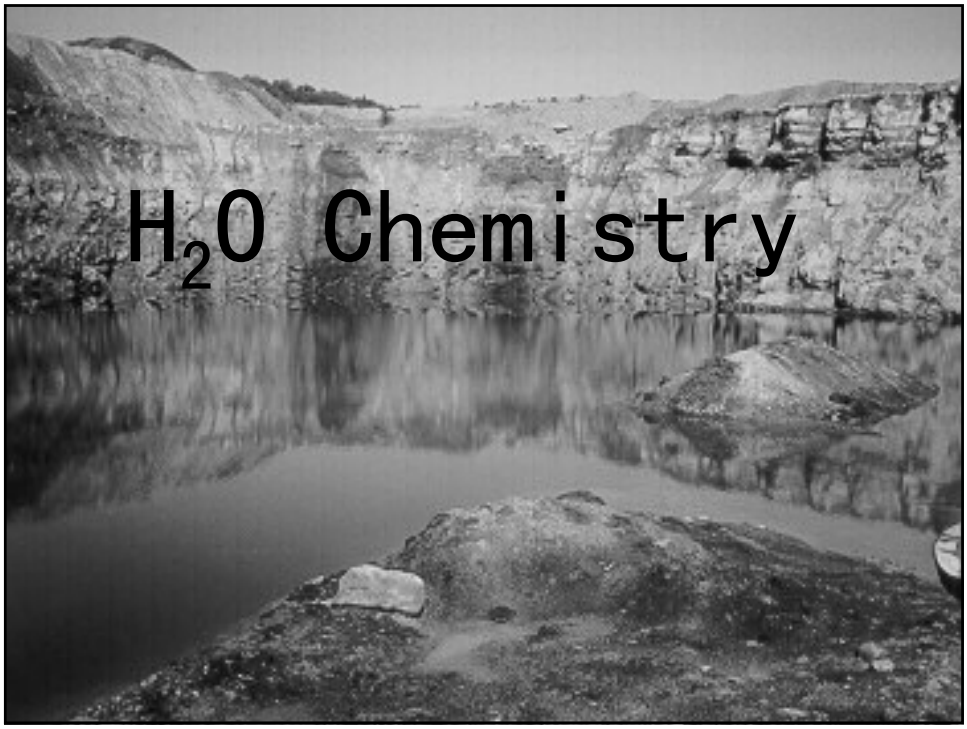


Master Variables

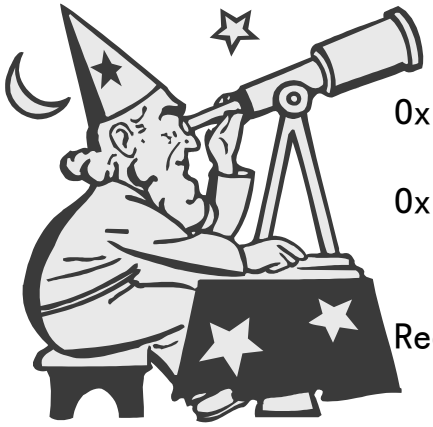
pH and Eh

pH Definition

H^+ H^+ H^+ H^+ H^+

Negative Log of
Hydrogen Ion Activity

Eh Definition



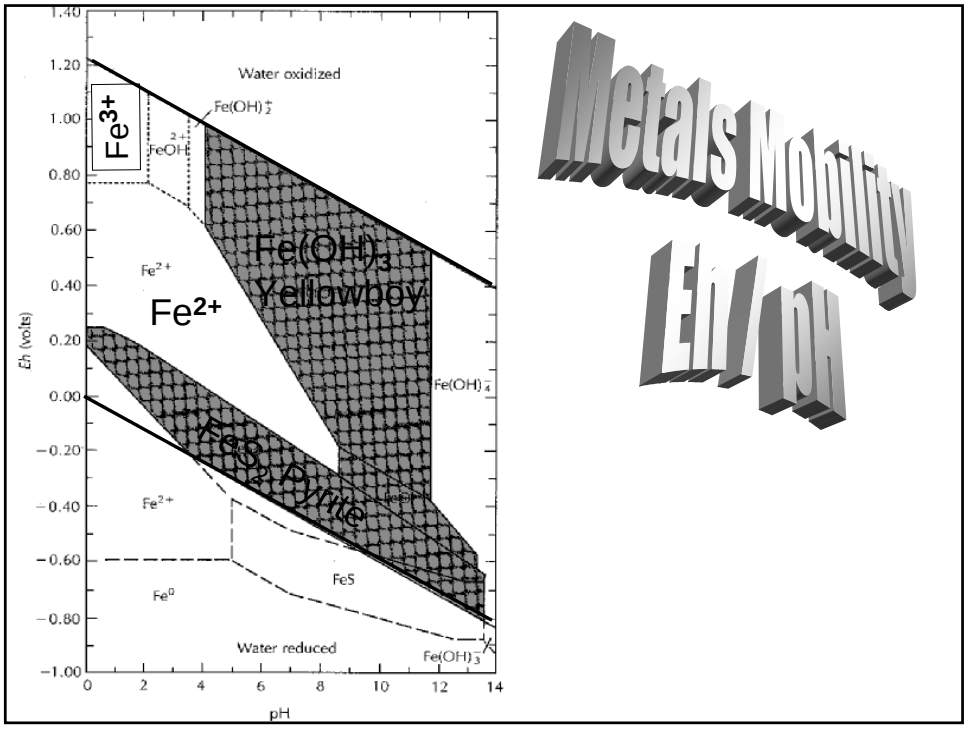
Oxidation & Reduction

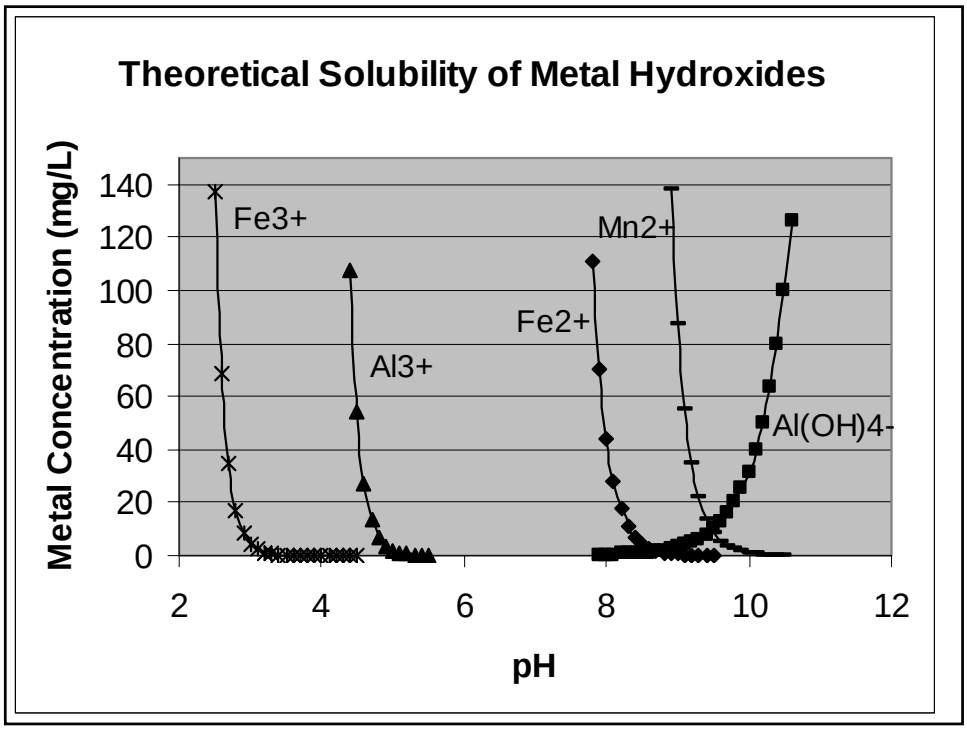
Oxidation: loss of electrons

$Fe^{2+} \rightarrow Fe^{3+} + e^-$

Reduction: gain of electrons

Redox-Sensitive Elements:


Metals Mobility
Eh / pH
Water oxidized
Water reduced
Fe3+
Fe2+
Fe(OH)3
Yellowboy
FeS2 Pyrite
FeS
Fe0
Eh (volts)
pH


Theoretical Solubility of Metal Hydroxides
Metal Concentration (mg/L)
pH
Fe3+
Al3+
Fe2+
Mn2+
Al(OH)4-

Acidity : Base Neutralizing Capacity

Directly Measure (titration)
Units are: mg/L $CaCO_3$

Calculate:

Acidity = 50 [(2 Fe^{2+}/56) + (3 Fe^{3+}/56)
