# QB365 Question Bank Software

**12th Physics Case study Questions Moving Charges And MagnetismFor - 2024**

12th Standard

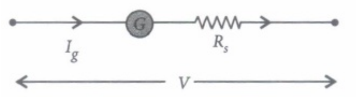
**Physics**

**SECTION A** 2 x 4 = 8

1) A galvanometer can be converted into voltmeter of given range by connecting a suitable resistance $R_s$ in series with the galvanometer, whose value is given by

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

where V is the voltage to be measured, $I_g$ is the current for full scale deflection of galvanometer and G is the resistance of galvanometer



Series resistort ($R_s$) increases range of voltmeter and the effective resistance of galvanometer. It also protects the galvanometer from damage due to large current.
Voltmeter is a high resistance instrument and it is always connected in parallel with the circuit element across which potential difference is to be measured. An ideal voltmeter has infinite resistance
In order to increase the range of voltmeter n times the value of resistance to be connected in series with galvanometer is $R_s$ = (n - l)G.

(I) 10 mA current can pass through a galvanometer of resistance $25\Omega$ What resistance in series should be connected through it, so that it is converted into a voltmeter of 100 V?

$(a)\ 0.975\Omega\ (b)\ 99.75\Omega\ (c)\ 975\Omega\ (d)\ 9975\Omega$ .

(ii) There are 3 voltmeter A, B, C having the same range but their resistance are $15,000\Omega, 10,000\Omega$ and $5,000\Omega$ respectively. The best voltmeter amongst them is the one whose resistance is

$(a)\ 5000\Omega\ (b)\ 10,000\Omega\ (c)\ 15,000\Omega$ **(d) all are equally good**

(iii) A milliammeter of range 0 to 25 mA and resistance of $10\Omega$ is to be converted into a voltmeter with a range of 0 to 25 V. The resistance that should be connected in series will be

**(a)** $930\Omega$ $(b)\ 960\Omega\ (c)\ 990\Omega\ (d)\ 1010\Omega$

(iv) To convert a moving coil galvanometer (MCG) into a voltmeter

**(a) a high resistance R is connected in parallel with MCG**

**(b) a low resistance R is connected in parallel with MCG**

**(c) a low resistance R is connected in series with MCG**

**(d) a high resistance R is connected in series with MCG**

(v) The resistance of an ideal voltmeter is

**(a) zero (b) low (c) high (d) infinity**

**Answer : (i) (d)**: A galvanometer can be converted into a voltmeter of given range by connecting a suitable high resistance R in series of galvanometer, which is given by

$$R = \frac{V}{I_g} - G = \frac{100}{10 \times 10^{-3}} - 25 = 10000 - 25 = 9975\Omega$$

**(ii) (c):** An ideal voltmeter should have a very high resistance.

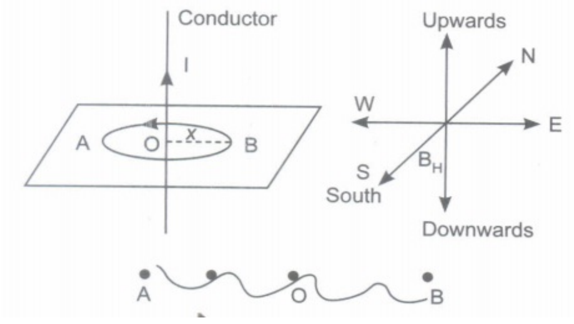
**(iii) (c):** Resistance of voltmeter $= \frac{25}{25 \times 10^{-3}} = 1000\Omega$

$$\therefore \quad X = 1000 - 10 = 990\Omega$$

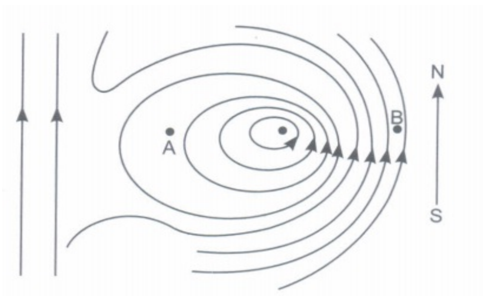
**(iv) (d)**: To convert a moving coil galvanometer into a voltmeter, it is connected with a high resistance in series. The voltmeter is connected in parallel to measure the potential difference. As the resistance is high, the voltmeter itself does not consume current.

**(v) (d):** The resistance of an ideal voltmeter is infinity.

2) If a straight current carrying conductor is placed as shown. Points A and B lies on west and east side of a conductor at a distance x each from the conductor. Then relate the magnetic field at A to that at B. Also draw the corresponding magnetic field lines.




**Answer :**




At a distance x towards east at point B, net magnetic field is due to

(i) current carrying conductor which is equal to

$$B = \frac{\mu_0 I}{2x} \text{ towards North}$$

(ii) Horizontal component of magnetic field BH directed towards North.

$$\therefore \; B_B = \frac{\mu_0 I}{2x} + B_H \qquad \text{.........(i)}$$

But at point A, at the same distance x; magnetic field due to straight conductor is towards south [using Right hand thumb Rule]