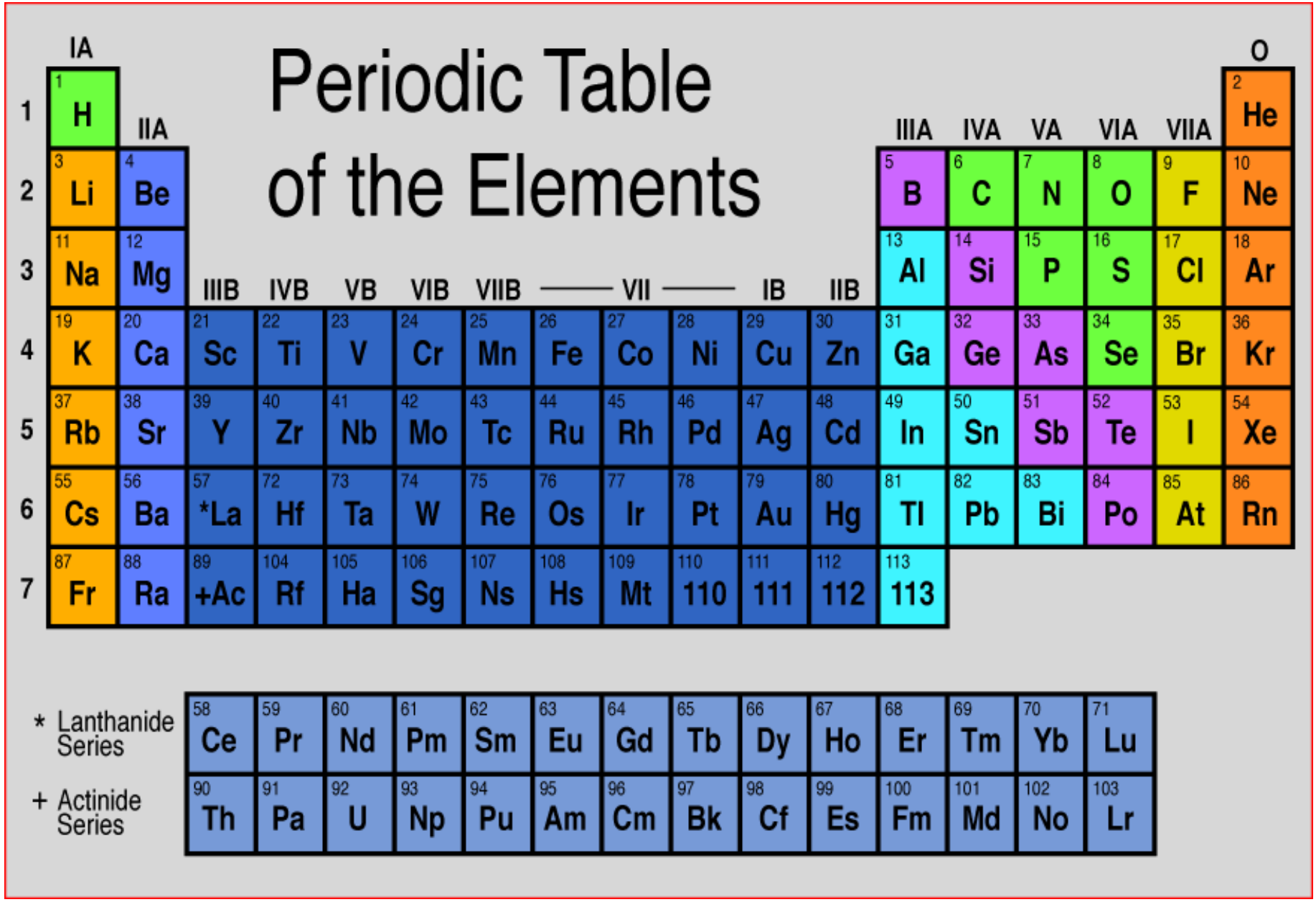
PERIODIC TABLE AEROBICS!



BINARY IONIC COMPOUNDS Binary means 2!

Properties of Ionic compounds:

- Are **electrolytes:** conduct electricity when dissolved in water
  - This is because of the ions!
    Metal Cations (+) and Nonmetal Anions (-)
- Have **Electrostatic attractions:**
  - From the + and - ions
  - This gives them STRONG bonds called a **crystal lattice**
  - This makes them HARD!

