

Solubility Chart

MO+H₂O -> M(OH) base
 N.M.O+H₂O--> Acid
 MO+NMO-->Salt
 MCO₃-->MO+CO₂
 M(OH)-->MO+H₂O
 MClO₃-->MCl+O₂
 Acid-->NMO+H₂O
 Combustion-->CO₂+H₂O+E

Cations	Soluble with ____ (aq)	Forms Precipitates with ____ (s)
Na⁺, K⁺, and NH₄⁺	Most Anions	(NH ₄) ₂ C ₂ O ₄ forms a precipitate
Bi³⁺	Nothing	Most anions
As³⁺	I ¹⁻	Most anions
Sb³⁺	Cl ¹⁻	Most anions

Anions	Soluble with ____ (aq)	Forms Precipitates with ____ (s)
NO₃¹⁻ nitrate	Most cations	No common cations
ClO₄¹⁻ perchlorate	Most cations	No common cations
ClO₃¹⁻ chlorate	Most cations	No common cations
C₂H₃O₂¹⁻ acetate	Most cations	Ag ¹⁺ , Hg ₂ ²⁺
F¹⁻ fluoride	Most cations	Cr ³⁺
Cl¹⁻ chloride	Most cations	Ag ⁺ , Pb ^{2+,4+} , Hg ₂ ²⁺ , Tl ¹⁺
Br¹⁻ bromide	Most cations	Ag ⁺ , Pb ^{2+,4+} , Hg ₂ ²⁺ , Tl ¹⁺
I¹⁻ iodide	Most cations	Ag ⁺ , Pb ^{2+,4+} , Hg ₂ ²⁺ , Tl ¹⁺
SO₄²⁻ sulfate	Most cations	Ag ⁺ , Ba ²⁺ , Sr ²⁺ , Pb ^{2+,4+} , Ca ²⁺ , Hg ₂ ²⁺
CrO₄²⁻ chromate	Most cations	Ba ²⁺ , Sr ²⁺ , Pb ^{2+,4+} , Ca ²⁺ , Hg ₂ ²⁺
S²⁻ sulfide	Na ⁺ , K ⁺ , NH ₄ ⁺ , Li ⁺ , Sr ²⁺	Most other cations
OH¹⁻ hydroxide	Na ⁺ , K ⁺ , NH ₄ ⁺ , Li ⁺ , Sr ²⁺ , Ba ²⁺ , Ca ²⁺	Most other cations
CO₃²⁻ carbonate	Na ⁺ , K ⁺ , NH ₄ ⁺ , Li ⁺	Most other cations
PO₄³⁻ phosphate	Na ⁺ , K ⁺ , NH ₄ ⁺	Most other cations
O²⁻ oxide	No common cations	Most cations

Polyatomic Ions			
1+		2-	
(NH ₄) ⁺¹	ammonium	(CrO ₄) ⁻²	chromate
1-		(Cr ₂ O ₇) ⁻²	dichromate
(NO ₃) ⁻¹	nitrate	(CO ₃) ⁻²	carbonate
(NO ₂) ⁻¹	nitrite	(HPO ₄) ⁻²	dibasic phosphate or <u>hydrogen phosphate</u>
(OH) ⁻¹	hydroxide		
(HCO ₃) ⁻¹	<u>bicarbonate</u> or hydrogen carbonate	(MnO ₄) ⁻²	manganate
(C ₂ H ₃ O ₂) ⁻¹	acetate	(O ₂) ⁻²	peroxide
		(S ₂ O ₃) ⁻²	thiosulfate
(ClO ₄) ⁻¹	perchlorate	(SO ₄) ⁻²	sulfate
(ClO ₃) ⁻¹	chlorate	(SO ₃) ⁻²	sulfite
(ClO ₂) ⁻¹	chlorite	(C ₂ O ₄) ⁻²	oxalate
(ClO) ⁻¹	hypochlorite		
		3-	
(CN) ⁻¹	cyanide	(AsO ₄) ⁻³	arsenate
(SCN) ⁻¹	thiocyanate	(AsO ₃) ⁻³	arsenite
(HSO ₄) ⁻¹	bisulfate or hydrogen sulfate	(BO ₃) ⁻³	borate
(MnO ₄) ⁻¹	permanganate		
(H ₂ PO ₄) ⁻¹	dihydrogen phosphate	(C ₆ H ₅ O ₇) ⁻³	citrate
		(PO ₄) ⁻³	phosphate or tribasic phosphate
(IO ₄) ⁻¹	periodate	(PO ₃) ⁻³	phosphite
(IO ₃) ⁻¹	iodate		
(IO) ⁻¹	hypoiodite		
		4-	
(NH ₂) ⁻¹	amide	(SiO ₄) ⁻⁴	silicate (ortho)
(CHO ₂) ⁻¹	formate		

