

Determine the oxidation number for each of the elements in the following molecules and ions.

- | | |
|---|--|
| 1. $\text{Ca}(\text{OH})_2$ <u>$\text{Ca}=+2$ $\text{O}=-2$ $\text{H}=+1$</u> | 11. $\text{Ba}(\text{BrO}_3)_2$ <u>$\text{Ba}=+2$ $\text{Br}=+5$ $\text{O}=-2$</u> |
| 2. $\text{Bi}(\text{NO}_3)_3$ <u>$\text{Bi}=+3$ $\text{N}=+5$ $\text{O}=-2$</u> | 12. NaAsO_2 <u>$\text{Na}=+1$ $\text{As}=+3$ $\text{O}=-2$</u> |
| 3. $\text{Ca}(\text{ClO})_2$ <u>$\text{Ca}=+2$ $\text{Cl}=+1$ $\text{O}=-2$</u> | 13. $\text{Pb}(\text{Cr}_2\text{O}_7)$ <u>$\text{Pb}=+2$ $\text{Cr}=+6$ $\text{O}=-2$</u> |
| 4. $\text{K}(\text{MnO}_4)$ <u>$\text{K}=+1$ $\text{Mn}=+7$ $\text{O}=-2$</u> | 14. $\text{Na}(\text{ClO}_4)$ <u>$\text{Na}=+1$ $\text{Cl}=+7$ $\text{O}=-2$</u> |
| 5. $\text{Na}_2(\text{CrO}_4)$ <u>$\text{Na}=+1$ $\text{Cr}=+6$ $\text{O}=-2$</u> | 15. MnO_2 <u>$\text{Mn}=+4$ $\text{O}=-2$</u> |
| 6. $\text{Cu}_2(\text{SO}_4)$ <u>$\text{Cu}=+1$ $\text{S}=+6$ $\text{O}=-2$</u> | 16. O_2 <u>$\text{O}=0$</u> |
| 7. Fe_2O_3 <u>$\text{Fe}=+3$ $\text{O}=-2$</u> | 17. $\text{Al}_2(\text{Cr}_2\text{O}_7)_3$ <u>$\text{Al}=+3$ $\text{Cr}=+6$ $\text{O}=-2$</u> |
| 8. $\text{Na}(\text{MnO}_4)$ <u>$\text{Na}=+1$ $\text{Mn}=+7$ $\text{O}=-2$</u> | 18. $\text{Mn}(\text{NO}_3)_2$ <u>$\text{Mn}=+2$ $\text{N}=+5$ $\text{O}=-2$</u> |
| 9. Cl_2 <u>$\text{Cl}=0$</u> | 19. KClO <u>$\text{K}=+1$ $\text{Cl}=+1$ $\text{O}=-2$</u> |
| 10. $\text{Sb}_2(\text{SO}_4)_3$ <u>$\text{Sb}=+3$ $\text{S}=+6$ $\text{O}=-2$</u> | 20. FeCO_3 <u>$\text{Fe}=+2$ $\text{C}=+4$ $\text{O}=-2$</u> |

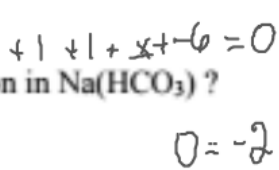
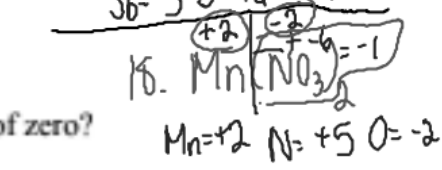
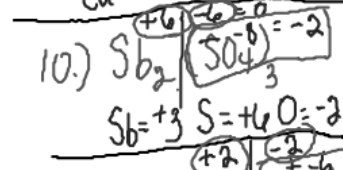
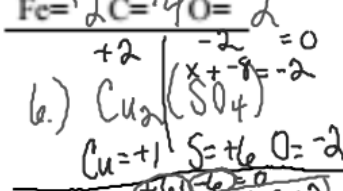
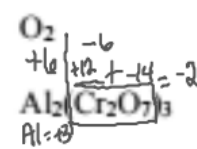
- 4 21. What is the oxidation number of chromium in $\text{K}_2\text{Cr}_2\text{O}_7$?
 (1) +12 (3) +3
 (2) +2 (4) +6

