ADDITIONAL REDOX QUESTIONS

1. Balance the following oxidation-reduction under the conditions specified:
   
   a. $\text{Z}_2\text{O}_3 + \text{X(CN)}_6^{3-} \rightarrow \text{Z}^- + \text{O}_2 + \text{X}^{3+} + \text{NO}_2 + \text{CO}_2$ (acidic conditions)

   b. $\text{Sn}^{4+} + \text{X(CNO)}_4^{2-} \rightarrow \text{Sn}^{2+} + \text{XO}_2^{3+} + \text{CO}_3^{2-} + \text{NO}$ (basic conditions)

   c. $\text{C}_7\text{H}_8 + \text{MnO}_4^- \rightarrow \text{C}_7\text{H}_6\text{O}_2 + \text{MnO}_2 + \text{Mn}^{2+}$ (basic conditions)

2. Stibnite ($\text{Sb}_2\text{S}_3$, Molar mass = 339.69 g/mol) is the most important ore containing antimony. A 0.5060 g sample of ore was chemically treated to produce antimony(III) ions in solution. The antimony(III) was oxidized to antimony(V) by adding 25.00 mL of 0.1165 N KMnO$_4$ solution. The excess KMnO$_4$ was titrated with 0.08430 N Fe$^{2+}$; 2.58 mL was required, producing Fe$^{3+}$($aq$) and Mn$^{2+}$($aq$). All reactions were carried out in acidic solutions.

   a. Calculate the % by mass Sb$_2$S$_3$ in the ore sample.
   b. What is the molarity of the KMnO$_4$ solution?
   c. What is the molarity of the Fe$^{2+}$ solution?

3. A 0.1283 g sample of M$_3$Fe(C$_2$O$_4$)$_3$ was dissolved in dilute acid, and all of the iron was converted to Fe$^{2+}$ ions. This acidic solution required 20.55 mL of 0.1000 N KMnO$_4$ solution to reach the end point of this titration in which the products were Fe$^{3+}$($aq$), Mn$^{2+}$($aq$) and CO$_2$(g).

   a. Calculate the molar mass of M$_3$Fe(C$_2$O$_4$)$_3$.

   b. What fraction of the total KMnO$_4$ solution was used in the titration of the oxalate ions (C$_2$O$_4$^{2-}) in the titration in part (a)?