Chapter 17 – Problem Set 1

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1. (a) $W = +4$
   (b) $Na = +4$; $O = -2$
   (c) $H = +1$; $I = +5$; $O = -2$
   (d) $C = +4$; $O = -2$
2. (a) NO_2^- loses electrons, so it is oxidized, and CrO_4^{2-} is reduced
   (b) ClO_3^- gains electrons, so it is reduced, and S^{2-} is oxidizes
3. (a) $ClO_2 + H_2O \longrightarrow ClO_3^- + 2\,H^+ + e^-$
   (b) $MnO_4^- + 4\,H^+ + 3\,e^- \longrightarrow MnO_2 + 2\,H_2O$
4. (a)

$$\begin{aligned} 5(2\,Cl^- &\longrightarrow Cl_2 + 2\,e^-) \\ +\ 2(MnO_4^- + 8\,H^+ + 5\,e^- &\longrightarrow Mn^{2+} + 4\,H_2O) \\ \hline 2\,MnO_4^- + 16\,H^+ + 10\,Cl^- &\longrightarrow 2\,Mn^{2+} + 8\,H_2O + 5\,Cl_2 \end{aligned} \tag{1}$$

   (b)

$$\begin{aligned} 2(Sn &\longrightarrow Sn^{2+} + 2\,e^-) \\ +\ O_2 + 4\,H^+ + 4\,e^- &\longrightarrow H_2O \\ \hline 2\,Sn + O_2 + 4\,H^+ &\longrightarrow 2\,Sn^{2+} + H_2O \end{aligned} \tag{2}$$

   (c)

$$\begin{aligned} 3Se + 2\,H_2O &\longrightarrow SeO_2 + 4\,H^+ + 4\,e^- \\ +\ 4NO_3^- + 4\,H^+ + 3\,e^- &\longrightarrow NO + 2\,H_2O \\ \hline 3\,Se + 4\,NO_3^- + 4\,H^+ &\longrightarrow 3\,SeO_2 + 4\,NO + 2\,H_2O \end{aligned} \tag{3}$$

5. (a)

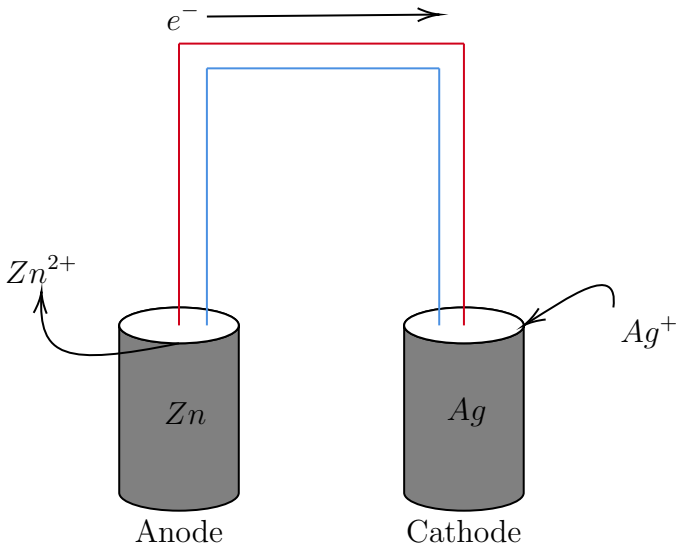

Figure 1: Galvanic Cell for $Zn/Zn^{2+}//Ag^+/Ag$

(b)

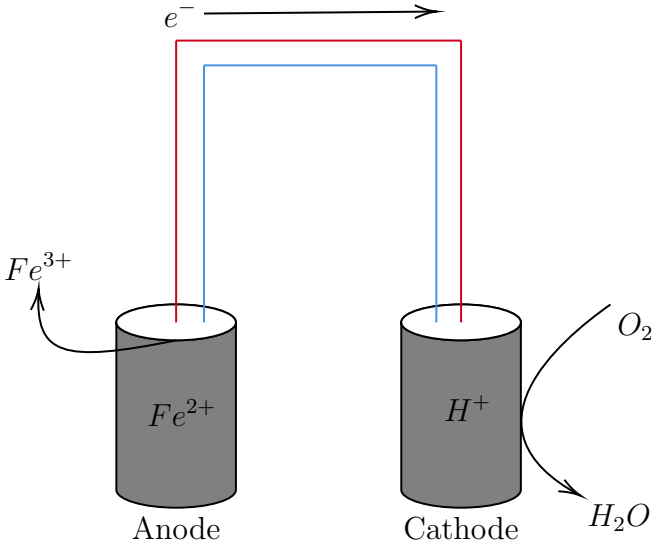

Figure 2: Galvanic Cell for $Fe^{2+}/Fe^{3+}//O_2/H_2O$

(c)

