Write this into your supplemental packet opposite page 55

Ion, counter Ion - Ionic Salts & Acids (balancing of oxidation number)

In this powerpoint, the following will be reviewed:

1) Preferred ion charge called "oxidation number"
2) Lewis dot structures for the monoatomic ions The "ides" "be one" (C^{4-}, N^{3-}, O^{2-}, F^{1-}).
3) Lewis dot structures for the polyatomic ions "ates"($[PO_4]^{3-}$, $[SO_4]^{2-}$, $[ClO_4]^{1-}$)
4) Both anions (-ides and -ates) seek out positively charged cations (Na^{1+}, Ca^{2+}, Al^{3+}) to achieve a balance of zero in overall substance charge.

Where'd me m -ates

$[PO_4]^{3-}$, $[SO_4]^{2-}$, $[ClO_4]^{1-}$

rrR' - ides" "be one" (C^{4-}, N^{3-}, O^{2-}, F^{1-}).

Things to keep in mind when considering oxidation numbers:

1) Any atom in its elemental form [$\overset{o}{Na}(s)$, $\overset{o}{O_2}(g)$ $\overset{o}{Mg}(s)$, $\overset{o}{Cl_2}(g)$] has an oxidation number of zero

2) For monatomic ions, the oxidation number equals an ion's charge;

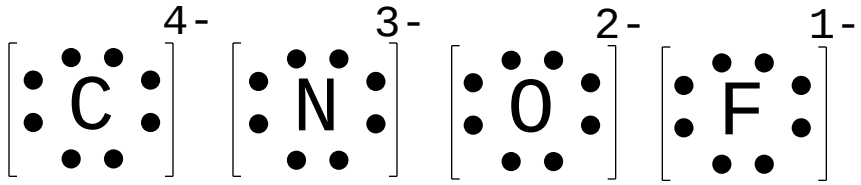
C^{4-} carbide ion $\quad N^{3-}$ nitride ion $\quad O^{2-}$ oxide ion $\quad F^{1-}$ fluoride ion

3) For polyatomic ions, the sum of the constituent atoms' oxidation numbers is equal to the charge of the ion;

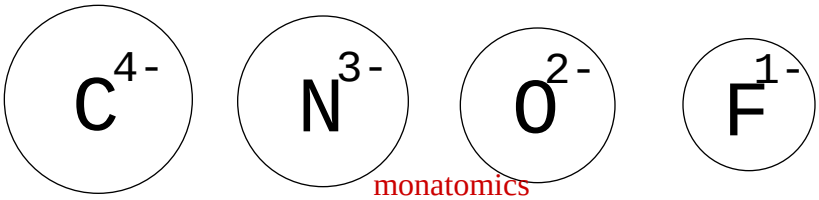
PO_4^{3-} phosphate ion $\quad SO_4^{2-}$ sulfate ion $\quad ClO_4^{1-}$ perchlorate ion

4) For neutral compounds, the sum of the constituent oxidation numbers is equal to zero.

Lewis dot structures for monatomics

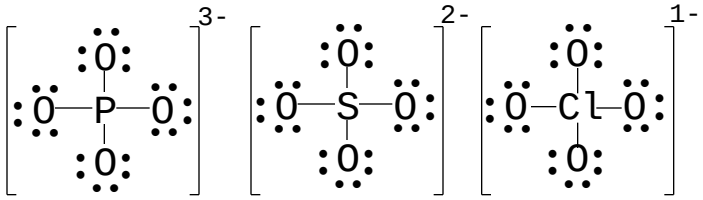


C^{4-} carbide ion $\quad N^{3-}$ nitride ion $\quad O^{2-}$ oxide ion $\quad F^{1-}$ fluoride ion