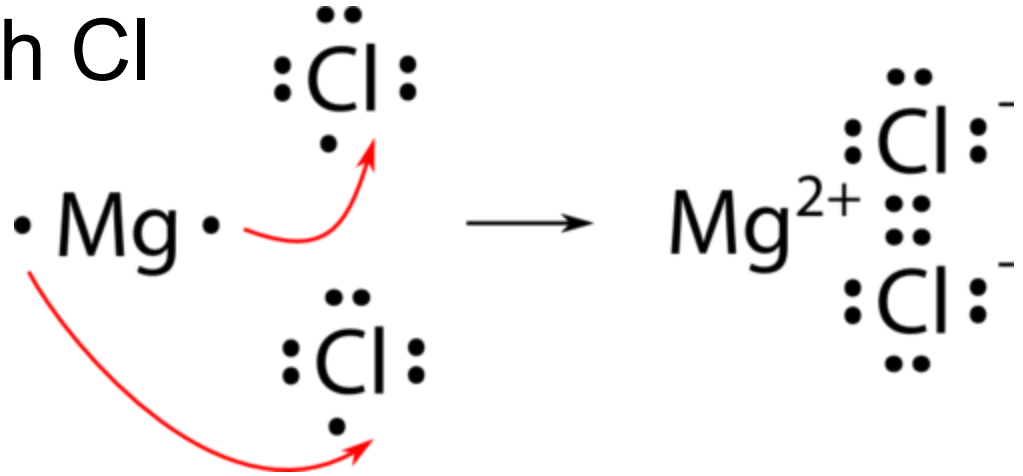
- Have **Strong Bonds:**
  - Require lots of energy to break
  - Causes high melting/boiling points
- Have **crystal structures**
  - depend on the elements being bonded
  - They must combine to form neutral compounds!
    - Ex. $CaBr_2$ is from the combination of

      1 Ca^{2+} cation & 2 Br^- anions

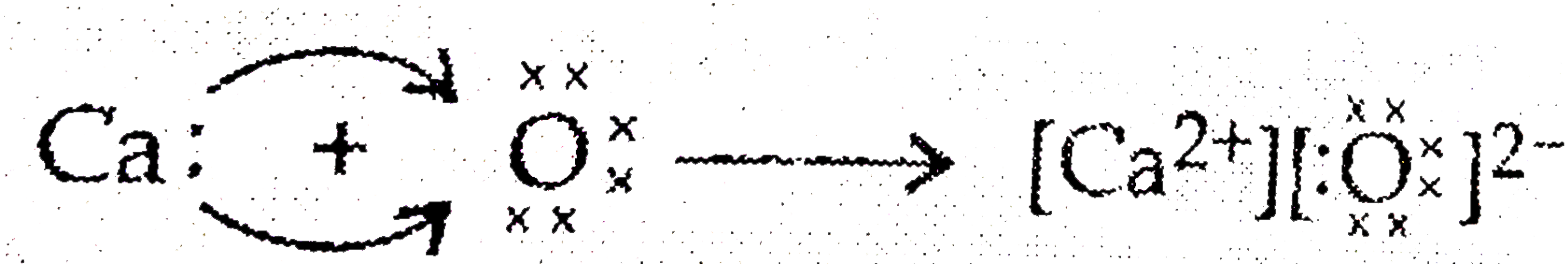
DRAWING IONIC COMPOUNDS:

(for each of the following ion pairs DRAW how the ionic compounds are made and then write the formula) First write the Lewis structures and then make sure they are neutral.

1.) Mg with Cl



2.) Ca with O



3.) Cs with I

4.) Mg with P

Shortcut to figure out the formula…

Example with Na_2S

1. First write down the charge (oxidation number) of each ion

   Na: Na^+

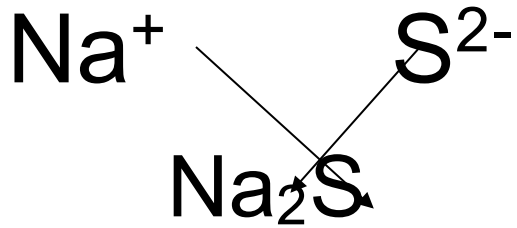
   S: S^{2-}

2. Write the two symbols side by side, with the cation first

   $Na^+ S^{2-}$

3. Make a neutral compound by making sure that the charges are equal.

- If the charges don't balance out then do **criss-cross** (only numbers) and reduce the numbers to simplest ratio because that is how ionic formula units arrange themselves!



