HW09 - REDOX and Electrochemical Cells

Question 1 — 3.0 pts

Balance the skeletal equation of hydrazine with chlorate ions, shown below:

$N_2H_4(g) + ClO_3^-(aq) \longrightarrow NO(g) + Cl^-(aq)$

The reaction takes place in basic solution. What is the smallest possible integer coefficient of ClO_3^- in the balanced equation?

a. 1

b. 3

c. 2

d. 4

Question 2 — 3.0 pts

Identify the reducing agent in the reaction in question 1.

a. ClO_3^-

b. Cl^-

c. N_2H_4

d. NO

Question 3 — 3.0 pts

In the reaction of thiosulfate ion with chlorine gas in an acidic solution, what is the reducing agent?

$Cl_2(g) + S_2O_3^{2-}(aq) \longrightarrow Cl^-(aq) + SO_4^{2-}(aq)$

a. Cl_2

b. $S_2O_3^{2-}$

c. S^{2+}

d. Cl

Question 4 — 3.0 pts

Balance the reaction in question 3 using oxidation and reduction half-reactions. What is the smallest possible integer coefficient of SO_4^{2-} in the combined balanced equation?

a. 1

b. 4

c. 3

d. 2

Question 5 — 3.0 pts

Balance the following equation between permanganate and formic acid in acid solution:

$$MnO_4^- + HCOOH \rightarrow Mn^{2+} + CO_2$$

Three questions: (1) Which side does water end up on? (2) What is the coefficient for H^+? (3) What is the coefficient for formic acid (HCOOH)?

a. right ; 5 ; 5

b. left ; 2 ; 5

c. left ; 6 ; 3

d. right ; 4 ; 2

e. right ; 6 ; 5

Question 6 — 3.0 pts

Chlorate ion in acidic solution will decompose to form chlorine dioxide and chloride ions:

$$ClO_2^- \rightarrow ClO_2 + Cl^-$$

All species are aqueous (aq). Balance this reaction and answer these questions: (1) What is the total number of electrons transferred? (2) What is the coefficient for ClO_2? (3) Which side of the reaction is H^+ and what is it's coefficient?

a. 5 e– ; 5 ; left 6

b. 2 e– ; 1 ; left 2

c. 4 e– ; 2 ; right 2

d. 4 e– ; 4 ; left 4

e. 3 e– ; 2 ; right 4

f. 4 e– ; 3 ; left 2

Question 7 — 3.0 pts

Consider the cell reaction represented by the skeletal equation:

$Mn(s) + Ti^{2+}(aq) \longrightarrow Mn^{2+}(aq) + Ti(s)$

What is the proper cell diagram for this reaction?

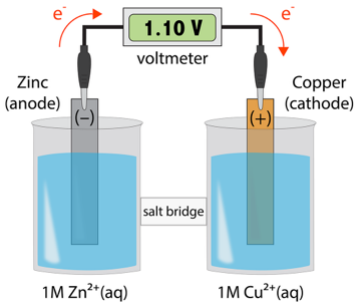
a. $Mn^{2+}(aq)$ | Mn(s) || Ti(s) | $Ti^{2+}(aq)$

b. Mn(s) | $Mn^{2+}(aq)$ || $Ti^{2+}(aq)$ | Ti(s)

c. Ti(s) | $Ti^{2+}(aq)$ || $Mn^{2+}(aq)$ | Mn(s)

d. $Ti^{2+}(aq)$ | Ti(s) || Mn(s) | $Mn^{2+}(aq)$

Question 8 — 3.0 pts



In this electrochemical cell, what is the reduction half reaction?

a. $Cu^{2+}(aq) + 2e^- \longrightarrow Cu(s)$

b. $Zn^{2+}(aq) + 2e^- \longrightarrow Zn(s)$

c. $Cu(s) \longrightarrow Cu^{2+}(aq) + 2e^-$

d. $Zn(s) \longrightarrow Zn^{2+}(aq) + 2e^-$

Question 9 — 3.0 pts

In a galvanic cell...

a. oxidation and reduction take place at the same time, but at different electrodes

b. oxidation takes place at the cathode

c. electrical energy is used to reverse spontaneous chemical reactions

d. electrolytes are added to carry electrons between electrodes

Question 10 — 3.0 pts

In a working electrochemical cell (a galvanic cell or a battery), the cations in the salt bridge move toward the cathode.

a. It depends on the charge of the cation.

b. It is impossible to tell unless we know if the cathode is "+" or "-".

c. False

d. True