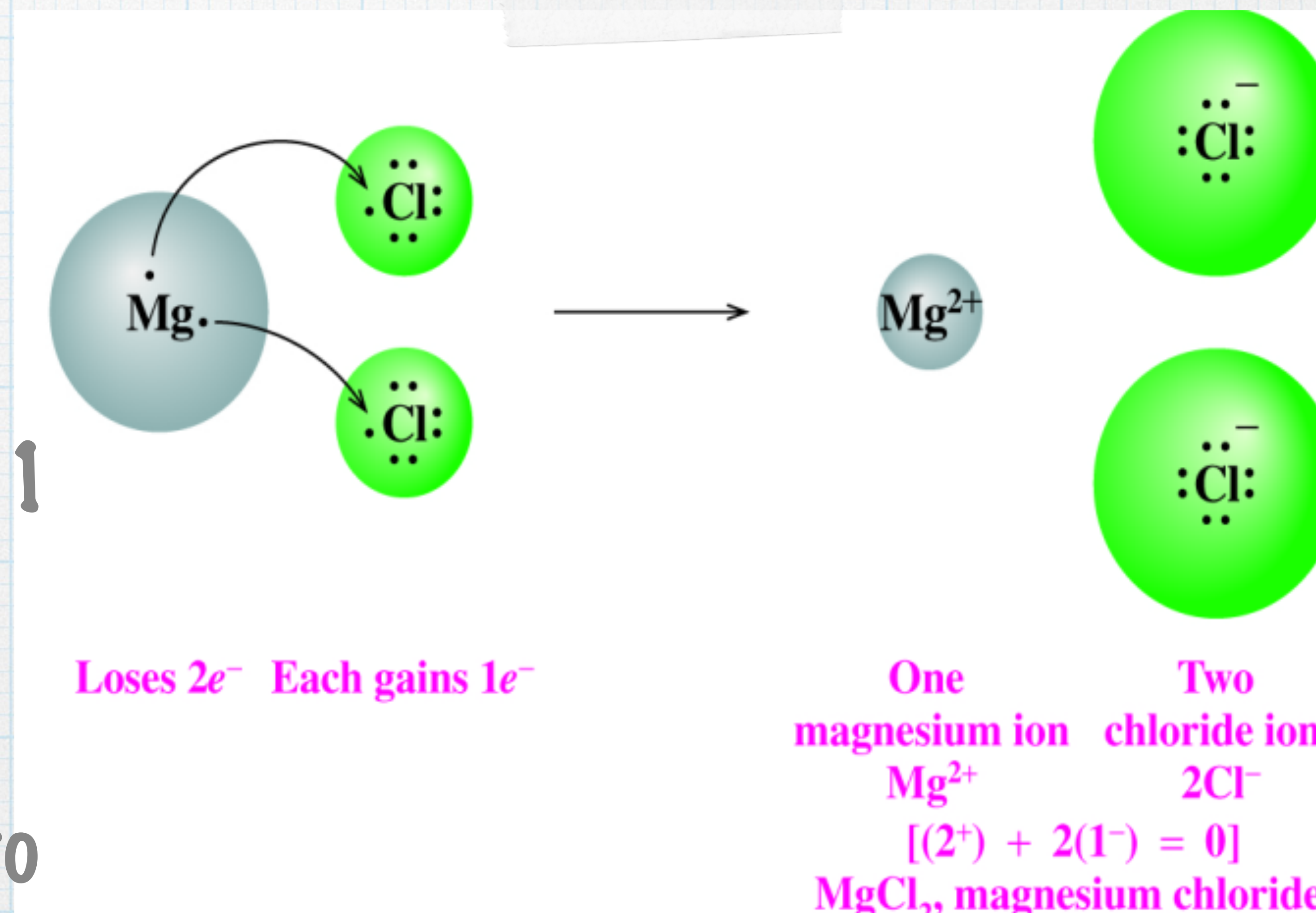
- In NaCl,
  - a Na atom loses its valence electron.
  - a Cl atom gains an electron.
  - the symbol of the metal is written first, followed by the symbol of the nonmetal.



You don't need to write, just listen. :)

