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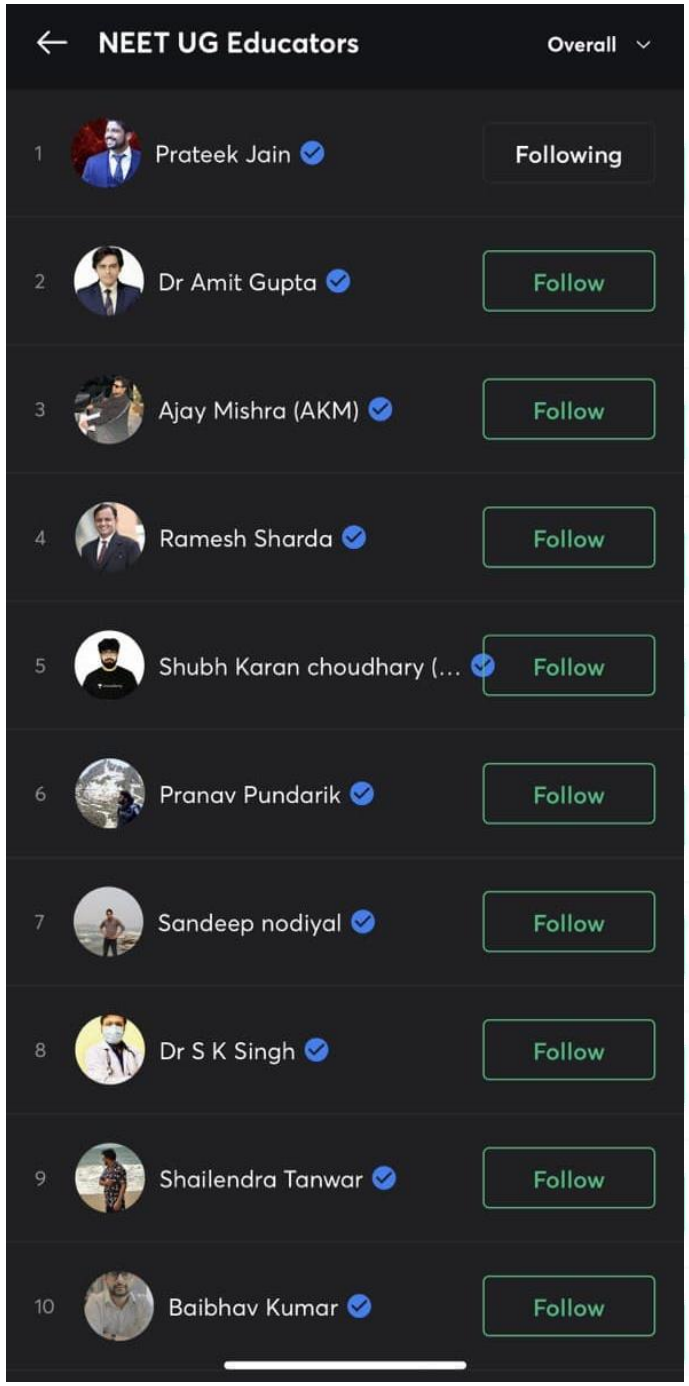