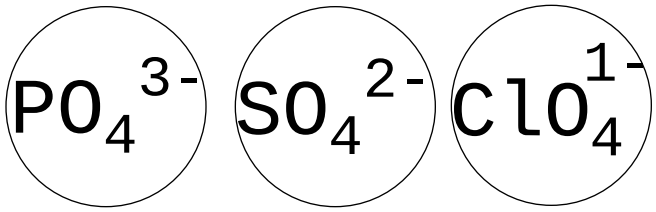
monatomics

Lewis dot structures for polyatomics



PO_4^{3-} SO_4^{2-} ClO_4^{1-}

phosphate ion sulfate ion perchlorate ion

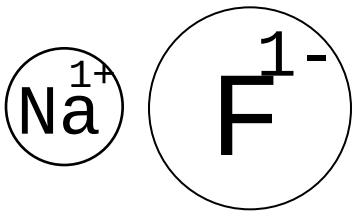


oxyanions

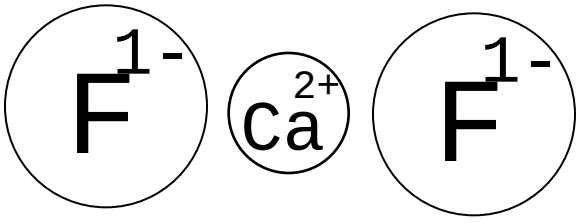
Balancing oxidation numbers in ionic salts

"Two atoms are walkng down the street…."(yes, we get the joke, DrG)

Draw a visual picture for the structure of sodium fluoride, NaF

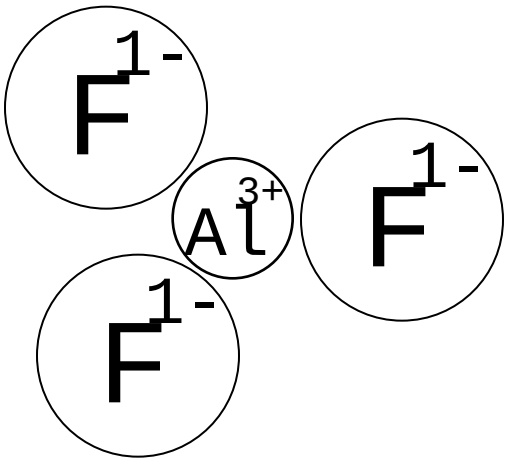


Draw a visual picture for the structure of calcium fluoride,CaF_2



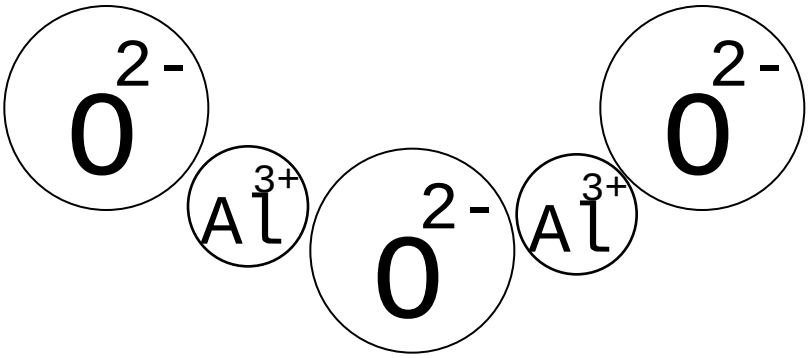
Balancing oxidation numbers in ionic salts

Draw a visual picture for the structure of aluminum fluoride, AlF_3



Balancing oxidation numbers in ionic salts

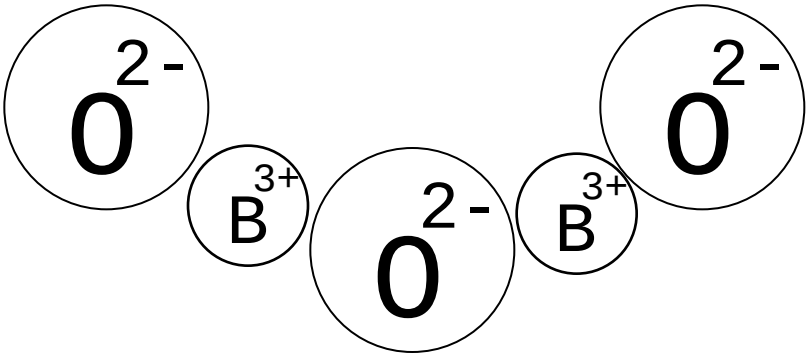
Draw a visual picture for the structure of aluminum oxide, Al_2O_3



Balancing oxidation numbers in ionic salts

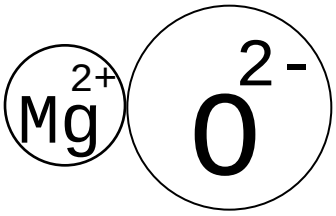
Can chemists have BO???????? No way, chemists have B_2O_3

