

All metals want to be positive
 All negative want to be negative

	<u>Oxidation State</u>
Group 1A	+1
Group 11A	+2
Group VIA	-2
Group VIIA	-1

Cations are formed when an atom loses one or more electrons and the atom has more protons than electrons.

- Example: $X \rightarrow X^{+} + e^{-}$ or $X \rightarrow X^{2+} + 2e^{-}$

Names of simple positive ions (cations) which only form one cation are derived from the name of the element the atom belongs to and adding the word -ion on the end.

- Example: Sodium forms Na^{+} and become sodium ion.

Works for all cation which only form a single common ion.

Forming more than one Cation:

If the element forms more than one commonly found ion, the charge of the ion must be given in the name.

- Example: Lead loses 4 electrons to form Pb^{4+} and becomes lead(IV) ion. If it loses 2 electrons Pb^{2+} and becomes lead(II) ion

Roman Numerals:

I	=	1	VI	=	6
II	=	2	VII	=	7
III	=	3	VIII	=	8
IV	=	4	IX	=	9
V	=	5	X	=	10

Ion	Modern name	Old name
Pb^{2+}	= lead(II) ion	= plumbous ion
Pb^{4+}	= lead(IV) ion	= plumbic ion
Fe^{2+}	= iron(II) ion	= ferrous ion
Fe^{3+}	= iron(III) ion	= ferric ion
Cu^{1+}	= copper(I) ion	= cuprous ion
Cu^{2+}	= copper(II) ion	= cupric ion

Commonly found lowest charge formed ends in -ous

Commonly found highest charge formed ends in -ic

Old names are mostly used in literature

Anions are formed when atoms have more electrons than protons so the overall charge on an atom becomes negative.

- Example: $X + e^- \rightarrow X^-$ or $X + 2e^- \rightarrow X^{2-}$

Naming Anions:

Names of elements or multi-atomic species forming only one anion the root name of the element but replace ending with -ide

- Example: $Cl + e^- \rightarrow Cl^-$ Chlorine \rightarrow Chloride
- $CN^- \rightarrow$ Cyanide
- $OH^- \rightarrow$ Hydroxide

Most anions are termed complex ions. Complex ions are composed of many atoms.

- Example:



A complex ion: group of atoms with their over all charge that when dissolved in water stays together in a single charged unit.

- Example:



Naming Polyatomic Ions:

1. Ions with the suffixes **-ate** and **-ite** contain oxygen atoms.

Ex: nitrate NO_3^- and nitrite NO_2^-

An ion with the suffix **-ite** has one fewer oxygen atom than a corresponding ion with the suffix **-ate**

Ex: sulfate SO_4^{2-} sulfite SO_3^{2-}

2. The prefix **bi-** for polyatomic ions means a single hydrogen is present, it does not mean two.

Ex: bicarbonate ion HCO_3^- = hydrogen carbonate
bisulfate ion HSO_4^- = hydrogen sulfate

3. An anion with the prefix **per-** contains one more oxygen atom than the corresponding **-ate** without the prefix.

Ex: chlorate ion ClO_3^-
perchlorate ion ClO_4^-

4. An anion with the prefix *hypo-* (Greek for under) contains **one less oxygen atom** than the corresponding **-ite** ion without the prefix.

Hypochlorite ion ClO^- and chlorite ion ClO_2^-

5. The prefix **thio** identifies the presence of sulfur in place of an oxygen.

sulfate ion SO_4^{2-} and **thiosulfate** $\text{S}_2\text{O}_3^{2-}$

and Cyanate ion OCN^- and **thiocyanate** SCN^-

Some common anions

1- Anions		2- Anions		3- & 4- Anions	
Peroxide	O_2^{2-}	Oxide	O^{2-}	Nitride	N^{3-}
Hydride	H^-	Sulfide	S^{2-}	Phosphide	P^{3-}
Iodide	I^-	Selenide	Se^{2-}	Arsenide	As^{3-}
Hydroxide	OH^-	Peroxide	O_2^{2-}	Carbide	C^{4-}
Hydrogen carbonate	HCO_3^-	Carbonate	CO_3^{2-}		
Hydrogen sulfate	HSO_4^-	Sulfate	SO_4^{2-}	Phosphate	PO_4^{3-}
Hydrogen sulfite	HSO_3^-	Sulfite	SO_3^{2-}	Phosphite	PO_3^{3-}
Acetate	CH_3COO^-	Thiosulfate	$\text{S}_2\text{O}_3^{2-}$		
Perchlorate	ClO_4^-				
Chlorate	ClO_3^-	Oxalate	$\text{C}_2\text{O}_4^{2-}$		
Chlorite	ClO_2^-	Chromate	CrO_4^{2-}		
Hypochlorite	ClO^-	Dichromate	$\text{Cr}_2\text{O}_7^{2-}$		

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Names & Formulas of Ionic Compounds:

Rule 1: For any ionic compound the total charge of all positive ions (cations) must equal the total charge of all negative ions (anions).

Rule 2: The Cation is Named First, the Anion is Named Second.

Example: Na^+ and Cl^-

We know that to form a compound charges must balance. So by inspection; $+1 + (-1) = 0$

so the formula is NaCl

The name is *sodium chloride*

NaClO = sodium hypochlorite

CsSCN = cesium thiocyanate