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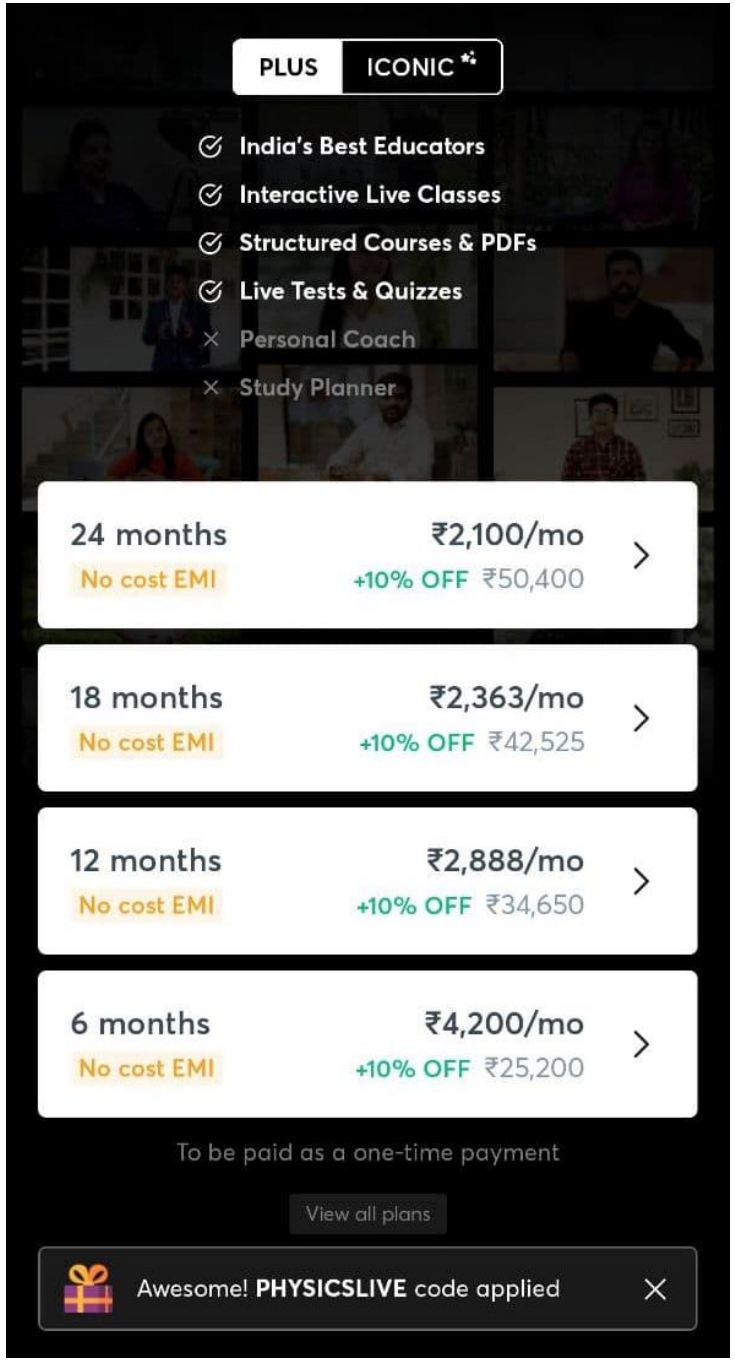

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Solution
NEET & AIIMS PYQs

Current Electricity (3/3): Bulb problems & Power rating of electrical appliances, Electrical Instruments

By Physicsaholics Team

PYQs on Following Subtopic:

Bulb problems & Power rating of electrical appliances

An electric bulb marked 40 W and 200 V, is used in a circuit of supply voltage 100 V. Now its power is

(a) 100 W (b) 20 W

(c) 40 W (d) 10 W. *(2002)*

AIIMS

Ans. d

A bulb of 25 W, 200 V and another bulb of 100 W, 200 V are connected in series with a supply line of 220 V. Then

(a) both bulbs will glow with same brightness

(b) both bulbs will get fused

(c) 25 W bulb will glow more brightly

(d) 100 W bulb will glow more brightly.

(2008)

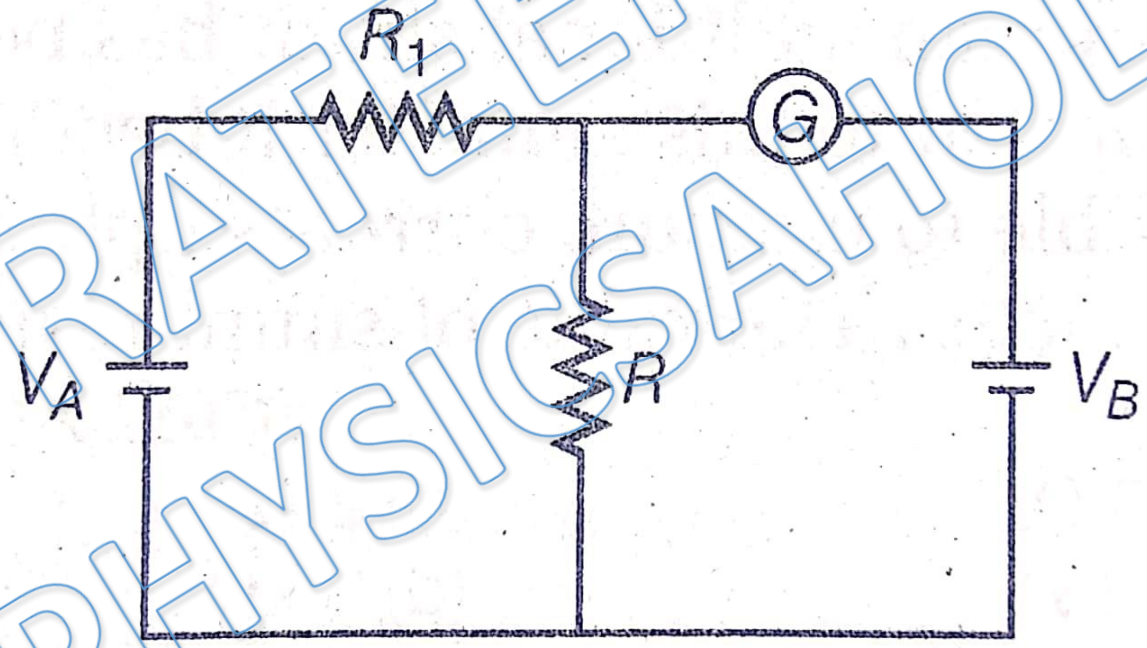
AIIMS

Ans. c

PYQs on Following Subtopic:

