

Atomic Ratios in Chemical Equations

The balancing process requires making the number of atoms the same on both sides using atomic ratios.

Ratio	Balance	Ratio	Balance	Ratio	Balance
1/1	Balanced	1/2 2/1	2	2/3 3/2	6
2/2	Balanced	1/3 3/1	3	3/4 4/3	12
3/3	Balanced	1/4 4/1	4	2/4 4/2	4
4/4	Balanced	1/6 6/1	6	2/6 6/2	6
5/5	Balanced	4/6 6/4	12	3/6 6/3	6

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Writing Chemical Reactions

Metal and Non-Metal Ion Charges

The charge of metals are based on the periodic table

Representative Elements (Metals and Non-Metals)

Group	1A	2A	1B – 10B	3A	4A	5A	6A	7A	8A
	1	2	3 - 12	13	14	15	16	17	18
Ion Charge	+1	+2	Var (+)	+3	+4/-4	-3	-2	-1	0

Transition Metals [Group 1B – 10B (3 - 12)] have variable charges based on the metals Lewis Dot Structures

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Polyatomic Ion Chart

The following is a list of common polyatomic ions

Polyatomic Ion	Ion Formula	Polyatomic Ion	Ion Formula	Polyatomic Ion	Ion Formula
Ammonium	NH ₄ ¹⁺	Hydronium	H ₃ O ¹⁺	Carbonate	CO ₃ ²⁻
Nitrate	NO ₃ ¹⁻	Cyanide	CN ¹⁻	Sulfate	SO ₄ ²⁻
Fluorate	FO ₃ ¹⁻	Hydroxide	OH ¹⁻	Chromate	CrO ₄ ²⁻
Chlorate	ClO ₃ ¹⁻	Acetate	C ₂ H ₃ O ₂ ¹⁻	Dichromate	Cr ₂ O ₇ ²⁻
Bromate	BrO ₃ ¹⁻	Permanganate	MnO ₄ ¹⁻	Oxalate	C ₂ O ₄ ²⁻
Iodate	IO ₃ ¹⁻	Bicarbonate	HCO ₃ ¹⁻	Phosphate	PO ₄ ³⁻

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Chemical Reaction Forms

Reaction Type	Basic Reaction Form	Reaction Example
Combination	A + B → AB	Na + Cl ₂ → NaCl
Decomposition	AB → A + B	HCl → H ₂ + Cl ₂
Ionization	AB → A ⁺ + B ⁻	NaCl → Na ¹⁺ + Cl ¹⁻
Single Replacement	A + BC → AC + B A more active than B	Na + AlCl ₃ → Al + NaCl Na more active than Al
Acid Single Replacement	A + HX → AX + H ₂ HX = Acid H - diatomic	Na + HCl → NaCl + H ₂
Double Replacement	AB + CD → AD + CB	NaCl + AlF ₃ → NaF + AlCl ₃
Acid Base Neutralization	HX + YOH → HOH + YX HX = Acid YOH = Base	HCl + NaOH → HOH + NaCl

Ionic Compound Form



X = Metal Y = Non-Metal
a and b = Subscripts

Trans. Metal Charges



X = Transition Metal

$$X = \frac{|b(-Y)|}{a}$$

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