- 2 22. In which substance is the oxidation number of Cl equal to +1?
 (1) Cl_2 (3) AlCl_3
 (2) Cl_2O (4) HClO_2

- 4 23. In which substance does hydrogen have an oxidation number of zero?
 (1) LiH (3) H_2S
 (2) H_2O (4) H_2

- 4 24. In which compound does carbon have an oxidation state of -4?
 (1) CO (3) CCl_4
 (2) CO_2 (4) CH_4

- 4 25. What is the oxidation number of carbon in $\text{Na}(\text{HCO}_3)$?
 (1) -2 (3) -4
 (2) +2 (4) +4

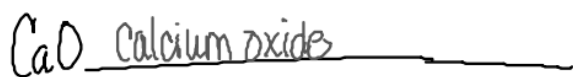


Ionic Compounds

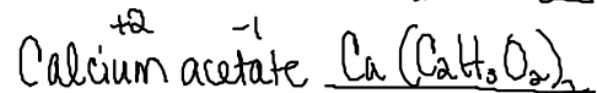
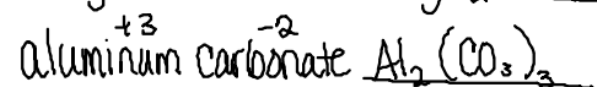
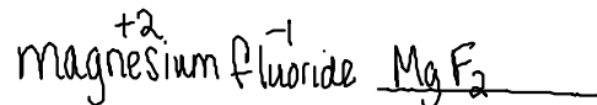
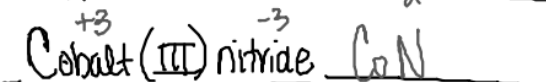
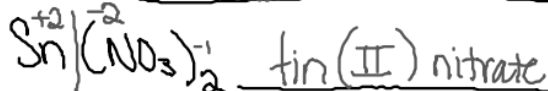
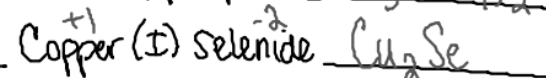
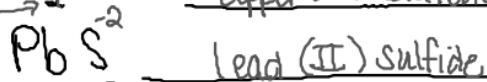
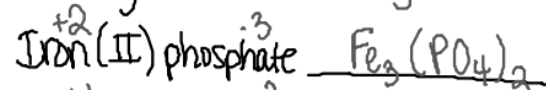
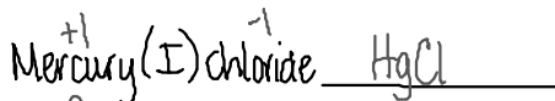
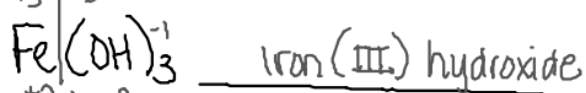
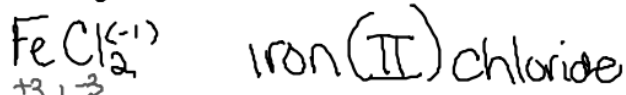
To name say the name of the metal + nonmetal ending with -ide

or

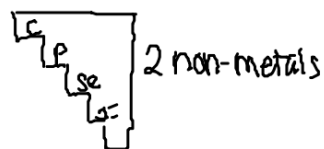
Say the name of the metal + the polyatomic ion.



+2 -2



Binary Non-metallic Compounds (covalent)



The name is a set of directions: the prefix = subscript

H_2O dihydrogen monoxide

CF_4 carbon tetrafluoride

CO_2 carbon dioxide

CO carbon monoxide

PBr_3 phosphorous tri bromide

Dibromine tetroxide Br_2O_4

CS_2 carbon disulfide

Phosphorous triiodide PI_3

Cl_2O_7 dichlorine hepta oxide

Tetrasulfur tetranitride S_4N_4

SiO_2 silicon dioxide

sulfur hexafluoride SF_6

N_2O_5 dinitrogen pentoxide

~~dibromide~~ monoxide Br_2O

nomenclature - the process of naming a compound

More about POLYATOMIC IONS

Acetate $C_2H_3O_2^{1-}$	Sulfate SO_4^{2-}	Phosphate PO_4^{3-}
Chlorate ClO_3^{1-}	Carbonate CO_3^{2-}	
Nitrate NO_3^{1-}	Peroxide O_2^{2-}	
Cyanide CN^{1-}		Ammonium NH_4^+
hydroxide OH^{1-}		

Polyatomic Family Rules:

The prefix PER denotes adding another oxygen to -ate
 The suffix -ATE denotes the main poly all are based on
 The suffix -ITE denotes removing an oxygen from -ate
 The prefix HYPO denotes removing another oxygen

example: ClO_4^{1-} perchlorate
 * ClO_3^{1-} chlorate ← memorize
 ClO_2^{1-} chlorite
 ClO^{1-} hypochlorite
 Keep the same charge for all.