Galvanometer, Ammeter & Voltmeter

In the circuit shown, the cells A and B have negligible resistances. For $V_A = 12$ V, $R_1 = 500\ \Omega$ and $R = 100\ \Omega$ the galvanometer (G) shows no deflection. The value of V_B is [CBSE AIPMT 2012]

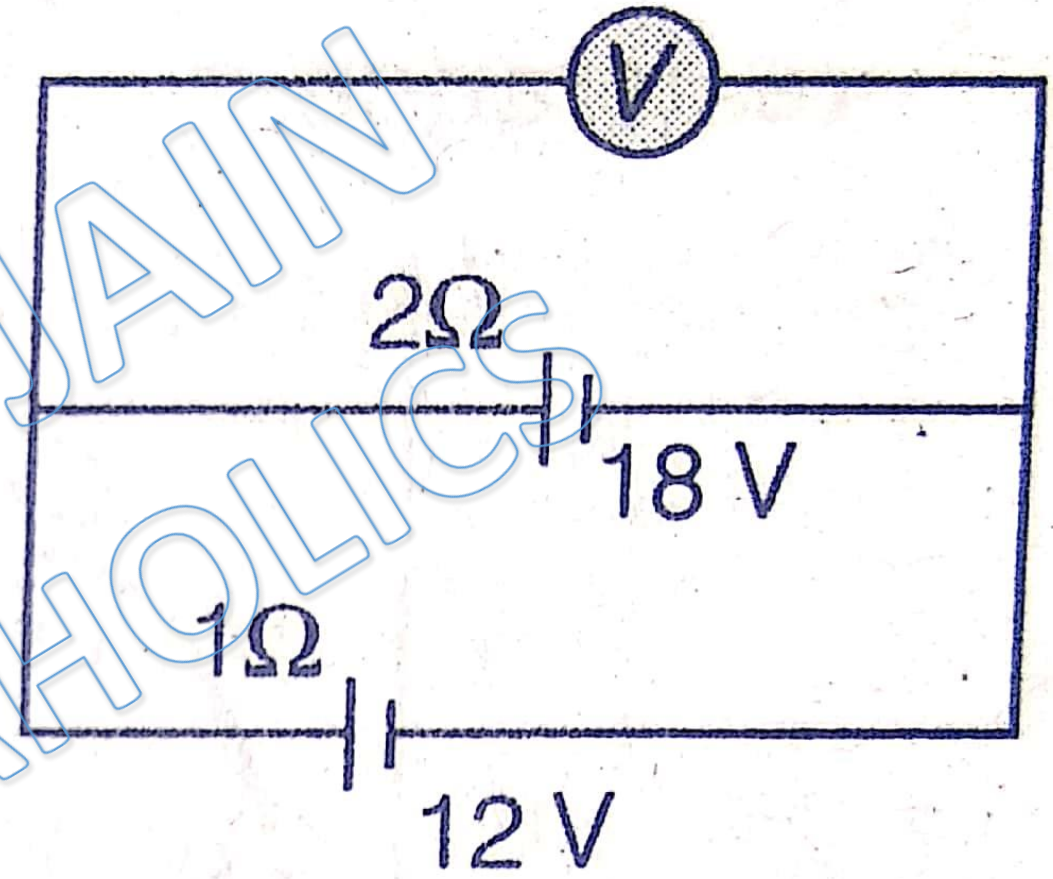


KVL

(a) 4 V (b) 2 V (c) 12 V (d) 6 V

Ans. b

. Two batteries, one of emf 18V and internal resistance 2 Ω and the other of emf 12 V and internal resistance 1 Ω, are connected as shown. The voltmeter V will record a reading of

