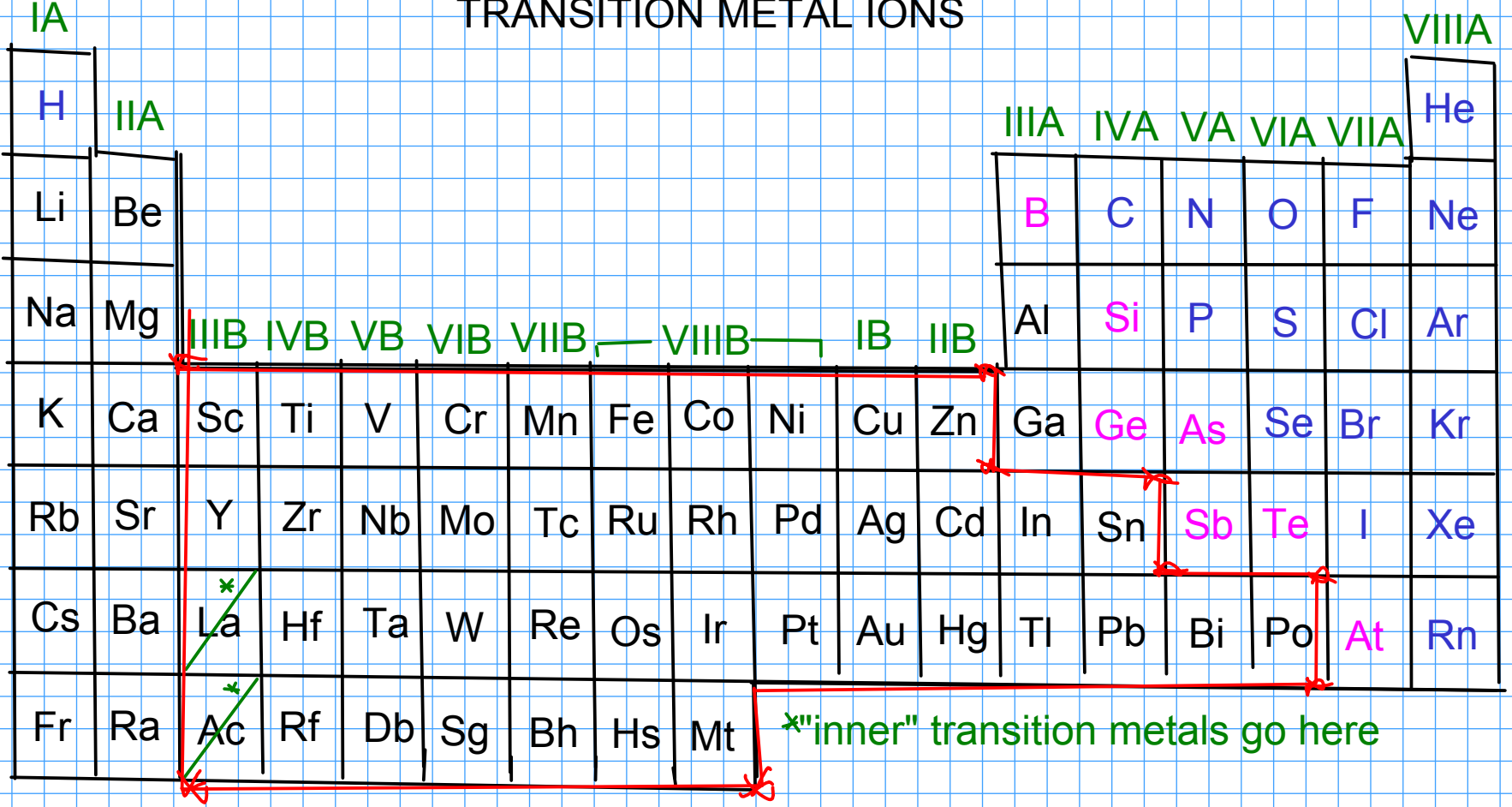
TRANSITION METAL IONS



The transition metals always form CATIONS!

However, many transition metals are capable of forming SEVERAL DIFFERENT CATIONS!

Example: Iron (Fe) forms two cations, depending on the situation: Fe^{2+} or Fe^{3+}

TRANSITION METAL CATIONS

- So how do you know which cation you're dealing with? For now, you'll have to be told

- Either the chemical formula of an ionic compound or the name of an ionic compound can tell you what charge is on the transition metal cation.

Examples:

Fe_3N_2

Fe^{2+} N^{3-}

Fe^{2+} N^{3-}

Fe^{2+}

+6 −6

FeN

Fe^{3+} N^{3-}

+3 −3

POLYATOMIC IONS

- Some MOLECULES can gain or lose electrons to form CATIONS or ANIONS. These are called POLYATOMIC IONS

- Polyatomic ions form ionic compounds in the same way that single-element ions do.

Example: CO_3^{2-} : carbonate ion

Al^{3+} CO_3^{2-}

Al^{3+} CO_3^{2-}

CO_3^{2-}

$Al_2(CO_3)_3$

YOU MUST MEMORIZE THE NAMES AND FORMULAS OF THE MOST COMMON POLYATOMIC IONS. CHECK THE COURSE WEB SITE FOR A LIST!

NAMES OF IONS

- To properly discuss ions and ionic compounds, we have to know how to name them!

CATIONS

3 kinds:

1. Main group cations (metals that take only one charge when forming ions)

   - The element's name is the same as the ion's name!

   Mg^{2+}: "magnesium ion"

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2. Transition metal cations (from metals that can form several cations)

   - The CHARGE of the cation must be given. Use a ROMAN NUMERAL after the element name to indicate charge!

   Fe^{2+}: "iron(II) ion"

   Cu^{+}: "copper(I) ion"

   Fe^{3+}: "Iron(III) ion"

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3. Polyatomic cations

   - Memorize list.

   NH_4^+: "ammonium ion"

ANIONS

2 kinds

1. Main-group nonmetals

- Use the STEM NAME of the element, then add "-ide" suffix

N^{3-} : "nitride" ion P^{3-} : "phosphide ion" S^{2-} : sulfide ion

O^{2-} : "oxide ion" F^{-} : "fluoride ion"

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2. Polyatomic ions

- Memorize list.(see web site, also see Ebbing/Wentworth p133)

$C_2H_3O_2^{-}$: "acetate ion" SO_4^{2-} : "sulfate ion"

NO_3^{-} : "nitrate ion" SO_3^{2-} "sulfite ion"

NO_2^{-} : "nitrite ion"

NAMING IONIC COMPOUNDS

- The name of the compound is based on the name of the ions in the compound
- Cation first, anion second

Examples:

$Mg(OH)_2$

magnesium hydroxide

Fe_2O_3

iron(III) oxide

$Fe^{3+}\ O^{2-}$

$Fe^{3+}\ O^{2-}$

O^{2-}

$+6\ \ -6$

Na_2S

sodium sulfide

CuO

copper(II) oxide

$Cu^{2+}\ O^{2-}$

$+2\ \ -2$

$BeBr_2$

beryllium bromide

Cu_2O

copper(I) oxide

$Cu^{+}\ O^{2-}$

Cu^{+}

$+2\ \ -2$

Remember to include the Roman numeral for charge in the name of transition metal compounds!