COMBINING ATOMS

* THE NUMBER OF ELECTRONS IN THE OUTER ENERGY LEVEL OF AN ATOM (VALENCE ELECTRONS) DETERMINES HOW AN ATOM WILL COMBINE WITH OTHER ATOMS.
* THE NUMBER OF ELECTRONS AN ATOM GAINS, LOSES, OR SHARES WHEN IT FORMS CHEMICAL BONDS IS CALLED ITS OXIDATION NUMBER.
* THE OXIDATION NUMBER OF AN ATOM DESCRIBES ITS COMBINING CAPACITY.
* THE SUM OF THE OXIDATION NUMBER OF THE ATOMS IN A COMPOUND MUST BE ZERO.
* THE OXIDATION NUMBER OF A MONOATOMIC ION IS EQUAL TO THE CHARGE ON THE ION.
* THE OXIDATION NUMBER OF GROUP 1 IS +1, AND FOR GROUP 2 IS +2.
* THE OXIDATION NUMBER OF HYDROGEN is +1
* THE OXIDATION NUMBER OF OXYGEN IS -2 EXCEPT IN HYDROGEN PEROXIDE WHERE IT IS -1.
* SODIUM HAS AN OXIDATION NUMBER OF +1
* CHLORINE HAS AN OXIDATION NUMBER OF -1
* ONE ATOM OF SODIUM WILL COMBINE WITH ONE ATOM OF CHLORINE TO FORM NaCl.

NAMING COMPOUNDS -Type I

* BINARY COMPOUNDS ARE MADE UP OF TWO DIFFERENT ELEMENTS.
* THE NAME OF THE METALLIC ELEMENT IS GIVEN FIRST, FOLLOWED BY THE STEM OF THE NON-METALLIC ELEMENTAL NAME TO WHICH THE SUFFIX IDE IS ADDED.

RULE TO REMEMBER

* METAL + NON-METAL + IDE = NAME
* A BINARY COMPOUND IS A COMPOUND THAT CONSISTS OF A COMBINATION OF TWO ELEMENTS.
* COMPOUNDS THAT END IN IDE INDICATE THAT THEY CONTAIN ONLY TWO ELEMENTS.
* THE FIRST ELEMENT IS A POSITIVELY CHARGED METAL, AND THE SECOND ELEMENT IS A NEGATIVELY CHARGED NON-METAL.
* THE POSITIVELY CHARGED ION IS THE NAME OF THE METAL, WHILE THE NEGATIVELY CHARGED ION CONSISTS OF THE STEM PLUS THE SUFFIX IDE.

\*STEMS OF THE MOST COMMONLY USED ELEMENTS ARE: \*

1. oxygen: Ox-

2. chlorine: Chlor-

3. carbon: Carb-

4. iodine: Iod-

5. bromine: Brom-

6. selenium: Selen-

7. nitrogen: Nitr-

8. phosphorus: Phosph-

9. fluorine: Fluor-

10. sulfur: Sulf- or Sulfur-

11. hydrogen: Hydr

TYPE II COMPOUNDS

* NAMES CONTAINING ROMAN NUMERALS
* IF THE POSITIVE ELEMENT HAS MORE THAN ONE POSSIBLE OXIDATION NUMBER, ITS OXIDATION IS SHOWN AS A ROMAN NUMERAL IN PARENTHESIS AFTER ITS NAME.

EX

Lead (IV) OXIDE = PBO2

Nitrogen (III) Fluoride = NF3

Copper (1) Chloride = CuCl

POLYATOMIC IONS

A GROUP OF COVALENTLY BONDED ATOMS THAT ACT LIKE A SINGLE ATOM WHEN

COMBINING WITH OTHER ATOMS IS CALLED A POLYATOMIC ION.

