

## Answer on Question 59060, Physics, Electric Circuits

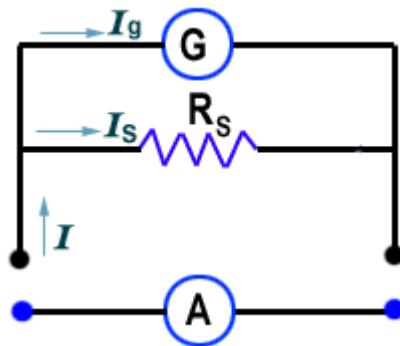
### Question:

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

- a) connect  $2000 \Omega$  in parallel to it
- b) connect  $200.12 \Omega$  in series to it
- c) connect  $20.10 \Omega$  in series to it
- d) connect  $0.012 \Omega$  in parallel to it**

### Solution:

Galvanometer can be converted into an ammeter by shunting it with a very small resistance as we can see in the scheme below:



Let the resistance of galvanometer be  $R_g$  and it gives full scale deflection when current  $I_g$  is passed through it. Then, from the Ohm's law we can write the potential difference across the galvanometer:

$$V_g = I_g R_g.$$

Let a shunt of resistance  $R_s$  is connected in parallel to galvanometer and total current through the circuit is  $I$ . Then, from the Kirchhoff's first law we can write the current through the shunt:

$$I_s = I - I_g.$$

Then, the potential difference across the shunt will be:

$$V_s = I_s R_s = (I - I_g) R_s.$$

But, potential difference across the galvanometer and shunt resistance are equal, so we can write:

$$(I - I_g) R_s = I_g R_g.$$

From this formula, we can find the shunt resistance  $R_s$ :

$$R_s = \frac{I_g}{I - I_g} R_g = \frac{0.0005 \text{ A}}{5 \text{ A} - 0.0005 \text{ A}} \cdot 120 \Omega = 0.012 \Omega.$$

**Answer:**

d) connect  $0.012 \Omega$  in parallel to it