Practice: Complete for the nitrate family

- NO_4^{1-} _____
- NO_3^{1-} _____
- NO_2^{1-} _____
- NO^{1-} _____

IONIC COMPOUNDS

The name consists of the name of the metal followed by the "-ide" form of the nonmetal or the name of the polyatomic ion.

Ex: MgO → magnesium oxide $Ca(C_2H_3O_2)_2$ → calcium acetate
 Practice:
 CaO calcium oxide $BaCl_2$ barium chloride
 $Al_2(CO_3)_3$ aluminium carbonate $(NH_4)_2(SO_4)$ ammonium sulfate



Compounds w/ Metals that have multiple Oxidation State

1st The oxidation state of the transition or inner transition metal must be found.

EX $\overset{+2}{\text{Fe}} | \overset{-2}{\text{Cl}_2}$ we know Cl has a 1- charge i.e. $2 \times 1- = 2-$ so that $\text{Fe} + (2-) = \text{zero}$
 $\text{Fe} = 2+$

2nd Record the name of the metal w/ the charge written in Roman Numerals, so from the example: Iron(II) Chloride

Practice:

Name the following compounds

- | | |
|---|--|
| 1.) $\overset{+3}{\text{Fe}}(\overset{-2}{\text{OH}})_3$ <u>iron(III) hydroxide</u> | $\overset{+2}{\text{Mg}}\overset{-1}{\text{I}}_2$ <u>magnesium iodide</u> |
| 2.) $\overset{+2}{\text{Cu}}(\overset{-2}{\text{SO}_4})$ <u>copper(II) sulfate</u> | $\overset{+3}{\text{Al}}(\overset{-1}{\text{C}_2\text{H}_3\text{O}_2)_3$ <u>aluminum acetate</u> |
| 3.) $\overset{+2}{\text{Pb}}\overset{-2}{\text{S}}_2$ <u>lead(II) sulfide</u> | $\overset{+3}{\text{Ni}}\overset{-2}{\text{O}}_3$ <u>nickel(III) oxide</u> |
| 4.) $\overset{+2}{\text{Sn}}(\overset{-1}{\text{NO}_3})_2$ <u>tin(II) nitrate</u> | $\overset{+6}{\text{W}}(\overset{-3}{\text{PO}_4})_2$ <u>tungsten phosphate</u> |

Write the formula for the following compounds.

- | | |
|-------------------------|---|
| 1.) Mercury(I) chloride | <u>Hg₂Cl₂</u> |
| 2.) Iron(II) phosphate | <u>Fe₃(PO₄)₂</u> |
| 3.) Copper(I) selenide | <u>Cu₂Se</u> |
| 4.) Cobalt(III) nitride | <u>CoN</u> |

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

Binary Compounds Containing Two Nonmetals

The nonmetal with the lower electronegativity is named 1st followed by the "-ide" form of the nonmetal w/ the higher electronegativity.

Example: dinitrogen monoxide = N₂O
 $\text{H}_2\text{O} \rightarrow$ dihydrogen monoxide CO_2 CO * Prefixes = subscript

Practice:

- | | |
|---|--|
| 1.) <u>PBr₃</u> phosphorous tribromide | 6.) <u>Br₂O₄</u> Dibromine tetroxide |
| 2.) <u>CS₂</u> carbon disulfide | 7.) <u>PI₃</u> Phosphorous triiodide |
| 3.) <u>Cl₂O₇</u> dichlorine heptoxide | 8.) <u>S₄N₄</u> Tetrasulfur tetranitride |
| 4.) <u>SiO₂</u> silicon dioxide | 9.) <u>SF₆</u> sulfur hexafluoride |
| 5.) <u>N₂O₅</u> dinitrogen pentoxide | 10.) <u>Br₂O</u> dibromide monoxide |