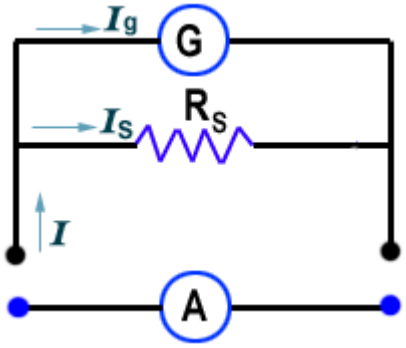
Answer on Question#52322 - Physics - Electromagnetism

A galvanometer of resistance 120Ω a full scale deflection with a current of 0.0005A. How would you convert it to an ammeter that reads a maximum current of 5A?

Solution:



Let a shunt of resistance R_s is connected in parallel to galvanometer. This resistance should be of such value, that total current through the circuit is $I = 5\text{A}$ and current through the galvanometer is $I_g = 0.0005\text{A}$. The voltage at this connection is given by the voltage at galvanometer:

$$V = V_g = I_g \cdot R_g$$

The total resistance of this circuit is given by

$$R = \frac{R_s \cdot R_g}{R_s + R_g}$$

Therefore, the total current through the circuit I can be expressed as follows

$$I = \frac{V}{R} = I_g \cdot R_g \frac{R_s + R_g}{R_s \cdot R_g} = \frac{I_g(R_s + R_g)}{R_s}$$

Expressing R_s we obtain ($I_g \ll I$):

$$R_s = \frac{I_g}{I - I_g} R_g \approx \frac{I_g}{I} R_g = \frac{0.0005\text{A}}{5\text{A}} 120\Omega = 1.2 \times 10^{-2}\Omega$$

Answer: connect a shunt of resistance $1.2 \times 10^{-2}\Omega$ in parallel to galvanometer.