

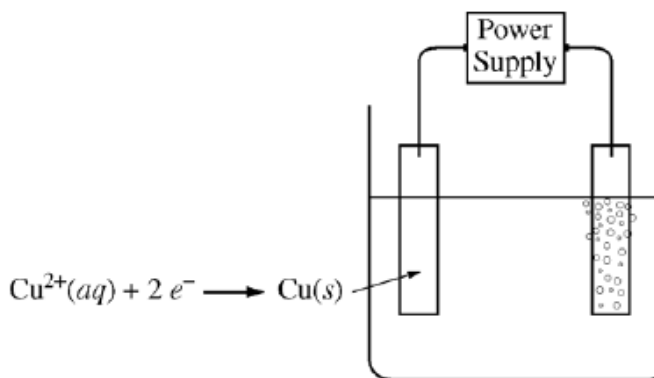
Name \_\_\_\_\_

## AP Chemistry

Chapter 17 HW 3: Due 3/15/18. Complete both electrochemistry free response questions. One will be graded and one won't. I usually pick the harder one(for me) to grade. Sometimes I pick the second one because it would be weird if a student did problem 2 but skipped problem 1 on a two problem assignment. Show all work. Box and clearly label all final free response answers.

1. An external direct-current power supply is connected to two platinum electrodes immersed in a beaker containing 1.0 M  $\text{CuSO}_4(\text{aq})$  at  $25^\circ\text{C}$ , as shown in the diagram above. As the cell operates, copper metal is deposited onto one electrode and  $\text{O}_2(\text{g})$  is produced at the other electrode. The two reduction half-reactions for the overall reaction that occurs in the cell are shown in the table below.

Half-Reaction	$E^\circ(\text{V})$
$\text{O}_2(\text{g}) + 4 \text{H}^+(\text{aq}) + 4 \text{e}^- \rightarrow 2 \text{H}_2\text{O}(\text{l})$	+1.23
$\text{Cu}^{2+}(\text{aq}) + 2 \text{e}^- \rightarrow \text{Cu}(\text{s})$	+0.34



- (a) On the diagram, indicate the direction of electron flow in the wire.
- (b) Write a balanced net ionic equation for the electrolysis reaction that occurs in the cell.
- (c) Predict the algebraic sign of  $\Delta G^\circ$  for the reaction. Justify your prediction.
- (d) Calculate the value of  $\Delta G^\circ$  for the reaction.
- An electric current of 1.80 amps passes through the cell for 40.0 minutes.
- (e) Calculate the mass, in grams, of the  $\text{Cu}(\text{s})$  that is deposited on the electrode.
- (f) Calculate the dry volume, in liters measured at  $25^\circ\text{C}$  and 1.26 atm, of the  $\text{O}_2(\text{g})$  that is produced.

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