Answer on Question #45710, Physics, Electromagnetism

A galvanometer with coil resistance 12.0Ω shows full scale deflection for a current of 2.5mA. How would you convert it into a voltmeter of range 0 to 10.0V

Solution

Voltmeter is an instrument used to measure the potential difference between any two points in a circuit. It is always connected in parallel to the circuit across the component where we want know the potential difference and will not alter the current flowing through the circuit neither will it draw current from the main circuit. The current should be negligible through the voltmeters if the resistance of the voltmeter should be high. For an ideal voltmeter the resistance should be infinity which is impractical but.Lets see how to convert galvanometer into voltmeter in this page.A galvanometer is the sensitive instrument used to measure small currents. Now our interest is to convert a galvanometer to voltmeter to measure the potential difference across any component in a circuit. This can be done by adding a suitable high resistance in series with galvanometer. When high resistance is connect in series with the galvanometer, very negligible current flow through it. We are interested to measure the potential difference ΔV. If I is the maximum current through the galvanometer then according ohms law

$$\Delta V = I(R + G)$$

where G is galvanometer resistance and R is new connected resistance. Hence

$$R = \frac{\Delta V}{I} - G$$

So we find resistance of resistor we should connect

$$R = \frac{10}{2.5 \cdot 10^{-3}} - 12 = 400 - 12 = 388\,\Omega$$