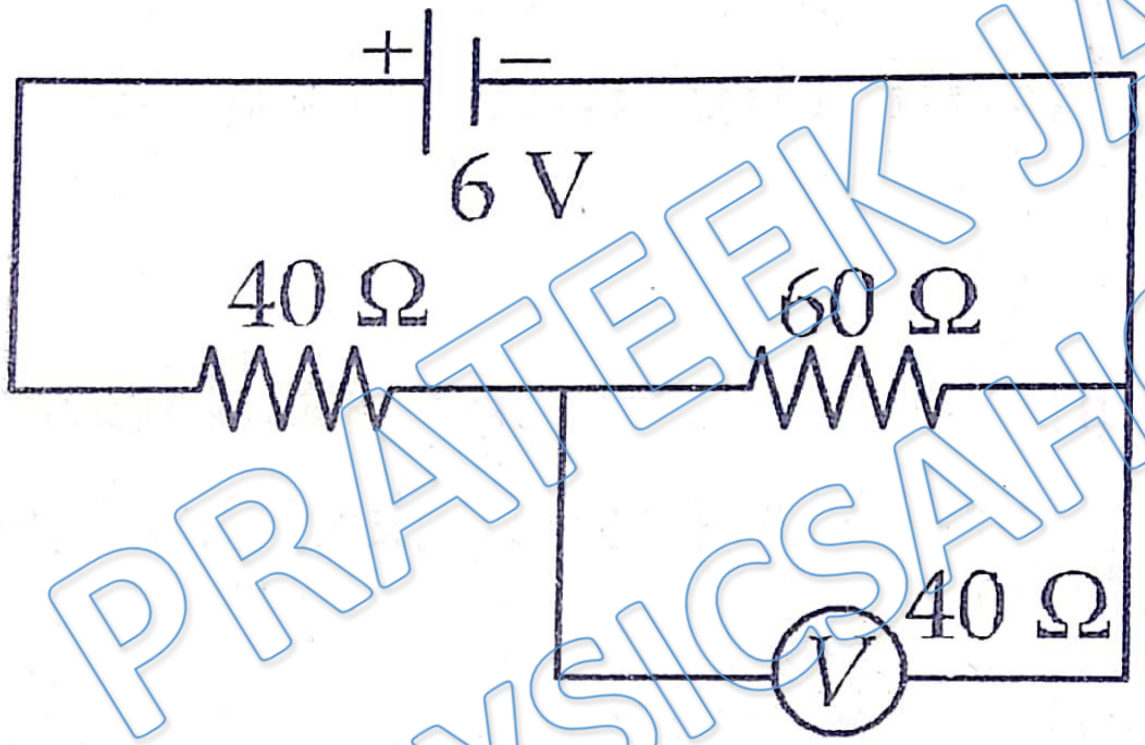


[CBSE AIPMT 2005]

(a) 15 V (b) 30 V (c) 14 V (d) 18 V

Ans. c

. The measurement of voltmeter in the following circuit is

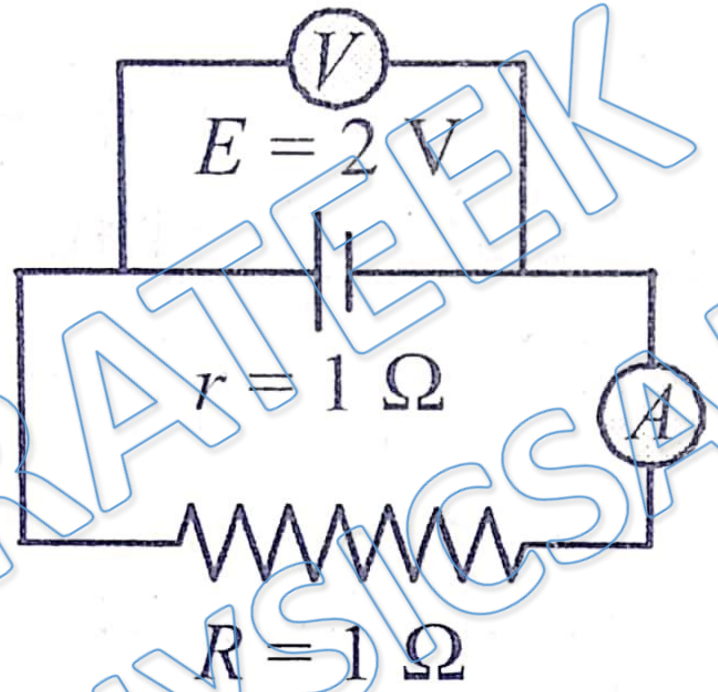


(a) 2.25 V
(b) 4.25 V
(c) 2.75 V
(d) 6.25 V

AIIMS (2017)

Ans. a

Assertion: In the following circuit, emf is 2 V and internal resistance of the cell is 1 Ω and $R = 1\ \Omega$, then reading of the voltmeter is 1 V.



Reason: $V = E - IR$ where $E = 2$ V, $I = 2/2 = 1$ A.

