Conversion of Galvanometer into Voltmeter and Ammeter 02.06.09



(M.Sc. Physics, M.Ed.)

Kendriya Vidyalaya, Sector 47, Chandigarh



<u>Conversion of a Galvanometer</u> into Ammeter and Voltmeter

<u>Galvanometer</u>: A galvanometer is a device used to find direction of current and its magnitude. It has small resistance and is connected in series.

<u>Conversion of a Galvanometer</u> into Ammeter and Voltmeter

<u>Ammeter</u>: - It is a low resistance galvanometer, used to measure current in a circuit. The current to be measured must pass through it, hence, it is connected in series combination. An ideal ammeter should have zero resistance.

<u>Conversion of a Galvanometer</u> into Ammeter and Voltmeter

Voltmeter: - It is a high resistance galvanometer, used to measure potential difference between two points. It is connected across the component's ends potential difference across which is to be measured. Hence, it is in parallel to that component. An ideal voltmeter must have infinite resistance.

Conversion of Galvanometer to Ammeter:

Galvanometer can be converted into ammeter by shunting it with a very small resistance.

Potential difference across the galvanometer and shunt resistance are equal.

$$(I - I_g) S = I_g G \quad \text{or} \quad S = \frac{I_g G}{I - I_g}$$



Conversion of Galvanometer to Voltmeter:

Galvanometer can be converted into voltmeter by connecting it with a very high resistance.

Potential difference across the given load resistance is the sum of p.d across galvanometer and p.d. across the high resistance.

$$V = I_g (G + R) \text{ or } R = \frac{V}{I_g} - G$$



Numerical

A galvanometer coil has a resistance of 12Ω and it shows fullscale deflection at a current of 3 mA. How would you convert it into (i) voltmeter of range 0 -18V (ii) an ammeter of range 0 - 6A

A galvanometer coil has a resistance of 12Ω and it shows full-scale deflection at a current of 3 mA. How would you convert it into (i) voltmeter of range 0 -18V (ii) an ammeter of range 0 - 6A

Solution:

$$R_{g} = 12\Omega \quad I_{g} = 3mA = 3 \times 10^{-3}A$$
(i) V = 18V hence R = $\frac{V}{I_{g}} - R_{g} = \frac{18}{3 \times 10^{-3}} - 12 = 6000 - 12 = 5988\Omega$
(ii) I = 6A hence S = $\frac{I_{g}R_{g}}{I - I_{g}} = \frac{3 \times 10^{-3} \times 12}{6 - 3 \times 10^{-3}}$
= $\frac{36 \times 10^{-3}}{6 - .003} = \frac{36 \times 10^{-3}}{5.997} = 6 \times 10^{-3} = 6 m\Omega$