

Name:
College ID:
Thomas Edison State University
General Chemistry II with Labs (CHE-122)
Section no.:
Semester and year:

Written Assignment 10: Electrochemistry

Answer all assigned questions and problems, and show all work.

1. Balance the following redox equations by the ion-electron method:
(25 points)

- a. $\text{H}_2\text{O}_2 + \text{Fe}^{+2} \rightarrow \text{Fe}^{+3} + \text{H}_2\text{O}$ (in acidic solution)
- b. $\text{Cu} + \text{HNO}_3 \rightarrow \text{Cu}^{+2} + \text{NO} + \text{H}_2\text{O}$ (in acidic solution)
- c. $\text{CN}^- + \text{MnO}_4^- \rightarrow \text{CNO}^- + \text{MnO}_2$ (in basic solution)
- d. $\text{Br}_2 \rightarrow \text{BrO}_3^- + \text{Br}^-$ (in basic solution)
- e. $\text{S}_2\text{O}_3^{2-} + \text{I}_2 \rightarrow \text{I}^- + \text{S}_4\text{O}_6^{2-}$ (in acidic solution)

(Reference: Chang 18.1)

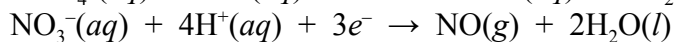
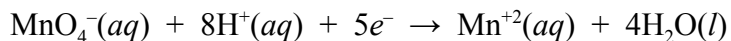
2. Calculate the standard emf of a cell that uses the Mg/Mg^{+2} and Cu/Cu^{+2} half-cell reactions at 25°C . Write the equation for the cell reaction that occurs under standard-state conditions. (10 points)

(Reference: Chang 18.11)

3. Predict whether Fe^{+3} can oxidize I^- to I_2 under standard-state conditions. (10 points)

(Reference: Chang 18.13)

4. Consider the following half-reactions:



Predict whether NO_3^- ions will oxidize Mn^{2+} to MnO_4^- under standard state conditions. (8 points)

(Reference: Chang 18.15)

5. Which species in each pair is a better oxidizing agent under standard-state conditions? (16 points)

- a. Br_2 or Au^{3+}
- b. H_2 or Ag^+
- c. Cd^{2+} or Cr^{3+}
- d. O_2 in acidic media or O_2 in basic media

(Reference: Chang 18.17)

6. Under standard-state conditions, what spontaneous reaction will occur in aqueous solution among the ions Ce^{4+} , Ce^{3+} , Fe^{3+} , and Fe^{2+} ? Calculate ΔG° and K for this reaction. (8 points)

(Reference: Chang 18.27)

7. What is the potential of a cell made up of Zn/Zn^{2+} and Cu/Cu^{2+} half-cells at 25°C if $[\text{Zn}^{2+}] = 0.25\text{ M}$ and $[\text{Cu}^{2+}] = 0.15\text{ M}$? (8 points)

(Reference: Chang 18.31)

8. Consider the electrolysis of molten barium chloride, BaCl_2 . (a) Write the half-reactions. (b) How many grams of barium metal can be produced by supplying

0.50 A for 30 minutes? (10 points)

(Reference: Chang 18.48)

9. In a certain electrolysis experiment involving Al^{3+} ions, 60.2 g of Al is recovered when a current of 0.352 A is used. How many minutes did the electrolysis last? (5 points)

(Reference: Chang 18.87)