Example: Charge Balance for $MgCl_2$

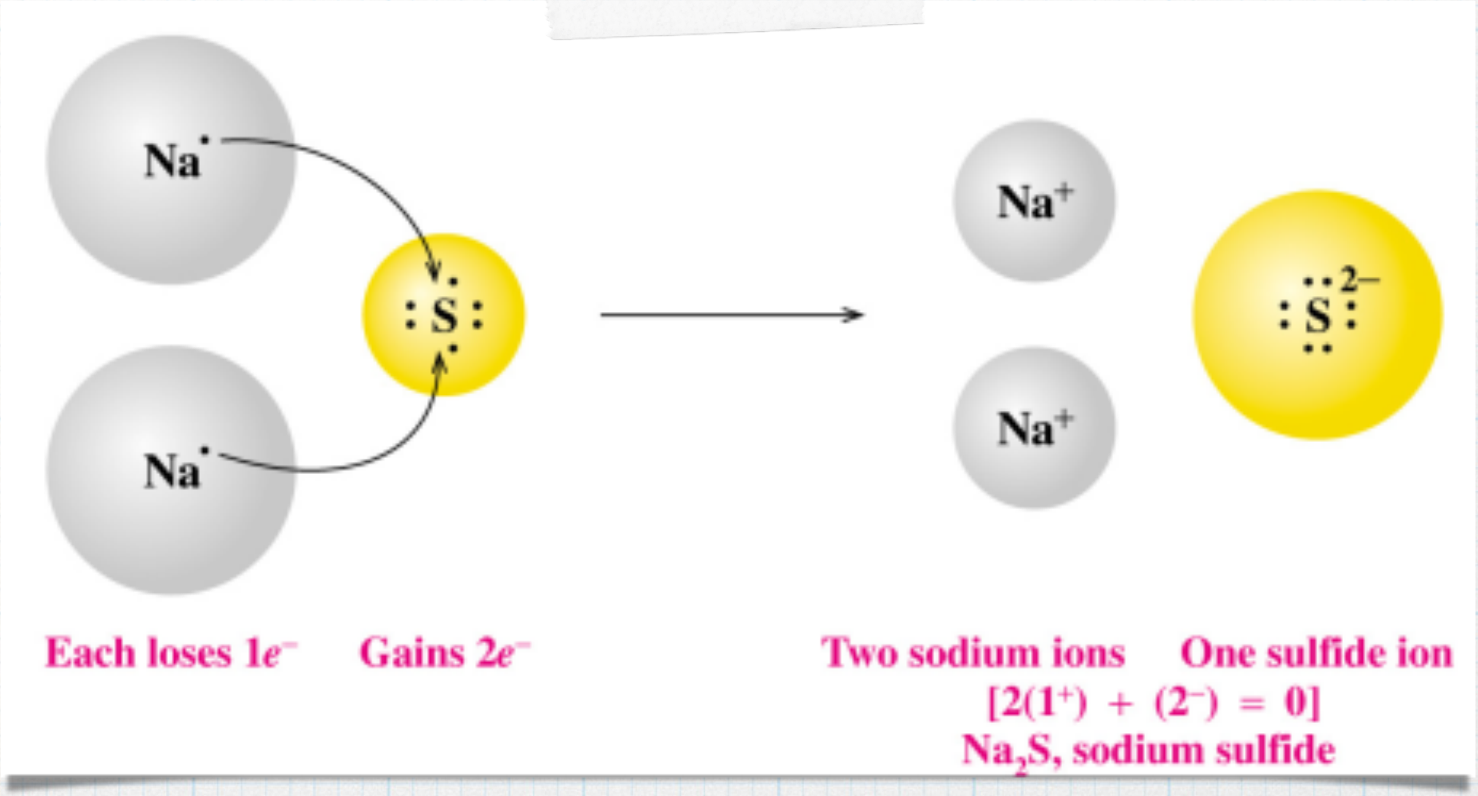
* In $MgCl_2$,
  * a Mg atom loses 2 valence electrons.
  * two Cl atoms each gain 1 electron.
  * subscripts indicate the number of ions needed to give charge balance.



Example: Charge Balance for Na_2S

You don't need to write, just listen. :)

* In Na_2S,
* two Na atoms lose 1 valence electron each.
* one S atom gains 2 electrons.
* subscripts show the number of ions needed to give charge balance.



Writing Ionic Formulas from Charges

You don't need to write, just listen. :)

* Charge balance is used to write the formula for sodium nitride, a compound containing Na^+ and N^{3-}.

$$3\left\langle\begin{matrix} Na^+ \\ Na^+ \\ Na^+ \end{matrix}\right. \quad + \quad N^{3-} \quad = \quad Na_3N$$

$$3(+1) \quad + \quad 1(3-) \quad = \quad 0$$

Steps for Writing Ionic Formulas

- 1) Double check that you have a metal and non metal.
- 2) Identify the charge of each ion.
- 3) 'Cross-over' charges to ensure compound is balanced. Represent these as subscripts.
- 4) You do not write 1.
- 5) If the charges are the same, you do not need to record the subscripts.

* Examples on board

Naming Ionic Compounds

Naming Binary Compounds

Steps for Naming Ionic Compounds

* 1) Double check that you have a metal and non-metal.
* 2) Write the name of the metal first.
* 3) Follow that by the name of the non-metal using the suffix -'ide'

* Examples on board

Now you try . . .

* Select the correct formula for each of the following ionic compounds.
* A. sodium oxide
    * 1) NaO 2) Na_2O 3) NaO_2
* B. aluminum chloride
    * 1) $AlCl_3$ 2) AlCl 3) Al_3Cl
* C. What is the name of LiF?