+ (3 Al/27) + (2 Mn/ 55) + 1000 (10^{-ph})

Iron Hydrolysis

$Fe^{3+} + 3\ H_2O \rightarrow Fe(OH)_3 + 3\ H^+$

Alkalinity:

Acid Neutralizing Capacity

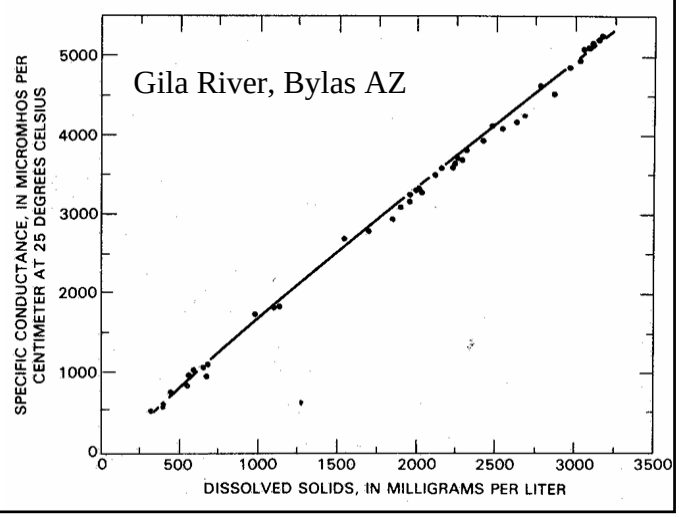
$CaCO_3 + H^+ \rightarrow Ca^{2+} + HCO_3^-$

TDS = Σ Dissolved Species

TDS (mg/L) = Sp Conductance x C

C generally 0.55 to 0.75

Mine Drainage toward higher end



Cations:

Net Positively Charged Ions

Anions:

Net Negatively Charged Ions

Milliequivalent Weight

Milliequiv. Wt = (millimole wt/Valence #)

Example:
Cl^-: meq wt = 35.45 mg/1 = 35.45

Ca^{2+}: meq wt = 40.08/2 = 20.04

Milliequivalents = mg X/ equiv. Wt

Ex: 37 mg Ca/20.04 = 1.84

Principl of Electroneutrality

ΣCations (meq/L) =
Σ Anions (meq/L)

Expressed as % Difference

%Diff =
[(Σ Cat. – Σ Anion)/(Σ Cat. + Σ Anion)] X 1C

Mineral Solubility