ELECTROCHEMISTRY WORKSHEET #3

1. In a redox titration 12.50 mL of 0.0800 mol/L $K_2Cr_2O_{7\,(aq)}$ was used in acidic solution to oxidize $Sn^{2+}{}_{(aq)}$ ions to $Sn^{4+}{}_{(aq)}$ ions. The volume of $K_2Cr_2O_{7\,(aq)}$ used was just sufficient to oxidize all the $Sn^{2+}{}_{(aq)}$ in 10.0 mL of the solution. Calculate the concentration of the $Sn^{2+}{}_{(aq)}$ ions in the solution according to the following unbalanced equation.

(Ans: 0.300 mol/L)

$$Cr_2O_7{}^{2-}{}_{(aq)} + Sn^{2+}{}_{(aq)} \rightarrow Sn^{4+}{}_{(aq)} + Cr^{3+}{}_{(aq)}$$

2. The copper (II) ions in a solution can be converted to copper metal by trickling the solution over scrap iron. The reaction produced iron (II) ions from scrap iron. If the process produces 25.00 L of solution containing 0.00200 mol/L of $Fe^{2+}{}_{(aq)}$ ions, what mass of copper is produced?

(Ans: 3.18g)

$$Cu^{2+}{}_{(aq)} + Fe_{(s)} \rightarrow Fe^{2+}{}_{(aq)} + Cu_{(s)}$$

3. What volume of 0.0500 mol/L $KmnO_{4\,(aq)}$ is needed to oxidize all the $Br^-_{(aq)}$ ions in 25.0 mL of an acidic 0.200 mol/L $NaBr_{(aq)}$ solution according to the following unbalanced equation.

(Ans: v = 20.0mL)

$$MnO_4^-{}_{(aq)} + Br^-_{(aq)} \rightarrow Br_{2\,(aq)} + Mn^{2+}_{(aq)}$$

4. Aqueous solutions of hydrogen peroxide sold in pharmacies are usually approximately 3% H_2O_2 by mass. However, in solution, hydrogen peroxide decomposes into water and oxygen.

What is the percent by mass of a solution of hydrogen peroxide, H_2O_2, prepared from 1.423 g of H_2O_2 which is titrated with 40.22 mL of 0.01143 mol/L $KMnO_{4(aq)}$.
The reaction occurs in an acidified solution.

(Hint: Find mass of H_2O_2 actually present, then mass %) *(Ans: 2.747%)*

Balanced equation:

$$5H_2O_{2(aq)} + 2MnO_4^-{}_{(aq)} + 6H^+_{(aq)} \rightarrow 2Mn^{2+}_{(aq)} + 5O_{2(g)} + 8H_2O_{(l)}$$

Page 744: #’s 29 - 32