Draw a visual picture for the structure of boron oxide, B_2O_3



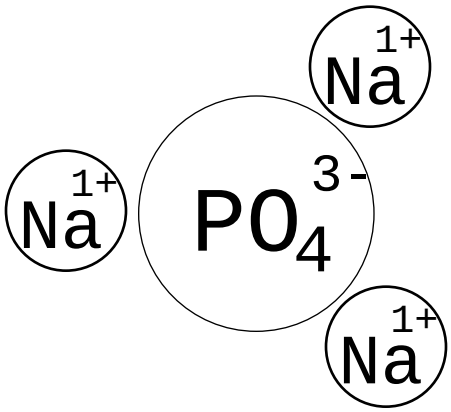
Balancing oxidation numbers in ionic salts

Draw a visual picture for the structure of magnesium oxide, MgO



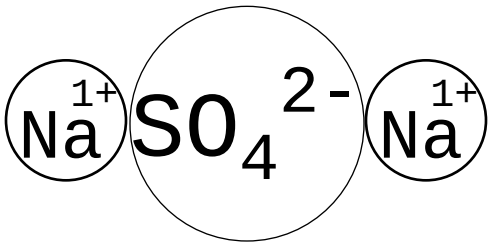
Balancing oxidation numbers in ionic salts

Draw a visual picture for the structure of sodium phosphate, Na_3PO_4



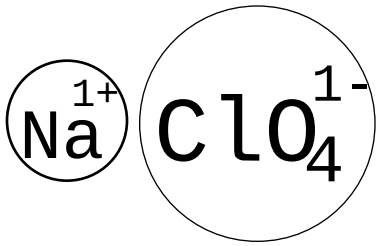
Balancing oxidation numbers in ionic salts

Draw a visual picture for the structure of sodium sulfate, Na_2SO_4



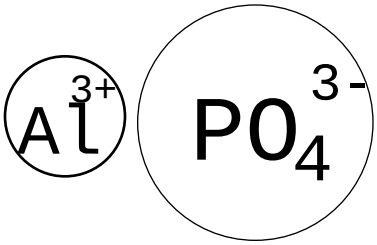
Balancing oxidation numbers in ionic salts

Draw a visual picture for the structure of sodium perchlorate, $NaClO_4$



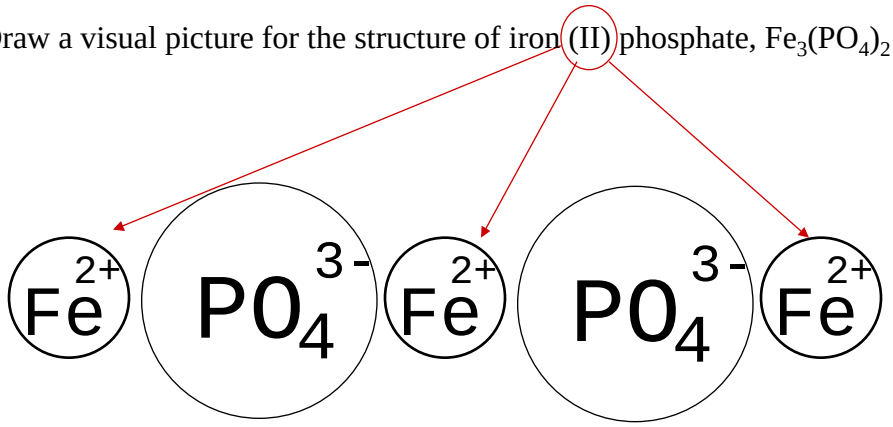
Balancing oxidation numbers in ionic salts

Does DrG feed his dog AlPO? No way, I feed him $AlPO_4$
Draw a visual picture for the structure of aluminum phosphate, $AlPO_4$



