

Answer on Question #46004-Physics-Electromagnetism

An ammeter is suspected of giving inaccurate readings. In order to confirm the readings, the ammeter is connected to a silver voltmeter in series and a steady current is passed for one hour. The ammeter reads $I_0 = 0.56A$ and $m = 2.0124g$ of silver is deposited. By what percentage is the ammeter reading incorrect?

Solution

$$m = \frac{Q A}{C v},$$

where m is the mass of silver, Q is charge transferred, $A = 108 \frac{kg}{kmol}$ is atomic weight of silver, $C = 9.65 \cdot 10^7 \frac{C}{kmol}$, v is valence.

$$m = \frac{Q A}{C v} \rightarrow m = \frac{It A}{C v} \rightarrow 2.0124 \cdot 10^{-3} = \frac{I \cdot 3600}{9.65 \cdot 10^7} \left(\frac{108}{1} \right) \rightarrow I = 0.50A.$$

$$\frac{|I - I_0|}{I} = \frac{0.56 - 0.50}{0.50} = 12\% \text{ error.}$$

Answer: 12%.