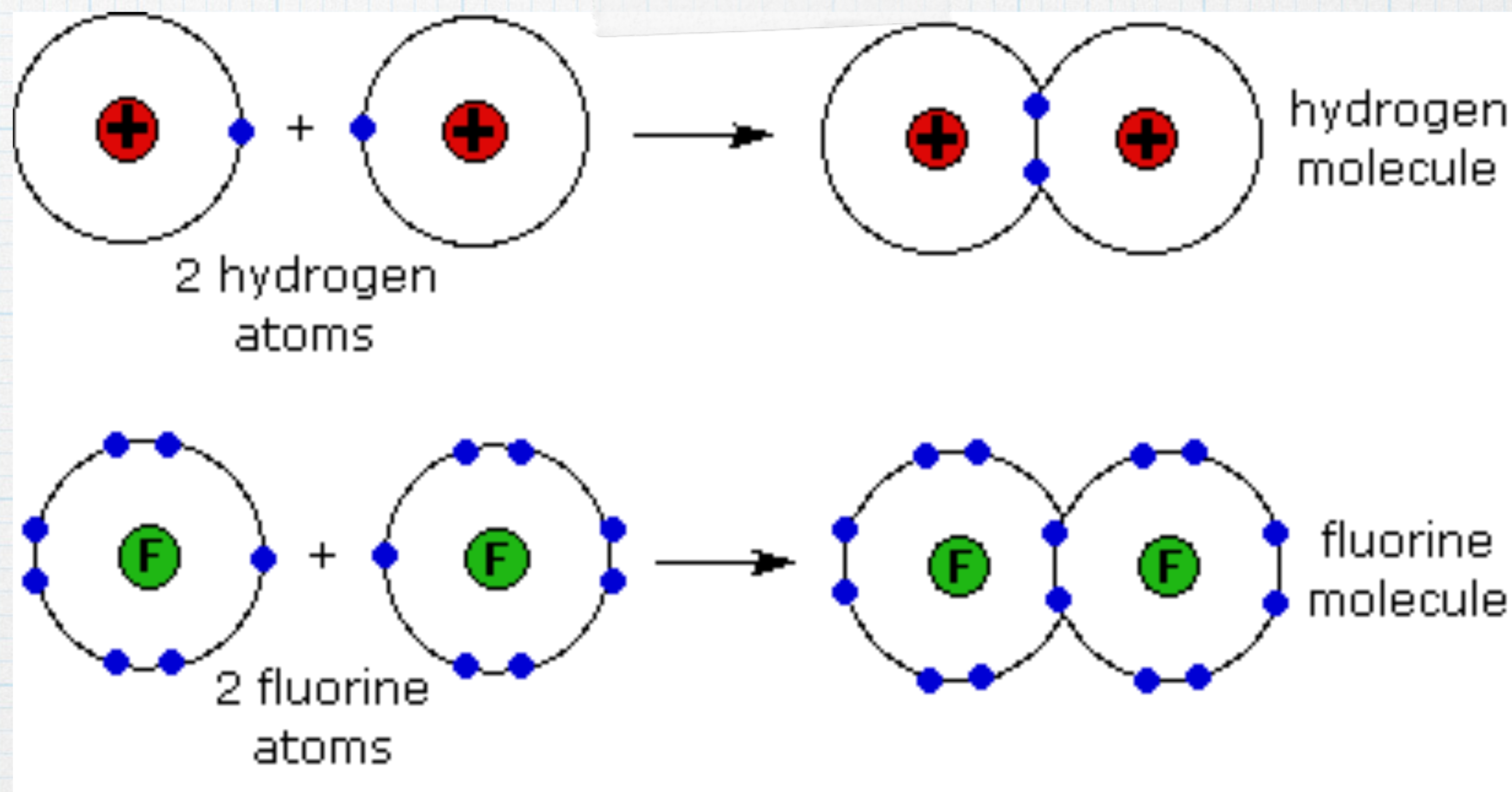
Molecular Compounds

Molecular Compounds

* A pure substance formed from two or more NON-METALS

Covalent Compounds

* Non-metals share electrons to get a full outer shell
* This creates a covalent bond = a bond that results from the sharing of outer electrons between non-metal atoms



Naming

* Can't use charges to figure out how many of each atom.
* Elements in the name are given prefixes corresponding to the subscripts (number of atoms) and the second element is given the suffix "-ide."
  * e.g. CO_2 is carbon dioxide, while CO is carbon monoxide

The Prefixes

Number	Prefix
1	mono*
2	di
3	tri
4	tetra
5	penta
6	hexa
7	hepta
8	octa
9	nona
10	deca

* The 1st element in the name never need a mono-

Examples

* Try the following:
* OF_4
* N_2O
* Cl_2O_7

Examples

* Try the following:
* OF_4
  * Oxygen tetraflouride
* N_2O
  * dinitrogen monoxide
* Cl_2O_7
  * dichlorine heptoxide

Examples

* iodine trichloride
* diphosphorus pentoxide
* sulphur hexaiodide

Examples

* iodine trichloride
  * ICl_3
* diphosphorus pentoxide
  * P_2O_5
* sulphur hexaiodide
  * SI_6

Diatomic Elements

Diatomic Elements

- Diatomic Elements: Cannot be found by themselves without being bound to something.
  - Example: 'O' does not exist in nature, but O_2 and H_2O do.

- HOFBrINCl
  - Acronym we use to represent diatomic elements
  - H_2, O_2, F_2, Br_2, I_2, N_2, Cl_2

Diatomic Gases

* HOFBrI NCl
  * are called simply the name of element + "gas"