Video

Electrochemistry Preliminary Quiz 16 (Standards: #10-4, #10-5)

Standards: #10-4_____/6 #10-5_____/4 total_____/10

____ 1. (#10-4) A piece of copper is dropped into a solution of 1.0M silver nitrate. A dark substance immediately begins to form. Which of the following is true regarding this process? (Cu^{2+} = 0 M, product)

I. The reaction will have a K value greater than 1. yes

II. The $\Delta G < 0$ yes

III. The ΔG is getting larger. $-\Delta G \uparrow 0$ yes

a. I only
b. I and II only
c. II and III only
d. I, II and III

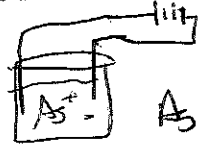
____ 2. (#10-4) Regarding the copper and silver reaction described above is allowed to run until the reaction appears to have stopped. Which of the following would be a method to increase the voltage of the reaction?

I. Cut the copper metal up into shavings No
II. Add 2M $AgNO_3$ to the solution. yes
III. Warm the solution. yes

$Cu^0 + Ag^+ \rightarrow Cu^{+2} + Ag^0$ (2M)

a. I only
b. I and III only
c. II only
d. II and III only

____ 3. (#10-5) Two electrodes are placed in a solution of silver nitrate and a large voltage is applied. Bubbles appear at the left most electrode and a solid appears at the right most electrode. What is the reaction taking place at the right most electrode?



a. $Ag \Rightarrow Ag^+ + 1e$
b. $Ag^+ \Rightarrow Ag + 1e$
c. $Ag + 1e \Rightarrow Ag$
d. $Ag^{+1} + 1e \Rightarrow Ag$

____ 4. (#10-5) Sample A: $Cu(NO_3)_2$ and sample B: $CuNO_3$ are electrolytically treated the same quantity of time at the same 1.0A. What is the different in mass of ~~copper produced?~~

a. A will exceed B by 1 mole
b. B will exceed A by 63g
c. B will be double A
d. A will be double B

→ #e⁻ equal

A: → $Cu^{+2} + 2e = Cu^0$

B: → $Cu^+ + 1e^- \rightarrow Cu^0$ ↑ ½ rate used = 2x

Problem

5. 4 points

For the oxidation-reduction reaction

$S_4O_6^{-2} + Cr^{2+} \Rightarrow Cr^{3+} + S_2O_3^{2-}$

The appropriate half-reactions are as follows

$2e^- + S_4O_6^{-2} \Rightarrow 2S_2O_3^{-2}$ E = 0.17V

$Cr^{3+} + 1e^- \Rightarrow Cr^{2+}$ E = -0.50V ← Flip

a. Write a balanced equation and calculate E° $2e^- + S_4O_6^{-2} \rightarrow 2S_2O_3^{-2}$ +0.17V

$2Cr^{+2} \rightarrow 2Cr^{+3} + 2e^-$ +0.5V

$S_4O_6 + 2Cr^{2+} \rightarrow 2S_2O_3^{-2} + 2Cr^{+3}$ +.67V

b. Calculate K for the reaction. (#10-4)

$\Delta G = -RT\ln K$

$\Delta G^\circ = nFE^\circ$

$-nFE = -RT\ln K$

$-(2)(96500)(+.67) = -8.31 \cdot 298 \cdot \ln K$

$K = 4.76E22$

c. Calculate ΔG° (#10-4)

d. When the reaction comes to equilibrium what will be the value of ΔG? (#10-4)

e. When this reaction comes to equilibrium what is the value of K? (#10-4)

zero

4.76×22 "b" ←

6. (#10-5) 2 points
Gold (III) nitrate is electroplated with a 1.0A current for 10 min. Answer the following questions.
a. What is the half reaction that is being described?

b. What is the mass of gold being plated?

c) $\Delta G^\circ = -nFE^\circ$

$-2(96500) \cdot$ [illegible] $=$

$\Delta G = -1.29 \times 5$ kJ/rxn

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b) $Au^{+3} + 3e^- \rightarrow Au^\circ$

$I = \frac{q}{t}$ $\quad 1. = \frac{q}{600\,sec} = 600\,C \cdot \frac{1\,mol\,e^-}{96500} =$

10.60 = 600 sec

$= 0.00621\,mol\,e^-$

$0.00621\,mole \cdot \frac{1\,Au}{3e^-} = 0.00207\,mol\,Au$

$.00207\,mol\,Au \cdot \frac{197g}{1\,mol\,e^-} = 0.408g$