Common Polyatomic Ions

Formula Name

1. NH4 +1 ammonium

2. Hg2 +2 mercury (I) ion

3. H3O +1 hydronium ion

4. NH3+1 ammonia

5. C2H3O2 -1 acetate

Type III Compounds

1. The first element in the formula is named first, and the full element name is used.

2. The second element is named as though it were an anion: root + ide

3. Prefixes are used to denote the numbers of atoms present. (See table below)

4. The prefix mono- is never used for naming the first element.

Number Prefix

1. mono =1

2. di = 2

3. tri = 3

4. tetra = 4

5. penta = 5

6. hexa = 6

7. hepta = 7

8. octa = 8

9. nona = 9

10. deca = 10

\*\*EXAMPLE: NO2 IS NITROGEN DIOXIDE

* NO2 IS NITROGEN DIOXIDE BECAUSE YOU HAVE A NITROGEN ATOM BONDED TO TWO OXYGEN ATOMS.
* SINCE THIS IS A BINARY COMPOUND OF TWO NON-METALS, WE USE THE NEW WAY OF NAMING WE JUST LEARNED.
* KEEP NITROGEN AS THE FIRST NAME, AND ATTACH THE PREFIX DI BEFORE THE OXYGEN BECAUSE THERE ARE TWO ATOMS OF OXYGEN.
* ADD THE OX STEM FROM OXYGEN AFTER THE DI PREFIX.
* ATTACH THE IDE SUFFIC AFTER OX, AND WE HAVE THE FINISHED PRODUCT, NITROGEN DIOXIDE.
* N2O4 IS DINITROGEN TETROXIDE
* PCL3 IS PHOSPHORUS TRICHLORIDE

\*IN SOME CASES THE PREFIX MONO IS USED TO AVOID AMBIGUITY.

Ex. CO IS CARBON MONOXIDE

Ex. CO2 IS CARBON DIOXIDE

* POLYATOMIC IONS

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COMBINING WITH OTHER ATOMS IS CALLED A POLYATOMIC ION.

Common Polyatomic Ions Formula Names:

1. NH4 +1 **ammonium**

2. Hg2 +2 **mercury (I) ion**

3. H3O +1 **hydronium ion**

4. NH3+1 **ammonia**

5. C2H3O2 -1 **acetate**

6. CO3 -2 **carbonate**

7. HCO3 -1 **hydrogen carbonate**

(bicarbonate)

8. ClO -1 **hypochlorite**

9. ClO2 -1 **chlorite**

10. ClO3 -1 **chlorate**

11. ClO4 -1 **perchlorate**

12. CrO4 -2 **chromate**

13. Cr2O7 -2 **dichromate**

14. CN -1 **cyanide**

15. OH -1 **hydroxide**

16. NO2 -1 **nitrite**

17. NO3 -1 **nitrate**

18. MnO4 -1 **permanganate**

19. PO4 -3 **phosphate**

20. HPO4 -2 **hydrogen phosphate**

21. H2PO4 -1 **dihydrogen phosphate**

22. SO3 -2 **sulfite**

23. SO4 -2 **sulfate**

24. HSO4-1 **bisulfate**

25. C2O4 -2 **oxalate**

26. O2 -2 **peroxide**

WITH THE EXCEPTION OF AMMONIUM ION (NH4 +), AMMONIA (NH3+1), mercury (I) ion (Hg2 +2), AND hydronium ion (H3O +1) THE

COMMON POLYATOMIC IONS ARE NEGATIVELY CHARGED.

\*\*\*IMPORTANT\*\*\*

THE CHARGE OF A POLYATOMIC ION IS ITS OXIDATION NUMBER\*\*\*\*

BEFORE ADDING A SUBSCRIPT TO A POLYATOMIC ION IT MUST BE ENCLOSED IN PARENTHESIS ( ).

Ca (OH)2

Parenthesis are not placed around a polyatomic ion if no subscript is added

CaCO3

NAMING COMPOUNDS CONTAINING POLYATOMIC IONS

-WRITE THE NAME OF THE POSITIVE ION FIRST.

-THEN WRITE THE NAME OF THE POLYATOMIC ION WITHOUT CHANGING ITS NAME

EX.

MAGNESIUM AND SULPHATE

a) Mg SO4

b) Mg+2 SO4 -2

c) MgSO4

d) Magnesium Sulfate

NAMES CONTAINING ROMAN NUMERALS

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