

PREDICTING CHARGE

										VIII A								
IA											III A	IV A	VA	VI A	VII A	VIII A		
H	Li	Be											B	C	N	O	F	Ne
Na	Mg	Al	Si	P	S	Cl	Ar											
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr	
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe	
Cs	Ba	La*	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn	
Fr	Ra	Ac*	Rf	Db	Sg	Bh	Hs	Mt	*inner transition metals go here									

You can reliably determine the charge using our method for Groups IA, IIA, IIIB, Aluminum, and the Group VA, VIA, and VIIA NONMETALS

Aluminum (Al): At atomic number 13, it is three electrons away from neon (Ne), and 5 electrons away from argon (Ar). Prediction: Aluminum will lose three electrons to form the cation Al^{3+}

Bromine (Br): At atomic number 35, bromine is one electron away from krypton (Kr). Prediction: Bromine will gain one electron to form the anion Br^-

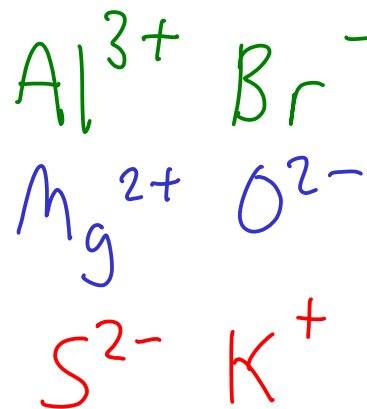
Strontium (Sr): At atomic number 38, strontium is two electrons away from krypton. Prediction: Strontium will lose two electrons to form the cation Sr^{2+}

EXAMPLES

IA		EXAMPLES										VIII A						
IA	IIA											IIIA	IVA	VA	VIA	VIIA	VIIIA	
H	Li	Be											B	C	N	O	F	He
Na	Mg											Al	Si	P	S	Cl	Ar	
		IIIB	IVB	VB	VIB	VII B	VIII B		IB	IIB								
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr	
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe	
Cs	Ba	La*	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn	
Fr	Ra	Ac*	Rf	Db	Sg	Bh	Hs	Mt	*"inner" transition metals go here									

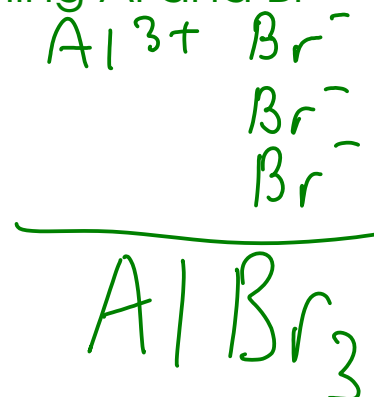
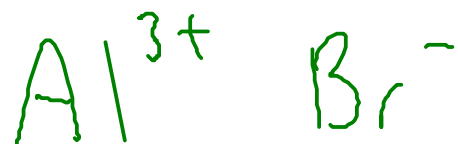
Find the formulas of:

- (1) an ionic compound containing Al and Br
- (2) an ionic compound containing Mg and O
- (3) an ionic compound containing S and K



Find the formula of:

* an ionic compound containing Al and Br



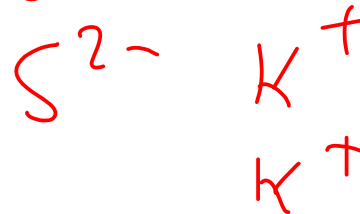
Find the formula of:

* an ionic compound containing Mg and O



Find the formula of:

* an ionic compound containing S and K



Remember, use the



TRANSITION METAL IONS

IA		TRANSITION METAL IONS										VIII A						
IA	IIA	IIIB	IVB	VB	VIB	VIIB	VIII B			IB	IIB	IIIA	IVA	VA	VIA	VIIA	VIII A	
H	Li	Be															He	
Li	Be												B	C	N	O	F	Ne
Na	Mg												Al	Si	P	S	Cl	Ar
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr	
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe	
Cs	Ba	La*	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn	
Fr	Ra	Ac*	Rf	Db	Sg	Bh	Hs	Mt	*"inner" transition metals go here									

The transition metals always form CATIONS!