Balancing oxidation numbers in **Transition Metal** ionic salts

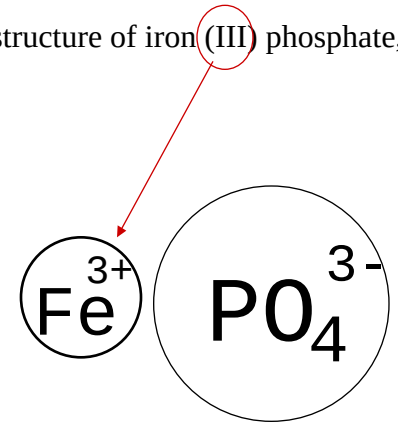
Draw a visual picture for the structure of iron (II) phosphate, $Fe_3(PO_4)_2$



Note, transition metal ionic salt names…..
Always use a roman numeral in its compound name
To represent the oxidation number for the TM ion

Balancing oxidation numbers in ionic salts

Draw a visual picture for the structure of iron (III) phosphate, $FePO_4$



Note, transition metal ionic salt names…..
Always use a roman numeral in its compound name
To represent the oxidation number for the TM ion

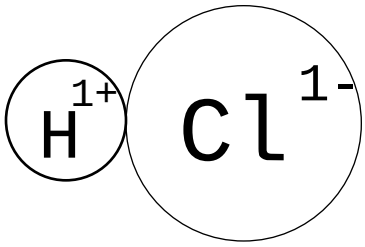
The acid proton, no electrons, no neutrons, JUST a proton

Draw a visual picture for the structure of a PROTON, H^+

Note, a substance with hydrogen listed first in its chemical formula (i.e. stomach acid, HCl) is a called an **acid**.

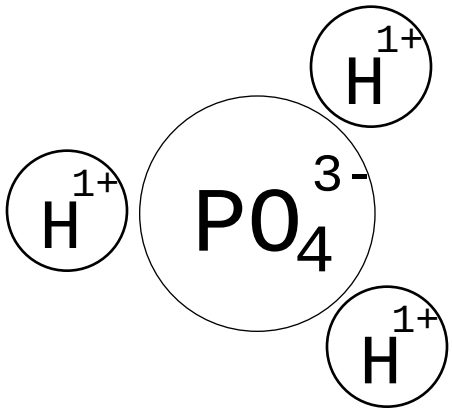
The acid proton, no electrons, no neutrons, JUST a proton

Draw a visual picture for the structure stomach acid, HCl,



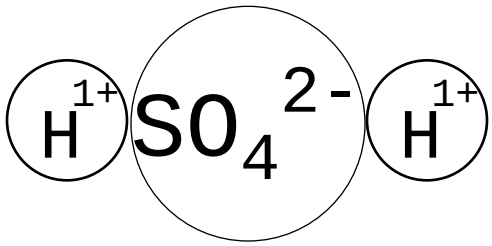
Balancing oxidation numbers in an oxyanion acid

Draw a visual picture for the structure of phosphoric acid, H_3PO_4



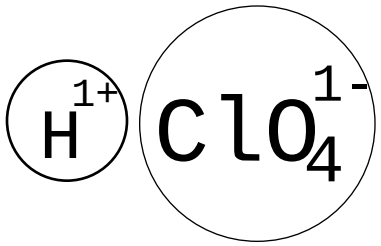
Balancing oxidation numbers in an oxyanion acid

Draw a visual picture for the structure of sulfuric acid, H_2SO_4



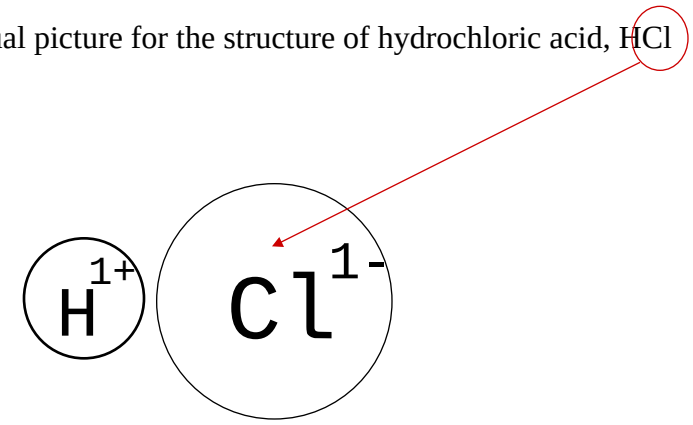
Balancing oxidation numbers in an oxyanion acid

