Ionic Compound Bonding and Nomenclature Data Sheets

*Binary Atoms and Ions Data Tables*

| Group Number | 1A<br>1 | 2A<br>2 | 1B – 10B | 3A<br>13 | 4A<br>14 | 5A<br>15 | 6A<br>16 | 7A<br>17 | 8A<br>18 |
|---|---|---|---|---|---|---|---|---|---|
| Element Type | Metals | Metals | Trans Metals | Metals* | Non-Metals* | Non-Metals* | Non-Metals | Non-Metals | Non-Metals |
| Valance Electrons ($e^-$) | 1 | 2 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Ion Charge | +1 | +2 | Var.<br>+1 to +7 | +3 | +4/-4 | -3 | -2 | -1 | 0 |
| Lewis Dot Structure |  |  |  |  |  |  |  |  |  |

*Includes Transition Metals (*Ga, In, Tl, Pb, Sn*) and Metalloids (*B, Si, Ge, As, Sb, Te, Po*)

*Roman Numerals for Transition Metal Charges*

| Trans. Metal Charge | +1 | +2 | +3 | +4 | +5 | +6 | +7 |
|---|---|---|---|---|---|---|---|
| Roman Numeral* | I | II | III | IV | V | VI | VII |

*Metal Ion Nomenclature: Rep Metal Ion, Trans. Metal (Charge*) Ion

*Binary Atom and Ion Nomenclature*

| Atomic Number | Periodic Group | Element Symbol | Element Name | Lose / Gain $e^-$ | Ion Charge | Ion Name |
|---|---|---|---|---|---|---|
| 1 | 1A / 1 | H | Hydrogen | Lose $1e^-$ | +1 | Hydride Ion |
| 6 | 4A / 14 | C | Carbon | Gain $4e^-$ | -4 | Carbide Ion |
| 7 | 5A / 15 | N | Nitrogen | Gain $3e^-$ | -3 | Nitride Ion |
| 15 | 5A / 15 | P | Phosphorous | Gain $3e^-$ | -3 | Phosphide Ion |
| 33 | 5A / 15 | As | Arsenic | Gain $3e^-$ | -3 | Arsenide Ion |
| 8 | 6A / 16 | O | Oxygen | Gain $2e^-$ | -2 | Oxide Ion |
| 16 | 6A / 16 | S | Sulfur | Gain $2e^-$ | -2 | Sulfide Ion |
| 34 | 6A / 16 | Se | Selenium | Gain $2e^-$ | -2 | Selenide Ion |
| 52 | 6A / 16 | Te | Tellurium | Gain $2e^-$ | -2 | Telluride Ion |
| 9 | 7A / 17 | F | Fluorine | Gain $1e^-$ | -1 | Fluoride Ion |
| 17 | 7A / 17 | Cl | Chlorine | Gain $1e^-$ | -1 | Chloride Ion |
| 35 | 7A / 17 | Br | Bromine | Gain $1e^-$ | -1 | Bromide Ion |
| 53 | 7A / 17 | I | Iodine | Gain $1e^-$ | -1 | Iodide Ion |
| 85 | 7A / 17 | At | Astatine | Gain $1e^-$ | -1 | Astatide Ion |

*Standard Base Form Polyatomic Ions*

| +1 Polyatomic Ions | | -1 Polyatomic Ions | | -2 Polyatomic Ions | | -3 Polyatomic Ions | |
|---|---|---|---|---|---|---|---|
| $H_3O^{1+}$ | Hydronium Ion | $FO_3^{1-}$ | Fluorate Ion | $CO_3^{2-}$ | Carbonate Ion | $PO_4^{3-}$ | Phosphate Ion |
| $NH_4^{1+}$ | Ammonium Ion | $ClO_3^{1-}$ | Chlorate Ion | $C_2O_4^{2-}$ | Oxalate Ion | | |
| | | $BrO_3^{1-}$ | Bromate Ion | $SO_4^{2-}$ | Sulfate Ion | | |
| -1 Polyatomic Ions | | $IO_3^{1-}$ | Iodate Ion | $S_2O_3^{2-}$ | Thiosulfate Ion | | |
| $OH^{1-}$ | Hydroxide Ion | $NO_3^{1-}$ | Nitrate Ion | $HPO_4^{2-}$ | Hydrogen Phosphate | | |
| $CN^{1-}$ | Cyanide Ion | $C_2H_3O_2^{1-}$ | Acetate Ion | $CrO_4^{2-}$ | Chromate Ion | | |
| $SCN^{1-}$ | Thiocyanate Ion | $HCO_3^{1-}$ | Bicarbonate Ion | $Cr_2O_7^{2-}$ | Dichromate Ion | | |
| $OCN^{1-}$ | Cyanate Ion | $MnO_4^{1-}$ | Permanganate Ion | | | | |

*Ionic Compound Nomenclature*

| | *Left Side of Name** | | | *Right Side of Name** | |
|---|---|---|---|---|---|
| Atom or Ion | Representative Metal Ion | Transition Metal Ion | (+) Polyatomic Ion | Non-Metal Ion | (-) Polyatomic Ion |
| Ion Ending | -ium / -um | _____ (+) | -ium | -ide | -ate or -ide |
| Formula | Periodic Table [*group = charge*] | Periodic Table [(+) = charge] | Polyatomic Ion Chart | Periodic Table [*group = charge*] | Polyatomic Ion Chart |
| Groups & Polyatomic Ion Forms | Groups 1A, 2A, Al, & Si Si = +4 | Groups 1B – 8B + In, Tl, Sn, Pb, Bi | Two Elements Single Ion | Groups 4A – 7A | Two or More Elements Single Ion |
| Example Ions | Sod**ium** Alumin**um** | Iron(III) Lead(IV) | Ammon**ium** Hydron**ium** | Chlor**ide** Sulf**ide** | Chlor**ate** Cyan**ide** Hydrox**ide** |

***Form**: Left Side* (*Charge*) *Right Side* + *ending*

*Covalent Compound Nomenclature Prefixes**

| Number Atoms | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| Name Prefix | mono- | di- | tri- | tetra- | penta- | hexa- | hepta- | octa- | nona- | deca- |

***Form**: Prefix Non-Metal* + *Prefix Non-Metal* (*-ide*)