AIIMS

(2008)

Ans. c

PYQs on Following Subtopic:

Conversion of galvanometer into ammeter, % error in ammeter

. A circuit contains an ammeter, a battery of 30 V and a resistance 40.8 Ω all connected in series. If the ammeter has a coil of resistance 480 Ω and a shunt of 20 Ω, then reading in the ammeter will be

[CBSE AIPMT 2015]

(a) 0.5 A (b) 0.25 A (c) 2 A (d) 1 A

Ans. a

. In an ammeter 0.2% of main current passes through the galvanometer. If resistance of galvanometer is G, the resistance of ammeter will be *[CBSE AIPMT 2014]*

(a) $\frac{1}{499}G$ (b) $\frac{499}{500}G$ (c) $\frac{1}{500}G$ (d) $\frac{500}{499}G$

Ans. c

The resistance of an ammeter is 13 Ω and its scale is graduated for a current upto 100 A. After an additional shunt has been connected to this ammeter it becomes possible to measure currents upto 750 A by this meter. The value of shunt resistance is

[CBSE AIPMT 2007]

(a) 20 Ω
(b) 2 Ω
(c) 0.2 Ω
(d) 2 kΩ

Ans. b

Assertion: To convert a galvanometer into an ammeter a small resistance is connected in parallel with it.

Reason: The small resistance increases the combined resistance of the combination. ***[2016]***

AIIMS

Ans. c

PYQs on Following Subtopic:

Conversion of galvanometer into voltmeter

A galvanometer has a coil of resistance 100 Ω and gives a full scale deflection for 30 mA current. If it is to work as a voltmeter of 30 V range, the resistance required to be added will be

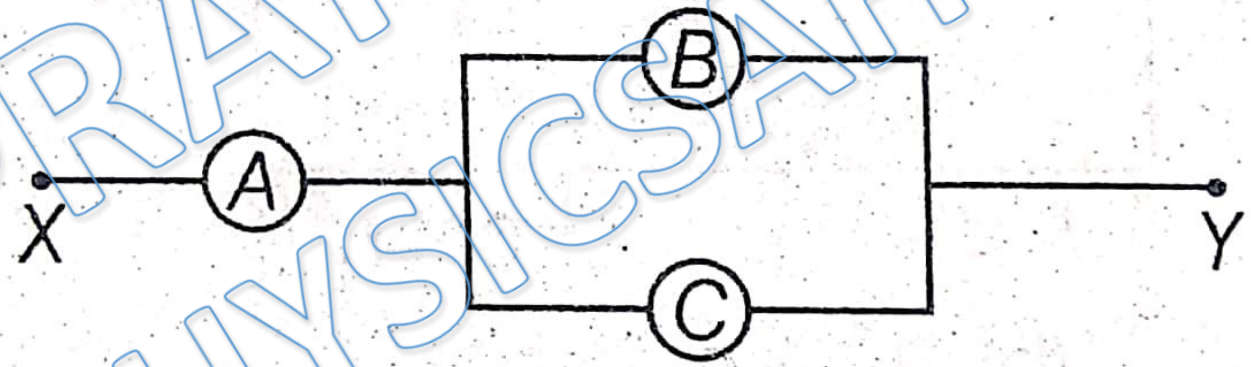
[CBSE AIPMT 2010]

(a) 900 Ω (b) 1800 Ω (c) 500 Ω (d) 1000 Ω

Ans. a

A, B and C are voltmeters of resistance R, $1.5\,R$ and $3R$ respectively as shown in the figure. When some potential difference is applied between X and Y, the voltmeter readings are V_A, V_B and V_C respectively. Then,

[CBSE AIPMT 2015]



(a) $V_A = V_B = V_C$

(b) $V_A \neq V_B = V_C$

(c) $V_A = V_B \neq V_C$

(d) $V_A \neq V_B \neq V_C$

Ans. a

A millivoltmeter of 25 mV range is to be converted into an ammeter of 25 A range. The value (in ohm) of necessary shunt will be *[CBSE AIPMT 2012]*

(a) 0.001
(b) 0.01
(c) 1
(d) 0.05

Ans. a

PYQs on Following Subtopic:

Potentiometer

A potentiometer is an accurate and versatile device to make electrical measurement of EMF because the method involves

[NEET 2017]

(a) cells
(b) potential gradients
(c) a condition of no current flow through the galvanometer
(d) a combination of cells, galvanometer and resistances

Ans. c

A potentiometer wire is 100 cm long and a constant potential difference is maintained across it. Two cells are connected in series first to support one another and then in opposite direction. The balance points are obtained at 50 cm and 10 cm from the positive end of the wire in the two cases. The ratio of emf is *[NEET 2016]*

(a) 5 : 4 (b) 3 : 4 (c) 3 : 2 (d) 5 : 1

Ans. c

A potentiometer wire has length 4 m and resistance 8 Ω. The resistance that must be connected in series with the wire and an accumulator of emf 2V, so as to get a potential gradient 1 mV per cm on the wire is

[CBSE AIPMT 2015]

(a) 32 Ω (b) 40 Ω (c) 44 Ω (d) 48 Ω

Ans. a

A potentiometer wire of length L and a resistance r are connected in series with a battery of e.m.f. E_0 and a resistance r_1. An unknown e.m.f. is balanced at a length l of the potentiometer wire. The e.m.f. E will be given by [CBSE AIPMT 2015]

