Chem 10123, Quiz 8 Name: _____
(Please Print)
April 8, 2020

1. (2 points) Write balanced ionic equations for the half reactions that occur at the anode and cathode for the electrolysis of an aqueous solution of $Cu(NO_3)_2$.
   Anode:

   Cathode:

2. Consider the following galvanic cell in which the volume of each half-cell is 0.500 L.

   $$Pb_{(s)} \mid PbO_{(s)} \mid OH^- (3.00\ M) \parallel Au^{3+} (1.00\ M) \mid Au_{(s)}$$

   (a) (3 points) Write balanced chemical equations for the two half-reactions and for the overall cell reaction.
   Anode:

   Cathode:

   Cell:

   (b) (5 points) Determine the ***cell potential*** (E_{cell}) for the cell as described above.

2. continued….

   (c) (5 points) **SHOW ALL WORK.** If current is drawn from the above cell at a constant rate of 0.50 amp, determine the pH of the solution in the Pb half-cell after 72 hours.

3. (5 points) **SHOW ALL WORK.** Use appropriate electrochemical data to determine the ***formation constant*** **(K_f)** for $AuCl_4^-(aq)$. ***Include balanced chemical equations for all relevant reactions***.

Standard Reduction Potentials

Half - Reaction	***E*° (volts)**
$Au^{3+}_{(aq)} + 3\ e^- \longrightarrow Au_{(s)}$	+ 1.50
$Cl_{2(g)} + 2\ e^- \longrightarrow 2\ Cl^-_{(aq)}$	+ 1.36
$O_{2(g)} + 4\ H^+_{(aq)} + 4\ e^- \longrightarrow 2\ H_2O$	+ 1.23
$Pt^{2+}_{(aq)} + 2\ e^- \longrightarrow Pt_{(s)}$	+ 1.18
$AuCl_4^-{}_{(aq)} + 3\ e^- \longrightarrow Au_{(s)} + 4\ Cl^-_{(aq)}$	+ 1.00
$Ag^+_{(aq)} + e^- \longrightarrow Ag_{(s)}$	+ 0.80
$Fe^{3+}_{(aq)} + e^- \longrightarrow Fe^{2+}_{(aq)}$	+ 0.77
$PtCl_4^{2-}{}_{(aq)} + 2\ e^- \longrightarrow Pt_{(s)} + 4\ Cl^-_{(aq)}$	+ 0.76
$Cu^{2+}_{(aq)} + 2\ e^- \longrightarrow Cu_{(s)}$	+ 0.34
$AgCl_{(s)} + e^- \longrightarrow Ag_{(s)} + Cl^-_{(aq)}$	+ 0.22
$Cu^{2+}_{(aq)} + e^- \longrightarrow Cu^+_{(aq)}$	+ 0.16
$2\ H^+_{(aq)} + 2\ e^- \longrightarrow H_{2(g)}$	0.00
$Pb^{2+}_{(aq)} + 2\ e^- \longrightarrow Pb_{(s)}$	- 0.13
$Ni^{2+}_{(aq)} + 2\ e^- \longrightarrow Ni_{(s)}$	- 0.23
$PbSO_{4(s)} + 2\ e^- \longrightarrow Pb_{(s)} + SO_4^{2-}{}_{(aq)}$	- 0.36
$Fe^{2+}_{(aq)} + 2\ e^- \longrightarrow Fe_{(s)}$	- 0.44
$PbO_{(s)} + H_2O + 2\ e^- \longrightarrow Pb_{(s)} + 2\ OH^-_{(aq)}$	- 0.58
$Zn^{2+}_{(aq)} + 2\ e^- \longrightarrow Zn_{(s)}$	- 0.76
$2\ H_2O + 2\ e^- \longrightarrow H_{2(g)} + 2\ OH^-_{(aq)}$	- 0.83
$Al^{3+}_{(aq)} + 3\ e^- \longrightarrow Al_{(s)}$	- 1.66
$Na^+_{(aq)} + e^- \longrightarrow Na_{(s)}$	- 2.21
$K^+_{(aq)} + e^- \longrightarrow K_{(s)}$	- 2.92