PROBLEM SET No. 1 - OXIDATION REDUCTION REACTIONS & STOICHIOMETRY

1. Silberberg 4.64
2. Silberberg 4.67
3. Silberberg 4.74
4. Silberberg 4.75

5. Balance the following oxidation-reduction equations. All reactions occur in acidic solutions.

   (a) $Zn + NO_3^- \rightarrow Zn^{2+} + NH_4^+$

   (b) $ReO_2 + Cl_2 \rightarrow HReO_4 + Cl^-$

   (c) $HNO_2 + MnO_4^- \rightarrow NO_3^- + Mn^{2+}$

   (d) $Cu + NO_3^- \rightarrow Cu^{2+} + NO$

6. Balance the following oxidation-reduction equations. All reactions occur in basic solutions.

   (a) $S_2O_3^{2-} + OCl^- \rightarrow SO_4^{2-} + Cl^-$

   (b) $NiO_2 + Fe \rightarrow Ni(OH)_2 + Fe(OH)_3$

   (c) $SbH_3 + H_2O \rightarrow Sb(OH)_4^- + H_2$

   (d) $P_4 \rightarrow PH_3 + HPO_3^{2-}$

7. Balance the following oxidation-reduction equations under the specific conditions noted:

   (a) $Pb + PbO_2 + SO_4^{2-} \rightarrow PbSO_4$ (acidic solution)

   (b) $CrI_3 + Cl_2 \rightarrow CrO_4^{2-} + IO_4^- + Cl^-$ (basic solution)

   (c) $XO_2^+ + YO^+ \rightarrow X_2O_4^{3-} + Y^- + Y_3O_7^{2-}$ (basic solution)

8. (a) Balance the following oxidation-reduction equation in **basic conditions**:

   $S_2O_3^{2-}(aq) + H_2O_2(aq) \rightarrow S_3O_6^{2-}(aq) + SO_4^{2-}(aq) + H_2O$

   (b) Which substance is the oxidizing agent?
   (c) What is the equivalent weight of H_2O_2 (Molar mass = 34.0) in the above reaction?
   (d) What is the normality of a 0.040 M H_2O_2 solution used in the above reaction?

9. Iodine reacts with thiosulfate ion ($S_2O_3^{2-}$) in acidic solution to form iodide and tetrathionate ion ($S_4O_6^{2-}$). Calculate the volume in mL of 0.100 *M* $Na_2S_2O_3$ needed to react with 7.50 g of I_2.

10. Silberberg 4.130 (**NOTE**: For part (c) of this question, the only solution which will be accepted is the one in which you use Normality, Molarity and equivalents. DO NOT balance any redox equation to solve this problem.