Atomic Ions			
+1		-1	
Li ⁺¹	Lithium	F ⁻¹	Fluoride
Na ⁺¹	Sodium	Br ⁻¹	Bromide
K ⁺¹	Potassium	Cl ⁻¹	Chloride
Ag ⁺¹	Silver	I ⁻¹	iodide
Cu ⁺¹	Copper (I) or Cuprous	H ⁻¹	hydride
Cs ⁺¹	Cesium		
H ⁺¹	Hydrogen		
+2		-2	
Mg ⁺²	Magnesium	O ⁻²	Oxide
Ca ⁺²	Calcium	O ₂ ⁻²	Peroxide
Ba ⁺²	Barium	S ⁻²	Sulfide
Zn ⁺²	Zinc		
Cd ⁺²	Cadmium (II)		
Cr ⁺²	Chromium (II) or Chromous	+2 (cont)	
Co ⁺²	Cobalt (II) or Cobaltous	Cu ⁺²	Copper (II) or Cupric
Hg ⁺²	Mercury (II) or Mercuric	Pb ⁺²	Lead (II) or Plumbous
Hg ₂ ⁺²	Mercury (I) or Mercurous	Fe ⁺²	Iron (II) or Ferrous
Mn ⁺²	Manganese (II) or manganous	Ni ⁺²	Nickel (II)
		Sn ⁺²	Tin (II) or Stannous
		Sr ⁺²	Strontium
+3		-3	
Al ⁺³	Aluminum	N ⁻³ P ⁻³	Nitride Phosphide
Fe ⁺³	Iron (III) or Ferric		
Ni ⁺³	Nickel (III)		
Cr ⁺³	Chromium (III) or Chromic		
+4			
Pb ⁺⁴	Lead (IV)		
Si ⁺⁴	Silicon (IV)		
Sn ⁺⁴	Tin (IV) or Stannic		
Mn ⁺⁴	Manganese (IV)		

Metal Activity Series / Redox Table

Super 7 Strong Acids

HI
 HBr
 HCl
 HNO₃
 H₂SO₄
 HClO₃
 HClO₄

Strong Base Is
 Group I/II
 Hydroxides (OH)-

Element	Metal Ion(s) Found in nature	Metal Obtained
Lithium	Li ⁺	Li (s)
Potassium	K ⁺	K (s)
Barium	Ba ²⁺	Ba(s)
Calcium	Ca ²⁺	Ca (s)
Sodium	Na ⁺	Na (s)
Magnesium	Mg ²⁺	Mg (s)
Aluminum	Al ³⁺	Al (s)
Manganese	Mn ²⁺	Mn (s)
Zinc	Zn ²⁺	Zn (s)
Chromium	Cr ³⁺ , Cr ²⁺	Cr (s)
Iron	Fe ³⁺ , Fe ²⁺	Fe (s)
Cobalt	Co ²⁺	Co (s)
Nickel	Ni ⁺	Ni (s)
Tin	Sn ²⁺	Sn(s)
Lead	Pb ²⁺	Pb (s)
Hydrogen	2H ⁺	H ₂ (g)
Copper	Cu ²⁺ , Cu ⁺	Cu (s)
Silver	Ag ⁺	Ag (s)
Mercury	Hg ²⁺	Hg (l)
Platinum	Pt ²⁺	Pt (s)
Gold	Au ³⁺ , Au ⁺	Au (s)

CO₂
 CO
 CH₄
 C₂H₆
 C₃H₈
 C₄H₁₀
 NO
 NO₂
 N₂O
 NH₃
 SO₃
 SO₂
 H₂S
 HCl

Table 20-1 Processes Leading to Oxidation and Reduction	
<u>Oxidation</u>	<u>Reduction</u>
Complete loss of electrons (ionic reactions)	Complete gain of electrons (ionic reactions)
Shift of electrons away from an atom in a covalent bond	Shift of electrons toward an atom in a covalent bond
Gain of oxygen	Loss of oxygen
Loss of hydrogen by a covalent compound	Gain of hydrogen by a covalent compound
An increase in oxidation number	A decrease in oxidation number