AP Chemistry
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Name_____

AP MULTIPLE CHOICE QUESTIONS
CH. 20, SET 2

1994

36. $Zn\ (s) + Cu^{2+} \Leftrightarrow Zn^{2+} + Cu\ (s)$

An electrolytic cell based on the reaction represented above was constructed from zinc and copper half-cells. The observed voltage was found to be 1.00 volt instead of the standard cell potential, E^o, of 1.10 volts. Which of the following could correctly account for this observation?

(A) The copper electrode was larger than the zinc electrode.
(B) The Zn^{2+} electrolyte was $Zn(NO_3)_2$, while the Cu^{2+} electrolyte was $CuSO_4$.
(C) The Zn^{2+} solution was more concentrated than the Cu^{2+} solution.
(D) The solutions in the half cells had different volumes.
(E) The salt bridge contained KCl as the electrolyte.

50. Which of the following acids can be oxidized to form a stronger acid?

(A) H_3PO_4 (D) H_3BO_3
(B) HNO_3 (E) H_2SO_3
(C) H_2CO_3

63. What is the maximum mass of copper that could be plated out by electrolyzing aqueous $CuCl_2$ for 16.0 hours at a constant current of 3.00 amperes? (1 faraday = 96,500 coulombs)

(A) 28 grams (D) 114 grams
(B) 57 grams (E) 128 grams
(C) 64 grams

1989

25. The simplest formula for an oxide of nitrogen that is 36.8 percent nitrogen by weight is

(A) N_2O (D) N_2O_3
(B) NO (E) N_2O_5
(C) NO_2

53. Which of the following must be true for a reaction that proceeds spontaneously from initial standard state conditions?

(A) $\Delta G^o > 0$ and $K_{eq} > 1$
(B) $\Delta G^o > 0$ and $K_{eq} < 1$
(C) $\Delta G^o < 0$ and $K_{eq} > 1$
(D) $\Delta G^o < 0$ and $K_{eq} < 1$
(E) $\Delta G^o = 0$ and $K_{eq} = 1$

60. $Fe^{2+} + 2e^- \rightarrow Fe\ (s)$ $\quad E^o_{red} = -0.44$ volt
$Ni^{2+} + 2e^- \rightarrow Ni\ (s)$ $\quad E^o_{red} = -0.23$ volt

The standard reduction potentials for two half-reactions are given above. The Nernst equation for a galvanic cell at 25°C in which Fe (s) reduces Ni^{2+} is the following

$$E = E_o - (0.059/2)\log[Fe^{2+}]/[Ni^{2+}]$$

What is the equilibrium constant for the reaction

$$Fe\ (s) + Ni^{2+} \rightarrow Fe^{2+} + Ni\ (s)$$

(A) 1.9×10^{-23} (D) $1.3 \times 10^{+7}$
(B) 7.6×10^{-8} (E) $5.2 \times 10^{+22}$
(C) $3.6 \times 10^{+3}$

20. $6I^- + 2MnO_4^- + 4H_2O\ (l) \rightarrow 3I_2\ (s) + 2MnO_2\ (s) + OH^-$

Which of the following statements regarding the reaction by the equation above is correct?

(A) Iodide ion is oxidized by hydroxide ion.
(B) MnO_4^- is oxidized by iodide ion.
(C) The oxidation number of manganese changes from +7 to +2.
(D) The oxidation number of manganese remains the same.
(E) The oxidation number of iodide ion changes from -1 to 0.

22. $\_\_\_Cr_2O_7^{2-} + \_\_\_e^- + \_\_\_H^+ \rightarrow \_\_\_Cr^{3+} + \_\_\_H_2O\ (l)$

When the equation for the half-reaction above is balanced with the lowest whole-number coefficients, the coefficient for H_2O is

(A) 2 (B) 4 (C) 6 (D) 7 (E) 14