Moving Coil Galvanometer-

It is a device used for the detection and measurement of the currents.

$$NBIA = k\theta \quad or \quad I = \frac{k}{NBA}\theta$$
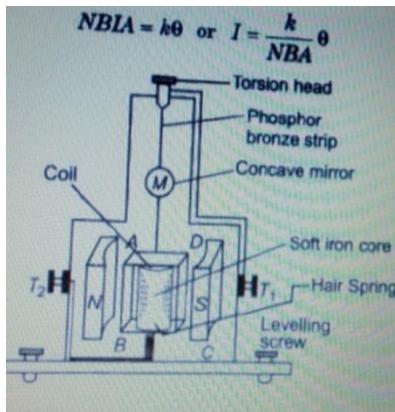
PRINCIPLE- It works on the principle that when a current carrying coil is placed in uniform magnetic field torque experienced on it.

Theory-

In equilibrium, deflecting torque = restoring torque

Deflecting torque = BINA sin θ ....(i)

Where,

N = number of turns in the coil,

B = magnetic field intensity,

A = area of cross-section of the coil and

θ = angle between magnetic field and area of the coil

suppose α is the deflection when torque experienced on the coil then,

restoring torque = k α ....(ii) , where k is the tortional constant

from eq. (i) and(ii) BINA sin θ = kα

because there is always a redial magnetic field , therefore θ=90⁰ , so

BINA =kα ,

I α α (current is proportional to the angle of deflection).

Here , k/BNA is known as the figure of merit.

Current Sensitivity

The deflection produced per unit current in galvanometer is called its current sensitivity.

Current sensitivity

Is = α / I = NBA / K

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Voltage Sensitivity

The deflection produced per unit voltage applied across the ends of galvanometer is called its voltage sensitivity.

Voltage sensitivity

$V_s = \alpha / V = NBA / KR$

where R is the resistance of the galvanometer.

 Therefore for a sensitive galvanometer

(i)   N should be large (ii) B should be large (iii) A should be large (iv) K should be small
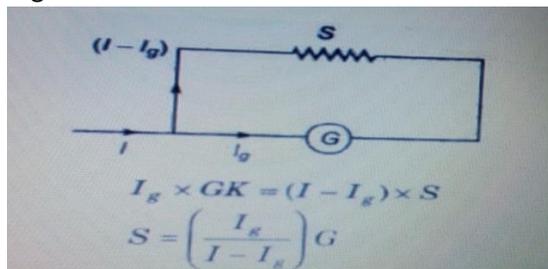
Ammeter -

An ammeter is a low resistance galvanometer used for measuring the current in a circuit.

It is always connected in series.

Conversion of a Galvanometer into an Ammeter

A galvanometer can be converted into an ammeter by connecting a low resistance into its parallel.

$$I_g \times GK = (I - I_g) \times S$$
$$S = \left(\frac{I_g}{I - I_g} \right) G$$

If G is the resistance of a galvanometer and it give full scale deflection for current, Ig then required low resistance S, connected in its parallel for converting it into an ammeter of range I is given by

The resistance of an ideal ammeter is zero.

Voltmeter

A voltmeter is a high resistance galvanometer used for measuring the potential difference between two points.

It is always connected in parallel.

The resistance of an ideal voltmeter is infinity. Conversion of a Galvanometer into a Voltmeter

A galvanometer can be converted into a voltmeter by connecting a high resistance into its series. If a galvanometer of resistance G show full scale deflection for current Ig then required high resistance

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R, connected in series for converting it into a voltmeter of range V is given by

$$V = I_g (G + R)$$

$$R = \frac{V}{I_g} - G$$