Unit 4 – Chapter 4: Types of Reactions **Name _____**

Assignment #3: Redox Reactions & Half-Reaction Method **Period _____**

1) Specify which of the following are oxidation-reduction reactions, and identify the oxidizing agent, the reducing agent, the substance being oxidized, and the substance being reduced.
   a. $Cu_{(s)} + 2\ Ag^{+}_{(aq)} \rightarrow 2\ Ag_{(s)} + Cu^{2+}_{(aq)}$
   b. $HCl_{(g)} + NH_{3(g)} \rightarrow NH_4Cl_{(s)}$
   c. $SiCl_{4(l)} + 2\ H_2O_{(l)} \rightarrow 4\ HCl_{(aq)} + SiO_{2(s)}$
   d. $SiCl_{4(l)} + 2\ Mg_{(s)} \rightarrow 2\ MgCl_{2(s)} + Si_{(s)}$
   e. $Al(OH)_4^{-}{}_{(aq)} \rightarrow AlO_2^{-}{}_{(aq)} + 2\ H_2O_{(l)}$

2) Specify which of the following equations represent oxidation-reduction reactions, and indicate the oxidizing agent, the reducing agent, the species being oxidized, and the species being reduced.
   a. $CH_{4(g)} + H_2O_{(g)} \rightarrow CO_{(g)} + 3H_{2(g)}$
   b. $2\ AgNO_{3(aq)} + Cu_{(s)} \rightarrow Cu(NO_3)_{2(aq)} + 2\ Ag_{(s)}$
   c. $Zn_{(s)} + 2\ HCl_{(aq)} \rightarrow ZnCl_2(aq) + H_{2(g)}$
   d. $2\ H^{+}_{(aq)} + 2\ CrO_4^{2-}{}_{(aq)} \rightarrow Cr_2O_7^{2-}{}_{(aq)} + H_2O_{(l)}$

3) Balance the following oxidation-reduction reactions that occur in acidic solution.
   a. $Zn_{(s)} + HCl_{(aq)} \rightarrow Zn^{2+}_{(aq)} + H_{2(g)} + Cl^{-}_{(aq)}$
   b. $I^{-}_{(aq)} + ClO^{-}_{(aq)} \rightarrow I_3^{-}{}_{(aq)} + Cl^{-}_{(aq)}$
   c. $As_2O_{3(s)} + NO_3^{-}{}_{(aq)} \rightarrow H_3AsO_{4(aq)} + NO_{(g)}$
   d. $Br^{-}_{(aq)} + MnO_4^{-}{}_{(aq)} \rightarrow Br_{2(l)} + Mn^{2+}_{(aq)}$
   e. $CH_3OH_{(aq)} + Cr_2O_7^{2-}{}_{(aq)} \rightarrow CH_2O_{(aq)} + Cr^{3+}_{(aq)}$

4) Balance the following oxidation-reduction reactions that occur in acidic solution using the half-reaction method.
   a. $Cu_{(s)} + NO_3^{-}{}_{(aq)} \rightarrow Cu^{2+}_{(aq)} + NO_{(g)}$
   b. $Cr_2O_7^{2-}{}_{(aq)} + Cl^{-}_{(aq)} \rightarrow Cr^{3+}_{(aq)} + Cl_{2(g)}$
   c. $Pb_{(s)} + PbO_{2(s)} + H_2SO_{4(aq)} \rightarrow PbSO_{4(s)}$
   d. $Mn^{2+}_{(aq)} + NaBiO_{3(s)} \rightarrow Bi^{3+}_{(aq)} + MnO_4^{-}{}_{(aq)}$
   e. $H_3AsO_{4(aq)} + Zn_{(s)} \rightarrow AsH_{3(g)} + Zn^{2+}_{(aq)}$