Draw a visual picture for the structure of perchloric acid, $HClO_4$



Balancing oxidation numbers in an monatomic acid

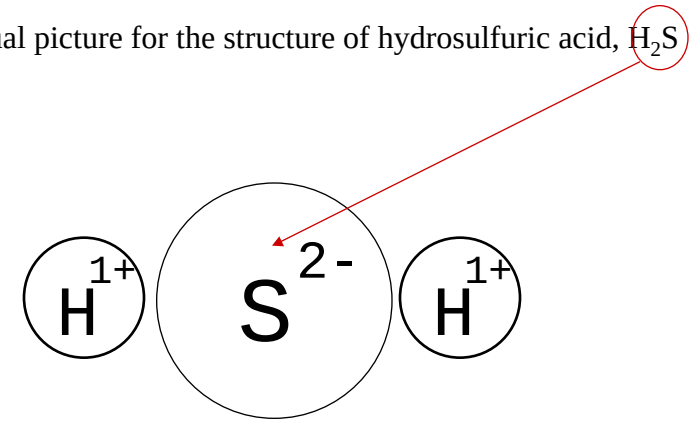
Draw a visual picture for the structure of hydrochloric acid, HCl



Note, use the word hydro if acid is a monatomic acid (i.e. stomach acid, HCl) is a called hydrochloric **acid**.

Balancing oxidation numbers in a monatomic acid

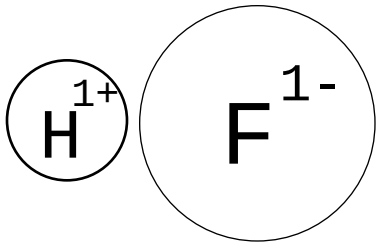
Draw a visual picture for the structure of hydrosulfuric acid, H_2S



Note, use the word hydro if acid is a monatomic acid (i.e. dihydrogen sulfide, H_2S) is a called hydrosulfuric **acid**.

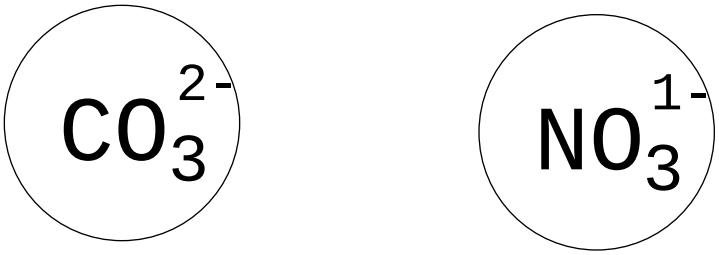
Balancing oxidation numbers in an monatomic acid

Draw a visual picture for the structure of hydrofluoric acid, HF



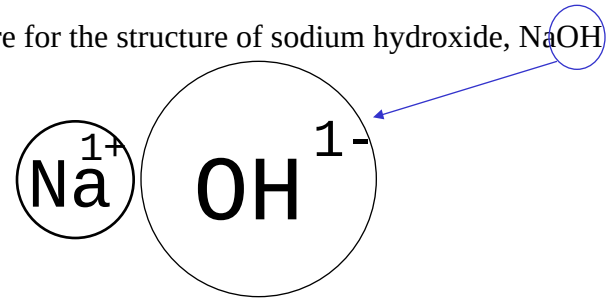
Other polyatomic ions carbonate ion and nitrate ion

Draw a visual picture for carbonate ion, CO_3^{2-} and nitrate ion, NO_3^{1-}



Balancing oxidation numbers in a base

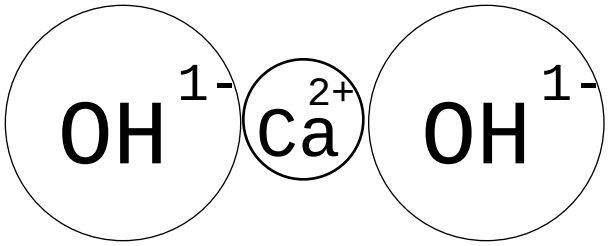
Draw a visual picture for the structure of sodium hydroxide, NaOH



Note, use of the word hydroxide is derived from hydro oxide
"proton ion" + "oxide ion" combinded equals hydroxide ion
(H^{1+} and O^{2-} together equals OH^{1-})