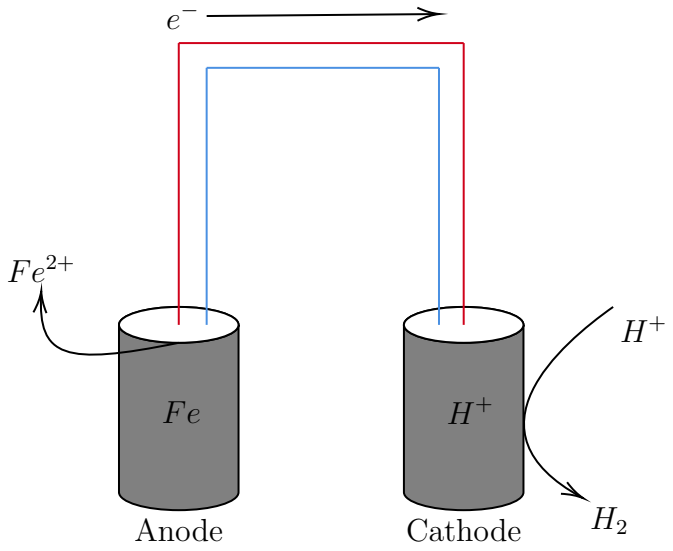

Figure 3: Galvanic Cell for $Fe/Fe(OH)_2//2\,H_2O/H_2$

(d)

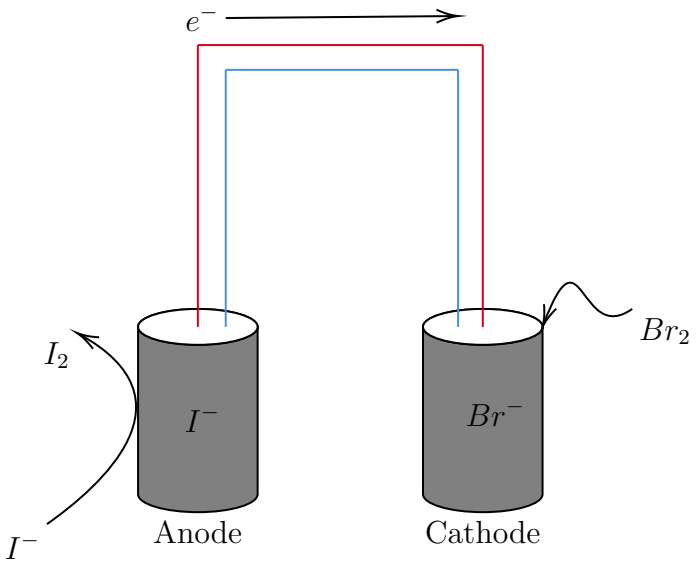

Figure 4: Galvanic Cell for $\mathrm{Br_2/2\,Br^-//2\,I^-/I_2}$

(e)

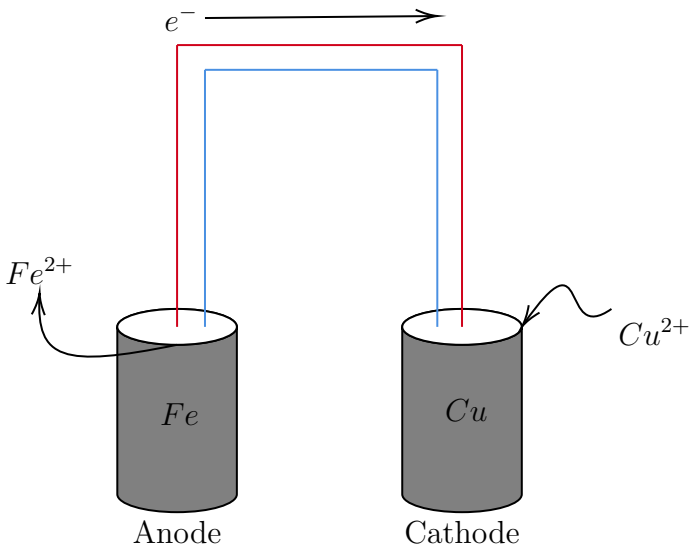

Figure 5: Galvanic Cell for Fe/Fe(OH)$_2$//Cu(OH)$_2$/Cu