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Chem 30 Unit 2 Assignment Pt B.

1.) a) $2[Zn_{(s)} \rightleftharpoons Zn^{2+}_{(aq)} + 2e^-]$ Anode LEOA

$O_{2(g)} + 2H_2O_{(l)} + 4e^- \rightleftharpoons 4OH^-_{(aq)}$ Cathode GERC

$2Zn_{(s)} + O_{2(g)} + 2H_2O_{(l)} \rightleftharpoons 2Zn^{2+}_{(aq)} + 4OH^-_{(aq)}$. /2

b.) $2Zn_{(s)} + O_{2(g)} + 2H_2O_{(l)} \rightleftharpoons 2Zn^{2+}_{(aq)} + 4OH^-_{(aq)}$

$E^\circ_{cell} = E^\circ_{cathode} - E^\circ_{anode}$.

$E^\circ_{cell} = (0.40V) - (-0.76V)$ /2

$E^\circ_{cell} = \underline{1.16V}$

c.) $O_{2(g)} + 2H_2O_{(l)} + 4e^- \rightleftharpoons 4OH^-_{(aq)}$.

1500A

5.0min = 300s.

n = ?

$n_{e^-} = \frac{(1500A)(300s)}{9.65\times10^4 C/mol} = 4.66mol$ /2

$\frac{n_{O_2}}{4.66mol} = \frac{1}{4}$ $= \underline{1.16mol}$

$m = nM$

$= (1.16mol)(32.00g/mol)$

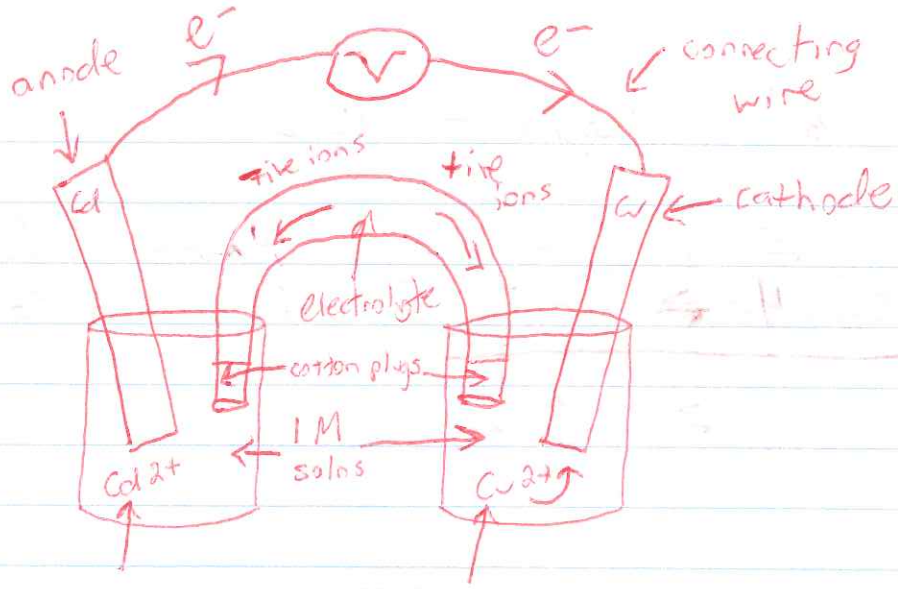
$= \underline{37.3g}$

d.) $E_o = (0.40V) - (-0.13)$ /2

$E_o = 0.53V$

A lead electrode would produce a smaller voltage.

2. a.)



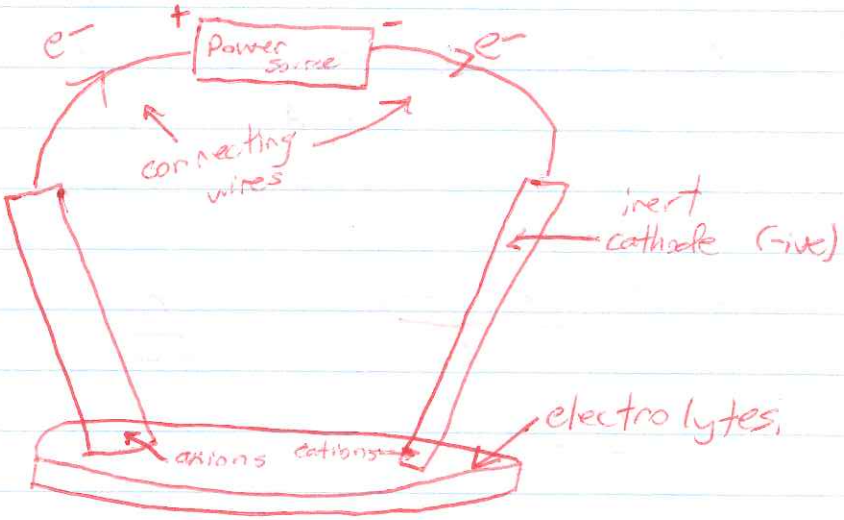
/4

b.) $Cu^{2+}_{(aq)} + 2e^- \rightleftharpoons Cu_{(s)}$ + 0.34V

$Cd_{(s)} \rightleftharpoons Cd^{2+}_{(aq)}$ ⊖ − 0.40V

/2 $Cu^{2+}_{(aq)} + Cd_{(s)} \rightleftharpoons Cu_{(s)} + Cd^{2+}_{(aq)}$ + 0.74V

3.) a.)



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b.) /4 *Must include eqn!

c) /2

4. Electrolytic cells:

consume electricity
non-spontaneous
cathode higher than anode on REDox table.
+ive E°_{net}
cathode -ive, anode +ive
often inert electrodes
1 solution
no salt bridge

Voltaic Cells:

produce electricity
spontaneous
anode higher than cathode on table
-ive E°_{net}
cathode +ive anode -ive
different metal electrodes
2 solutions
salt bridge.

Both cells use two electrodes, connecting wires & electrolytes. In both cells, +ve anode go to +ve anode & -ve cathode goes to -ve cathode.
Both cells involve an exchange of electrons.

/5 Practical Uses: Voltaic → common AA → D cells.
car batteries

Electrolytic → electroplating
→ rechargeable batteries.

5.) a) Common anode: $Zn_{(s)}$ ($Zn_{(s)}$ is a SRA, which is e^- oxidized, LEOA)

/3 Leclanché cell: $Zn_{(s)} \rightarrow ZnCl_2 \cdot 2NH_3$
Zinc Chloride cell: $Zn_{(s)} \rightarrow ZnCl_2 \cdot 4ZnO \cdot 5H_2O_{(s)}$ from $0 \rightarrow 2^+$
Alkaline / MnO_2 cell: $Zn_{(s)} \rightarrow ZnO_{(s)}$

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

/2 $n = 10g$, $M = 65.39 g/mol$, $n = \frac{m}{M} = 0.153 mol$

$\frac{2}{1} = \frac{n_{e^-}}{0.153 mol}$, $n_{e^-} = 0.3059 mol$

$n_{e^-} = \frac{iT}{F}$ $T = \frac{n_{e^-} F}{i}$

$= \frac{(0.3059 mol)(9.65 \times 10^4)}{(0.300 A)} = 9.84 \times 10^4 s$

27.3h
~~=27h~~