Balancing oxidation numbers in a base

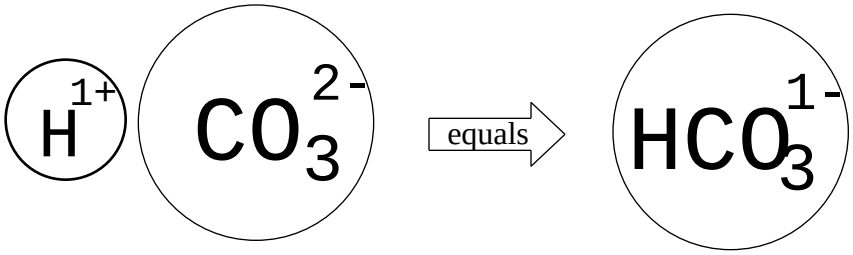
Draw a visual picture for the structure of calcium hydroxide, $Ca(OH)_2$



Note, use of the word hydroxide is derived from hydro oxide
"proton ion" + "oxide ion" combinded equals hydroxide ion
(H^{1+} and O^{2-} together equals OH^{1-})

Balancing oxidation numbers in a hydro - ate ions

Draw a visual picture for the structure of hydrogen carbonate ion, HCO_3^{1-}



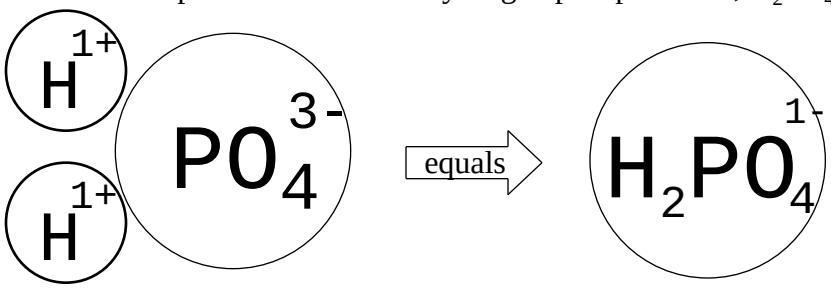
proton combined with carbonate ion → hydrogen carbonate ion, HCO_3^{1-}

$H^+ + CO_3^{2-} \xrightarrow{\text{combination reaction}} HCO_3^{1-}$

reactant ions product ion

Balancing oxidation numbers in a hydro - ate ions

Draw a visual picture for the of dihydrogen phosphate ion, $H_2PO_4^{1-}$



proton combined with phosphate ion → dihydrogen phosphate ion, $H_2PO_4^{1-}$

$2H^+ + PO_4^{3-} \xrightarrow{\text{combination reaction}} H_2PO_4^{1-}$

reactant ions product ion

Supplemental packet page 75

Sparklettes Water

Dr. Gergens - SD Mesa College

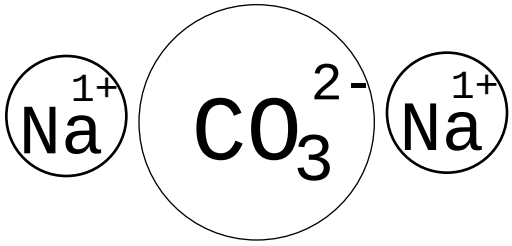
The Crystal-Fresh® Drinking Water ingredient label says the following:

"Drawn from our deep protected wells in Santa Ana, CA. Purified using our Crystal-Fresh process, including filtration, ozonation, reverse osmosis, and/or dionization. Contains purified water and specially selected minerals in nutritionally insignificant amounts for great taste (sodium bicarbonate, magnesium chloride, calcium chloride and sodium sulfate).

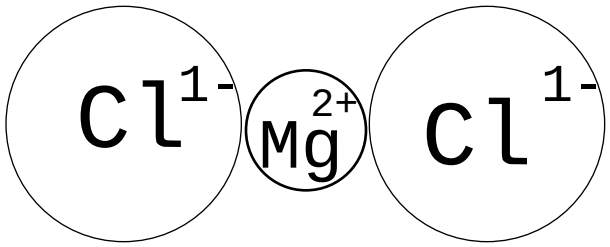
Lets learn to write the correct formulas for these substances (sodium bicarbonate, magnesium chloride, calcium chloride and sodium sulfate) that Sparkletts ® adds to it's purified water In "nutritionally insignificant amounts for great taste."