(a) $\frac{LE_0 r}{l r_1}$ (b) $\frac{E_0 r}{(r + r_1)} \cdot \frac{l}{L}$ (c) $\frac{E_0 l}{L}$ (d) $\frac{LE_0 r}{(r + r_1) l}$

Ans. b

A potentiometer circuit has been set up for finding the internal resistance of a given cell. The main battery, used across the potentiometer wire, has an emf of 2.0 V and a negligible internal resistance. The potentiometer wire itself is 4 m long. When the resistance R, connected across the given cell, has values of (i) infinity, (ii) 9.5 Ω, the balancing lengths, on the potentiometer wire are found to be 3 m and 2.85 m, respectively.

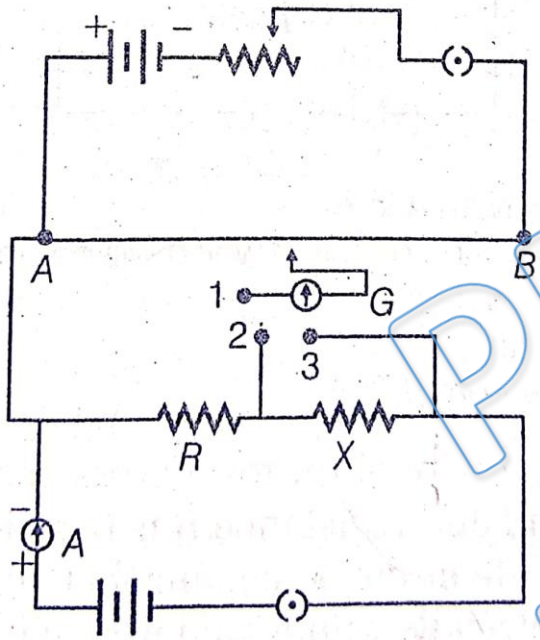
The value of internal resistance of the cell is

[CBSE AIPMT 2014]

(a) 0.25 Ω
(b) 0.95 Ω
(c) 0.5 Ω
(d) 0.75 Ω

Ans. c

. A potentiometer circuit is set up as shown. The potential gradient across the potentiometer wire, is k volt/cm and the ammeter, present in the circuit, reads 1.0 A when two way key is switched off. The balance points, when the key between the terminals (a) 1 and 2 (b) 1 and 3, is plugged in, are found to be at lengths l_1 cm and l_2 cm respectively. The magnitudes, of the resistors R and X in ohm, are then equal, respectively to *[CBSE AIPMT 2010]*



(a) $k(l_2 - l_1)$ and kl_2
(b) kl_1 and $k(l_2 - l_1)$
(c) $k(l_2 - l_1)$ and kl_1
(d) kl_1 and kl_2

Ans. b

A cell can be balanced against 110 cm and 100 cm of potentiometer wire, respectively with and without being short circuited through a resistance of 10 Ω. Its internal resistance is [CBSE AIPMT 2008]

(a) 1.0 Ω (b) 0.5 Ω (c) 2.0 Ω (d) zero

wrong question

Ans. a

Potentiometer measures the potential difference more accurately than a voltmeter, because [CBSE AIPMT 2000]

(a) it has a wire of high resistance
(b) it has a wire of low resistance
(c) it does not draw current from external circuit
(d) it draws a heavy current from external circuit

Ans. c

. A potentiometer consists of a wire of length 4 m and resistance 10 Ω. It is connected to a cell of emf 2 V. The potential gradient of the wire is *[CBSE AIPMT 1999]*

(a) 0.5 V/m
(b) 2 V/m
(c) 5 V/m
(d) 10 V/m

Ans. a

In a potentiometer experiment of a cell of emf 1.25 V gives balancing length of 30 cm. If the cell is replaced by another cell, balancing length is found to be 40 cm. What is the emf of second cell ?