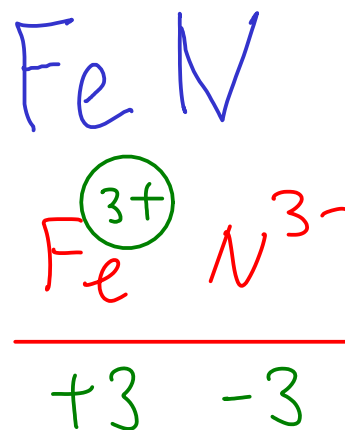
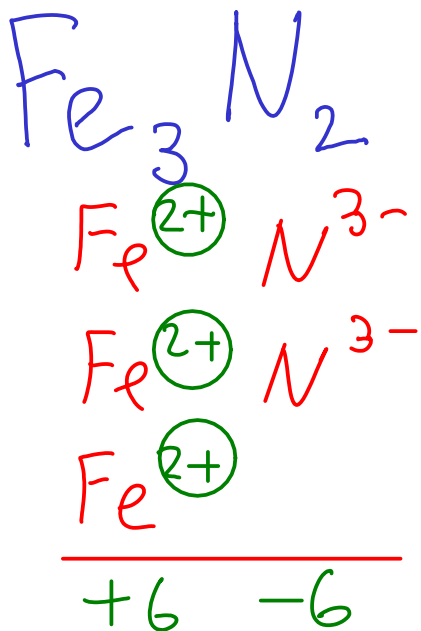
However, many transition metals are capable of forming SEVERAL DIFFERENT CATIONS!

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:



* The iron ions in this compound have a charge of +3. We call them "iron(III)" ions ... pronounced "iron three". This compound is called "iron(III) nitride"

* The iron ions in this compound have a charge of +2. We call them "iron(II)" ions ... pronounced "iron two". This compound is called "iron(II) nitride"

POLYATOMIC IONS

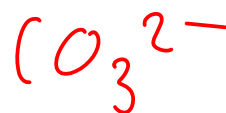
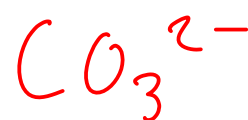
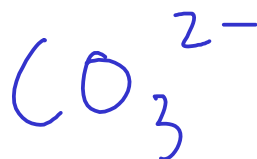
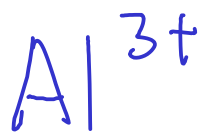
- Some MOLECULES can gain or lose electrons to form CATIONS or ANIONS. These are called POLYATOMIC IONS

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

Example: CO_3^{2-} : CARBONATE ION

* Compare
to
 Al_2O_3

from
 Al^{3+} O^{2-}



* Use parenthesis when an ionic compound's formula contains more than one of a polyatomic ion.

See the web site or page 63 - table 2.5 (9th ed) or table 2.6 (10th ed) - for a list of common polyatomic ions! p64 $\xrightarrow{\uparrow}$

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!



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!



③ Polyatomic cations

- Memorize list.



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"

②

Polyatomic ions

- Memorize list.(see web site)

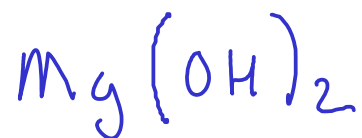
 $\text{C}_2\text{H}_3\text{O}_2^-$: "acetate ion" SO_4^{2-} : "sulfate ion" NO_3^- : "nitrate ion" SO_3^{2-} "sulfite ion" NO_2^- : "nitrite ion"

* Polyatomic ions ending in "-ate" and "-ite" suffixes always contain oxygen! "-ate" ions have more oxygen atoms than their "-ite" counterparts.

NAMING IONIC COMPOUNDS

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

Examples:



magnesium hydroxide



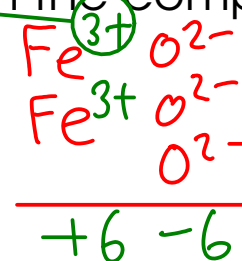
sodium sulfide



beryllium bromide



iron(III) oxide



* Remember to include the Roman numeral for CHARGE when you're writing transition metal compound names!

Page 63 (9th edition): Chart of polyatomic ions

Page 64 (10th edition)