

## Balancing Chemical Equations Help Sheet

Elemental Anions	Polyatomic Ions	Diatomic Gases
C <sup>4-</sup> carbide	CO <sub>3</sub> <sup>2-</sup> carbonate	H <sub>2</sub>
N <sup>3-</sup> nitride	NO <sub>3</sub> <sup>1-</sup> nitrate	N <sub>2</sub>
O <sup>2-</sup> oxide	PO <sub>4</sub> <sup>3-</sup> phosphate	O <sub>2</sub>
F <sup>1-</sup> fluoride	SO <sub>4</sub> <sup>2-</sup> sulphate	F <sub>2</sub>
P <sup>3-</sup> phosphide	ClO <sub>3</sub> <sup>1-</sup> chlorate	Cl <sub>2</sub>
S <sup>2-</sup> sulphide	OH <sup>1-</sup> hydroxide	
Cl <sup>1-</sup> chloride	CN <sup>1-</sup> cyanide	
As <sup>3-</sup> arsenide		
Se <sup>2-</sup> selenide	NH <sub>4</sub> <sup>1+</sup> ammonium	
Br <sup>1-</sup> bromide		
Sb <sup>3-</sup> antimonide		
Te <sup>2-</sup> telluride		
I <sup>1-</sup> iodide		

### How to Build a Formula:

cation / anion →	FeS	AlCO <sub>3</sub>	MgOH	KCN
consider the charges →	Fe <sup>3+</sup> S <sup>2-</sup>	Al <sup>3+</sup> CO <sub>3</sub> <sup>2-</sup>	Mg <sup>2+</sup> OH <sup>1-</sup>	K <sup>1+</sup> CN <sup>1-</sup>
balance the formula →	Fe <sub>2</sub> S <sub>3</sub>	Al <sub>2</sub> (CO <sub>3</sub> ) <sub>3</sub>	Mg(OH) <sub>2</sub>	KCN

**DON'T ATTEMPT TO BALANCE UNTIL YOU HAVE THE FORMULAS!!!**

**WHEN BALANCING IT IS OFTEN NECESSARY TO MAKE ODD  
NUMBERS OF ATOMS EVEN**

## Solubility Rules for Common Ions in Aqueous Solution

	ANIONS	CATIONS	
1	essentially all	alkali ions ( $\text{Li}^{1+}$ , $\text{Na}^{1+}$ , $\text{K}^{1+}$ , $\text{Rb}^{1+}$ , $\text{Cs}^{1+}$ , $\text{Fr}^{1+}$ )	soluble
2	essentially all	hydrogen ion ( $\text{H}^{1+}(\text{aq})$ )	soluble
3	essentially all	ammonium ion ( $\text{NH}_4^{1+}$ )	soluble
4	nitrate, $\text{NO}_3^{1-}$	essentially all	soluble
5	acetate, $\text{CH}_3\text{COO}^{1-}$	essentially all	soluble
6	chloride, $\text{Cl}^{1-}$ bromide, $\text{Br}^{1-}$ iodide, $\text{I}^{1-}$	$\text{Ag}^{1+}$ , $\text{Pb}^{2+}$ , $\text{Hg}_2^{2+}$ , $\text{Cu}^{1+}$	insoluble*
		all others	soluble
7	sulphate, $\text{SO}_4^{2-}$	$\text{Ca}^{2+}$ , $\text{Sr}^{2+}$ , $\text{Ba}^{2+}$ , $\text{Pb}^{2+}$ , $\text{Ra}^{2+}$ , $\text{Ag}^{1+}$	insoluble
		all others	soluble
8	sulphide, $\text{S}^{2-}$	alkali ions**, $\text{H}^{1+}(\text{aq})$ , $\text{NH}_4^{1+}$ , $\text{Be}^{2+}$ , $\text{Mg}^{2+}$ , $\text{Ca}^{2+}$ , $\text{Sr}^{2+}$ , $\text{Ba}^{2+}$ , $\text{Ra}^{2+}$	soluble
		all others	insoluble
9	hydroxide, $\text{OH}^{1-}$	alkali ions, $\text{H}^{1+}(\text{aq})$ , $\text{NH}_4^{1+}$ , $\text{Sr}^{2+}$ , $\text{Ba}^{2+}$ , $\text{Ra}^{2+}$	soluble
		all others	insoluble
10	phosphate, $\text{PO}_4^{3-}$ carbonate, $\text{CO}_3^{2-}$ sulphite, $\text{SO}_3^{2-}$	alkali ions, $\text{H}^{1+}(\text{aq})$ , $\text{NH}_4^{1+}$	soluble
		all others	insoluble

insoluble\* means low solubility and can involve lengthy calculations in grade twelve chemistry

alkali ions\*\* are:  $\text{Li}^{1+}$ ,  $\text{Na}^{1+}$ ,  $\text{K}^{1+}$ ,  $\text{Rb}^{1+}$ ,  $\text{Cs}^{1+}$ ,  $\text{Fr}^{1+}$