Chemistry 146 – Van Bramer
Spring Problem Set – Week 14 Solutions

Assign oxidation numbers to each element in the reactants and in the products. Identify what is being oxidized and what is being reduced. Balance the following redox reactions using both the half reaction and the oxidation number methods.

a. In an acidic solution, potassium dichromate reacts with ethyl alcohol to produce aqueous chromium (III) ions, carbon dioxide and water.

$16\ H^+(aq) + 2\ K_2Cr_2O_7\ (aq) + C_2H_5OH\ (aq) \rightarrow 4\ Cr^{3+}(aq) + 2\ CO_2\ (g) + 11\ H_2O\ (aq) + 4\ K^+(aq)$

b. In a basic solution solid silver reacts with aqueous cyanide and oxygen gas to produce silver (I) cyanide.

$4\ Ag(s) + 4\ CN^-(aq) + O_2\ (g) + 4\ H_2O\ (l) \rightarrow 4\ Ag(CN)\ (aq) + 4\ OH^-\ (aq)$

c. Solid aluminum reacts with solid iodine to produce solid aluminum iodide.

$2\ Al\ (s) + 3\ I_2\ (s) \rightarrow 2\ AlI_3\ (s)$

d. Solid zinc metal reacts with aqueous hydrochloric acid to produce aqueous zinc (II) ions and hydrogen gas.

$Zn\ (s) + 2\ HCl\ (aq) \rightarrow Zn^{2+}\ (aq) + H_2\ (g) + 2\ Cl^-\ (aq)$

e. Aqueous arsenous acid reacts with solid zinc metal to produce gaseous arsenic (III) hydride and aqueous zinc (II) ions.

$6\ H^+\ (aq) + H_3AsO_3\ (aq) + 3\ Zn\ (s) \rightarrow AsH_3\ (aq) + 3\ Zn^{2+}\ (aq) + 3\ H_2O\ (l)$

f. Aqueous silver nitrate reacts with solid copper metal to produce solid silver and aqueous copper (II) nitrate.

$2\ AgNO_3\ (aq) + Cu\ (s) \rightarrow 2\ Ag\ (s) + Cu(NO_3)_2\ (aq)$