Look at these examples:

1. Mg bonded with O

Mg: Mg^{2+}

O: O^{2-}

Mg^{2+} O^{2-}

Mg_2O_2

Recall we simplify the ratio, so it will be: MgO

2. Mg with F

Mg: Mg^{2+}

F: F^-

Mg^{2+} F^-

MgF_2

To create a neutral ionic compound, for every 1 Mg 2 fluoride ions are needed to bond : MgF_2

Try these:

3. Al with O

4. Sr with Cl

Naming Binary (only 2 elements) Ionic Compounds

1. First write the cation, then the anion.
2. The cation is named after its parent element. (i.e. Na^+ is called sodium)
3. For the anion take the first part of the parent element's name, drop the ending and add –ide (i.e. Cl^- would be chloride)

Some Examples

1.) KCl

- Potassium chloride

2.) $CaBr_2$

- Calcium bromide

3.) SrS

strontium sulfide

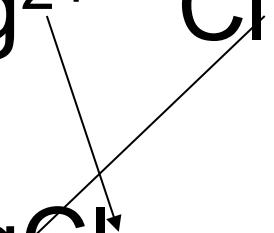
4.) $AlBr_3$

aluminum bromide

When writing the formula from the name, first write the ions (cation first, then anion) and then the formula

Example: Magnesium chloride

Mg^{2+} Cl^-



$MgCl_2$

Write the formulas for the main group binary compounds

1.) aluminum oxide

2.) magnesium phosphide

3.) Calcium oxide

4.) lithium sulfide

What about metals that are not in A-Groups?? How do we know the charge??

Many cations in the f/d blocks can have multiple charges. (ex. Fe can be Fe^{2+} or Fe^{3+})

- We differentiate the charge by using roman numerals. This is called the STOCK SYSTEM!
  - Fe^{2+} = iron(II)
  - Fe^{3+} = Iron(III)

TABLE 2.4 Common Cations

Charge	Formula	Name	Formula	Name
1+	H^+	Hydrogen ion	NH_4^+	Ammonium ion
	Li^+	Lithium ion	Cu^+	Copper(I) or cuprous ion
	Na^+	Sodium ion		
	K^+	Potassium ion		
	Cs^+	Cesium ion		
	Ag^+	Silver ion		
2+	Mg^{2+}	Magnesium ion	Co^{2+}	Cobalt(II) or cobaltous ion
	Ca^{2+}	Calcium ion	Cu^{2+}	Copper(II) or cupric ion
	Sr^{2+}	Strontium ion	Fe^{2+}	Iron(II) or ferrous ion
	Ba^{2+}	Barium ion	Mn^{2+}	Manganese(II) or manganous ion
	Zn^{2+}	Zinc ion	Hg_2^{2+}	Mercury(I) or mercurous ion
	Cd^{2+}	Cadmium ion	Hg^{2+}	Mercury(II) or mercuric ion
			Ni^{2+}	Nickel(II) or nickelous ion
			Pb^{2+}	Lead(II) or plumbous ion
			Sn^{2+}	Tin(II) or stannous ion
3+	Al^{3+}	Aluminum ion	Cr^{3+}	Chromium(III) or chromic ion
			Fe^{3+}	Iron(III) or ferric ion

Some Examples

1.) *MnF_2

- Manganese (II) fluoride

2.) *PbS

- Lead (II) sulfide

3.) Cobalt(III) chloride → Use criss-cross

- $CoCl_3$

4.) tin (IV) bromide

- $SnBr_4$

Ahh Transition Metals-
Name to formula is pretty easy but formula to name is a bit more involved….

- To figure out the name from the formula you have to use the anion!
- Ex. Fe_2O_3 → iron (??) oxide
  - Oxygen is predictable → O^{-2}
  - Iron is variable → Fe^{+x}
  - I use an equation equal to zero

Cation Subscript(cation charge) + Anion subscript(anion charge) = 0

$$2(x) + 3(-2)=0 \rightarrow 2x= 6 \rightarrow x=3$$

So… Fe in this case is +3 and this is

Iron (III) oxide!

Cation Subscript(cation charge) + Anion subscript(anion charge) = 0

Let's Practice

1) CuO

2) VS_2

3) Pb_3P_2

4) MnN

Cation Subscript(cation charge) + Anion subscript(anion charge) = 0

Here are my solutions!!!

1) CuO

1(x) + 1(-2) = 0

Solve for x

X= +2

Copper (II) oxide

2) VS_2

1(x) + 2(-4) = 0

Solve for x

X= +4

Vanadium (IV) sulfide

3) Pb_3P_2

3(x) + 2(-3) = 0

Solve for x

X= +2

Lead (II) phosphide

4) MnN

1(x) + 2(-3) = 0

Solve for x

X= +3

Manganese (III) Nitride