Supplemental packet page 76

Lets learn to write the correct formulas for these substances (sodium bicarbonate, magnesium chloride, calcium chloride and sodium sulfate) that Sparkletts ® adds to it's purified water In "nutritionally insignificant amounts for great taste."



Lets learn to write the correct formulas for these substances (sodium bicarbonate, magnesium chloride, calcium chloride and sodium sulfate) that Sparkletts ® adds to it's purified water In "nutritionally insignificant amounts for great taste."



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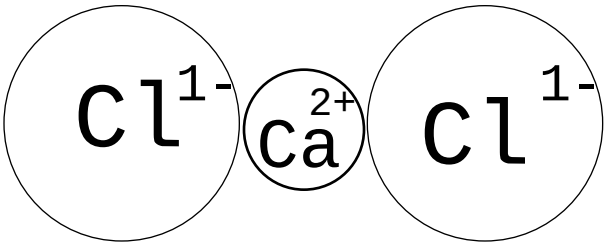
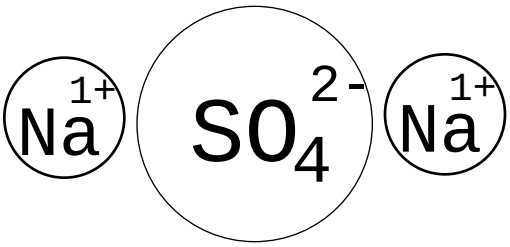


Lets learn to write the correct formulas for these substances (sodium bicarbonate, magnesium chloride, calcium chloride and sodium sulfate) that Sparkletts ® adds to it's purified water In "nutritionally insignificant amounts for great taste."



Sparklettes Water Nomenclature Exercise: "Nutritionally insignificant amounts of these compounds added for good taste."
Dr. Gergens - SD Mesa College

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1. Write the name each cation and each anion (e.g., Na^+ is sodium ion; Cl^- is chloride ion)
2. Say and write the name of the ionic salt compound by combining each cation with each anion in the table (e.g., sodium chloride)
3. Complete the table by writing in the ionic salt compound formula in each cell of the table (e.g., NaCl).
4. When writing a formula a cation and anion must combine in an appropriate ration to balance charge; see examples on back.

cations (name these ions)	anions (name these ions)		
	Cl^- **chloride ion**	SO_4^{2-} sulfate ion	HCO_3^- hydrogen carbonate ion
Na^+ **sodium ion**	NaCl **sodium chloride**	Na_2SO_4 sodium sulfate	$NaHCO_3$ sodium hydrogen carbonate
Mg^{2+} magnesium ion	$MgCl_2$ magnesium chloride	$MgSO_4$ magnesium sulfate	$Mg(HCO_3)_2$ magnesium hydrogen carbonate
Ca^{2+} calcium ion	$CaCl_2$ calcium chloride	$CaSO_4$ calcium sulfate	$Ca(HCO_3)_2$ calcium hydrogen carbonate

5. Predict the transition metal cation charge for iron, Fe, in the ionic salt $Fe_2(SO_4)_3$, and place it in the cation box below.
6. Give a name for $Fe_2(SO_4)_3$. Since transition metals can variable charge, you must some how indicate metal cation charge in its name.
7. Write additional formulas for the cation Fe^{3+} combined with the anions Cl^- and HCO_3^- and give their compound names.

cation			
iron (III) ion	$FeCl_3$ iron (III) chloride	$Fe_2(SO_4)_3$ iron (III) sulfate	$Fe(HCO_3)_3$ iron (III) hydrogen carbonate

Acids: In general, a substance that has an 'H' listed first in its formula is referred to as an acid. Name the acid but place a prefix in its name di = 2, tri = 3, tetra = 4, penta = 5, hexa = 6, hepta = 7, octa = 8, nona = 9, deca = 10 to indicate the number of hydrogens in the formula.

cations	anions		
	Cl^-	SO_4^{2-}	HCO_3^-
H^+ hydrogen ion	HCl hydrogen chloride	H_2SO_4 hydrogen chloride	H_2CO_3 dihydrogen carbonate
give a common name and use for each acid	hydrochloric acid stomach acid	sulfuric acid car battery acid	carbonic acid carbonated water