Experiment #4: The Electrical Equivalent of Heat and the Resistivity of Materials

-Tejas (Tj) Hariharan

Purpose:

➔ The Purpose of this experiment is to demonstrate the equivalence of electrical energy and thermal energy using a specifically constructed copper "calorimeter".

Part 1:

Calculations and Analysis:

➔ See attached Graphs 1 and 2 for details on data.

➔ From Data: $P_{9v} = 23.61475$.

➔ $W_{el} = P \Delta t = (23.61475)(260.897 \, K) = 6161.017 \, Joules.$

➔ As we Assumed that $W_{el} = \Delta Q$ => 6161.017 J = c*(357 g)*(69.94518 – 23.01923)

➔ c = 0.03678 $\dfrac{J}{g \, ^oC}$. % Difference = 7% from accepted value.

➔ The difference in the values can be due to human error and error in experimental conditions and equipment.

Part 2:

Calculations and Analysis:

➔ See attached Graph 3 for details on data.

Part 2:

Calculations and Analysis:

➔ See attached Graphs 4 and 5 for details on data.

➔ The plot of the first graph (graph 4) IS keeping with equation 5.

➔ According to this $R_0 = 273.86$ and $E_g / 2K = -0.0397$.

➔ This implies that: $\dfrac{E_g}{(2*8.615*10^5)} = 4051.3 \Rightarrow E_g (band \; gap \; energy) = 0.698 \, Joules.$ (From graph 4).