FLINN SCIENTIFIC

Solubility Rules

General Solubility Rules for Inorganic Compounds

Nitrates (NO_3^-): All nitrates are soluble.

Acetates ($C_2H_3O_2^-$): All acetates are soluble; silver acetate is moderately soluble.

Chlorides (Cl^-): All chlorides are soluble except AgCl, $PbCl_2$, and Hg_2Cl_2. $PbCl_2$ is soluble in hot water, slightly soluble in cold water.

Sulfates (SO_4^{2-}): All sulfates are soluble except barium and lead. Silver, mercury(I), and calcium are slightly soluble.

Hydrogen sulfates (HSO_4^-): The hydrogen sulfates (bisulfates) are more soluble than the sulfates.

Carbonates (CO_3^{2-}), **phosphates** (PO_4^{3-}), **chromates** (CrO_4^{2-}), **silicates** (SiO_4^{2-}): All carbonates, phosphates, chromates, and silicates are insoluble, except those of sodium, potassium, and ammonium. An exception is $MgCrO_4$, which is soluble.

Hydroxides (OH^-): All hydroxides (except lithium, sodium, potassium, cesium, rubidium, and ammonium) are insoluble; $Ba(OH)_2$ is moderately soluble; $Ca(OH)_2$ and $Sr(OH)_2$ are slightly soluble.

Sulfides (S^{2-}): All sulfides (except sodium, potassium, ammonium, magnesium, calcium and barium) are insoluble. Aluminum and chromium sulfides are hydrolyzed and precipitate as hydroxides.

Sodium (Na^+), **potassium** (K^+), **ammonium** (NH_4^+): All sodium, potassium, and ammonium salts are soluble (except some transition metal compounds).

Silver (Ag^+): All silver salts are insoluble. Exceptions: $AgNO_3$ and $AgClO_4$; $AgC_2H_3O_2$ and Ag_2SO_4 are moderately soluble.

Ion Formula Chart

Names and Charges of Some Common Ions

1+	2+	3+
ammonium, NH_4^+	barium, Ba^{2+}	aluminum, Al^{3+}
cesium, Cs^+	beryllium, Be^{2+}	chromium(III), Cr^{3+}
copper(I), Cu^+	cadmium, Cd^{2+}	gallium, Ga^{3+}
gold(I), Au^+	calcium, Ca^{2+}	gold(III) Au^{3+}
hydrogen, H^+	cobalt(II), Co^{2+}	iron(III), Fe^{3+}
lithium, Li^+	copper(II), Cu^{2+}	
potassium, K^+	iron(II), Fe^{2+}	
rubidium, Rb^+	lead(II), Pb^{2+}	
silver, Ag^+	magnesium, Mg^{2+}	
sodium, Na^+	mercury(I), Hg_2^{2+}	
	mercury(II), Hg^{2+}	
	nickel, Ni^{2+}	
	strontium, Sr^{2+}	
	tin(II), Sn^{2+}	
	zinc, Zn^{2+}	

1–	2–	3–
acetate, $C_2H_3O_2^-$	carbonate, CO_3^{2-}	borate, BO_3^{3-}
bromate, BrO_3^-	chromate, CrO_4^{2-}	nitride, N^{3-}
bromide, Br^-	dichromate, $Cr_2O_7^{2-}$	phosphate, PO_4^{3-}
chlorate, ClO_3^-	hydrogen phosphate, HPO_4^{2-}	phosphide, P^{3-}
chloride, Cl^-	oxide, O^{2-}	
chlorite, ClO_2^-	oxalate, $C_2O_4^{2-}$	
cyanide, CN^-	peroxide, O_2^{2-}	
dihydrogen phosphate, $H_2PO_4^-$	selenide, Se^{2-}	
fluoride, F^-	sulfate, SO_4^{2-}	
hydrogen carbonate, or bicarbonate, HCO_3^-	sulfide, S^{2-}	
hydrogen sulfate, HSO_4^-	sulfite, SO_3^{2-}	
hydroxide, OH^-	tartrate, $C_4H_4O_6^{2-}$	
iodate, IO_3^-	telluride, Te^{2-}	
iodide, I^-	thiosulfate, $S_2O_3^{2-}$	
nitrate, NO_3^-		
nitrite, NO_2^-		
permanganate, MnO_4^-		