ENGINEERING CHEMISTRY
(CHY 1004)
ASSIGNMENT -2.

1) $t = 45 \text{ min} = 2700 \text{ s}$

$i = 0.15 \text{ A}$

GMW of Cu = 63.5 u

$$I = \frac{Q}{t}$$

$Q = I \times t$

$Q = 0.15 \times 2700 = 405 \text{ C}$

2 moles of $\bar{e}$ can deposit 1 mole of Cu

1 mole can deposit = 1 Faraday = 96500 C

2 moles of $\bar{e}$ deposit = 2 Faraday = 193000 C

193000 C = 1 mole of Cu

405 C = x moles of Cu

$193000 \; x = 405$

$$x = \frac{405}{193000} \text{ moles of Cu}$$

$$\text{no. of moles} = \frac{wt}{GMW} = \frac{g}{63.5}$$

$$\text{no. of grams} = 63.5 \times \frac{405}{193000} = 0.133$$

∴ no of grams of Cu dissolved = 0.1339

(2) If the slope of the graph line is too steep, there will be alternative discharge source used i.e.

$$\text{slope of graph} \propto \frac{1}{\text{discharging time}}$$

Here a has more slope than d, so I would suggest customer to use battery D as it will be long-lasting.

(3) Half cell Creations:-

Reduction:- Takes place at cathode. There, cobalt combines with lithium ions to form lithium cobalt oxide ($LiCoO_2$).

$$CoO_2 + Li^+ + e^- \longrightarrow LiCoO_2.$$

Oxidation:- Takes place at anode. There, graphite intercalation compound life

formed graphite (C_6) and lithium ions. The half-reaction is:-

$$LiC_6 \longrightarrow C_6 + Li^+ + \bar{e}$$

Here is the full reaction:-

Recharging:- $LiC_6 + CoO_2 \longrightarrow C_6 + LiCoO_2$.

Discharging:- $C_6 + LiCoO_2 \longrightarrow LiC_6 + CoO_2$

(4) Fuel cells are more efficient than combustion engines as they operate at higher thermodynamic efficiency. Combustion engines must first convert their fuel into heat, then into mechanical energy, and finally into electricity. Fuel cells skip those intermediatary steps.

Comparision	PEMFC	SOFC
Advantages	1. Highly efficient 2. Fuel flexibility 3. Smaller, less expensive than materials required for SOFC	1. Can use CO + hydrogen as fuel without any issues. 2. Current technology can produce cheaper and lighter insulation. 3. Better thermal management
Disadvantages	① Requirement of Pure hydrogen with neCO which technically challenging, Complex & expensive. ② Complex water & thermal management	① Long start-up times of SOFC systems. ② Insulation & heat dispersion.

(5) $E^{\circ}_{Fe^{+2}/Fe} = -0.44\ V$

$E^{\circ}_{Sn^{+2}/Sn} = -0.15\ V$

$E^{\circ}_{Mg^{2+}/Mg} = -2.38\ V$

More is the negative value, more is the chance of coating it

with metal. $-2.38 < -0.44$. Therefore Mg can be used to coat iron where as $-0.15 > -0.44$ so, Sn cannot be used to coat it