

SOLUBLE COMPOUNDS

Almost all salts of Na^+ , K^+ , NH_4^+

Salts of nitrate, NO_3^-
chlorate, ClO_3^-
perchlorate, ClO_4^-
acetate, CH_3CO_2^-

Solubility Rules

EXCEPTIONS

Almost all salts of Cl^- , Br^- , I^-

Halides of Ag^+ , Hg_2^{2+} , Pb^{2+}

Compounds containing F^-

Fluorides of Mg^{2+} , Ca^{2+} , Sr^{2+} , Ba^{2+} , Pb^{2+}

Salts of sulfate, SO_4^{2-}

Sulfates of Ca^{2+} , Sr^{2+} , Ba^{2+} , Pb^{2+} , Ag^+

INSOLUBLE COMPOUNDS

EXCEPTIONS

Most salts of carbonate, CO_3^{2-}
phosphate, PO_4^{3-}
oxalate, $\text{C}_2\text{O}_4^{2-}$
chromate, CrO_4^{2-}

Salts of NH_4^+ and the alkali metal cations Na^+ , K^+ are exceptions for all of these

Most metal sulfides, S^{2-}

BaS is soluble

Most metal hydroxides OH^- and oxides O^{2-}

Ba(OH)₂ is soluble

Table 3.1 Formulas and Names of Some Common Polyatomic Ions

Formula	Name	Formula	Name
CATION: Positive Ion			
NH_4^+	ammonium ion		
ANIONS: Negative Ions			
Based on a Group 4A element		Based on a Group 7A element	
CN^-	cyanide ion	ClO^-	hypochlorite ion
CH_3CO_2^-	acetate ion	ClO_2^-	chlorite ion
CO_3^{2-}	carbonate ion	ClO_3^-	chlorate ion
HCO_3^-	hydrogen carbonate ion (or bicarbonate ion)	ClO_4^-	perchlorate ion
Based on a Group 5A element		Based on a transition metal	
NO_2^-	nitrite ion	CrO_4^{2-}	chromate ion
NO_3^-	nitrate ion	$\text{Cr}_2\text{O}_7^{2-}$	dichromate ion
PO_4^{3-}	phosphate ion	MnO_4^-	permanganate ion
HPO_4^{2-}	hydrogen phosphate ion		
H_2PO_4^-	dihydrogen phosphate ion		
Based on a Group 6A element			
OH^-	hydroxide ion		
SO_3^{2-}	sulfite ion		
SO_4^{2-}	sulfate ion		
HSO_4^-	hydrogen sulfate ion (or bisulfate ion)		

Strong Acids

HCl
HBr
HI
HNO₃
HClO₄
H₂SO₄

Strong Bases

LiOH
NaOH
KOH
Ca(OH)₂(s)
Ba(OH)₂(s)

all acids are soluble

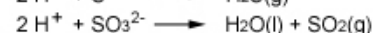
Weak Acids

CH₃COOH
NH₄⁺
H₂CO₃
H₂C₂O₄
H₂SO₃
H₂S
H₃PO₄
HCN
HF
NHO₂
HClO

Weak Bases

CH₃COO⁻
NH₃
CO₃²⁻
C₂O₄²⁻
SO₃²⁻
S²⁻
PO₄³⁻
CN⁻
F⁻
NO₂⁻
ClO⁻

Gas Forming Reactions:



M = a metal atom

Strong Electrolytes:

Soluble ionic compounds
Strong acids and strong bases

Determining Net Ionic Equations

- Write out all reactants as they exist in solution
- Identify acids and bases
 - If both an acid and a base are present, an acid-base reaction occurs
 - Be sure to look for hidden bases that are anions in other ionic compounds, such as CO_3^{2-} in CaCO_3 .
- Look for ions that will form an insoluble compound. If so, they form a precipitate.
- Look for one of the known gas-forming reactions.
- Write out products as they exist in solution.
- Cancel spectator ions. Note: ions that are "always soluble" will be spectator ions in acid-base or precipitation reactions.