(a) $\simeq 1.47$ V (b) $\simeq 1.57$ V

(c) $\simeq 1.37$ V (d) $\simeq 1.67$ V *(2018)*

AIIMS

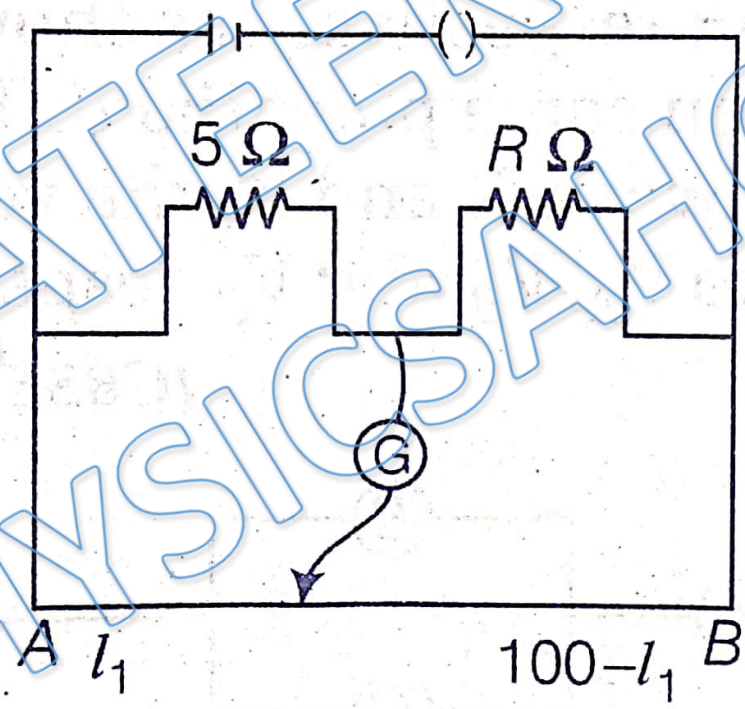
Ans. d

PYQs on Following Subtopic:

Meter Bridge, End Correction

The resistances in the two arms of the meter bridge are 5 Ω and R Ω, respectively. When the resistance R is shunted with an equal resistance, the new balance point is at 1.6 l_1. The resistance R, is

[CBSE AIPMT 2014]



(a) 10 Ω (b) 15 Ω (c) 20 Ω (d) 25 Ω

Ans. b

In meter bridge, the balancing length from left is found to be 20 cm when standard resistance of 1 Ω is in right gap. The value of unknown resistance is *[CBSE AIPMT 1999]*

(a) 0.25 Ω (b) 0.4 Ω (c) 0.5 Ω (d) 4 Ω

Ans. a

Q) A resistance wire connected in the left gap of a metre bridge balances a 10 Ω resistance in the right gap at a point which divides the bridge wire-in the ration 3 : 2. If the length of the resistance wire is 1.5 m, then the length of 1Ω of the resistance wire is:

NEET 2020

(1) 1.5×10^{-1} m

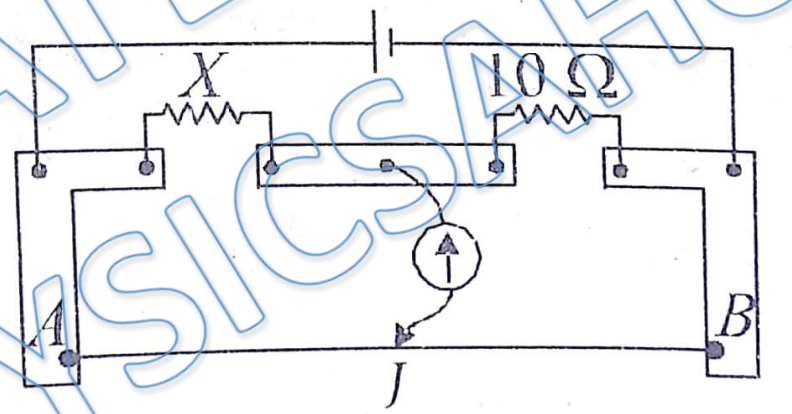
(2) 1.5×10^{-2} m

(3) 1.0×10^{-2} m

(4) 1.0×10^{-1} m

Ans. 4

A meter bridge is set-up as shown, to determine an unknown resistance X using a standard 10 ohm resistor. The galvanometer shows null point when tapping-key is at 52 cm mark. The end-corrections are 1 cm and 2 cm respectively for the ends A and B. The determined value of X is



(a) 10.2 ohm
(b) 10.6 ohm
(c) 10.8 ohm
(d) 11.1 ohm *(2017)*

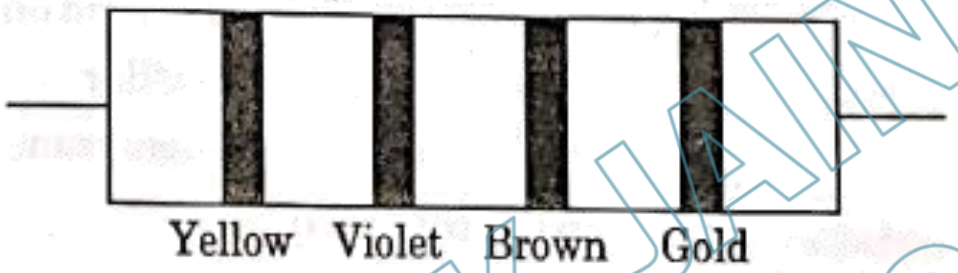
AIIMS

Ans. b

PYQs on Following Subtopic:

Color coding

Q) The color code of a resistance is given below :



The values of resistance and tolerance, respectively, are :

NEET 2020

(1) 4.7 kΩ, 5%

(2) 470 Ω, 5%

(3) 470 kΩ, 5%

(4) 47 kΩ, 10%

Ans. 2

In the figure a carbon resistor has bands of different colours on its body as mentioned in the figure. The value of the resistance is

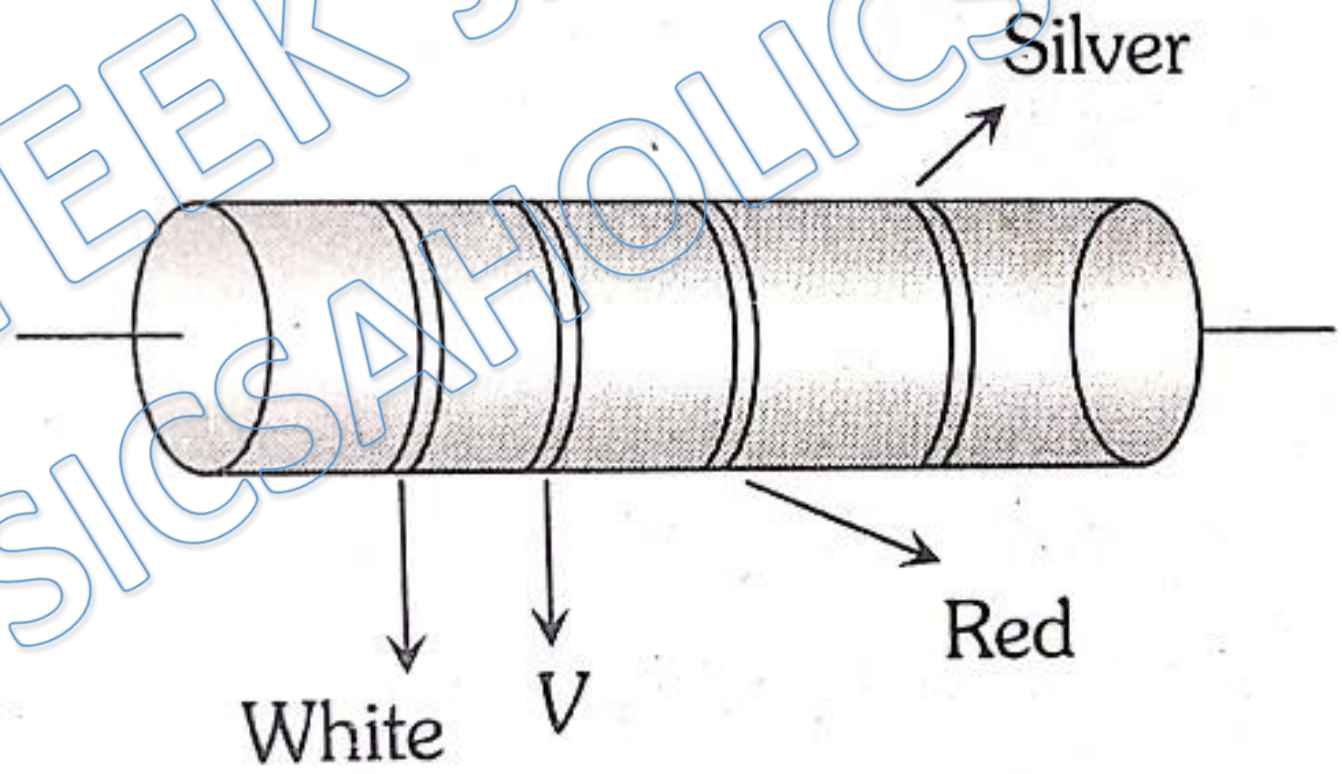
[Kerala PET 2002; AMU (Med.) 2010; Kerala PMT 2012]

(a) $2.2\ k\Omega$

(b) $3.3\ k\Omega$

(c) $5.6\ k\Omega$

(d) $9.1\ k\Omega$



Ans. d

The colour sequence in a carbon resistor is red, brown, orange and silver. The resistance of the resistor is

[DCE 2004; Kerala PMT 2008; J&K CET 2012]

(a) $21\times10^{3}\pm10\%$

(b) $23\times10^{1}\pm10\%$

(c) $21\times10^{3}\pm5\%$

(d) $12\times10^{3}\pm5\%$

Ans. a

The tolerance level of a resistor with the colour code red, blue, orange, gold is **[Kerala PET 2011]**

(a) $\pm 5\%$

(b) $\pm 10\%$

(c) $\pm 20\%$

(d) $\pm 40\%$

(e) $\pm 30\%$

Ans. a

The carbon resistor has orange bands. The maximum value of resistance offered by the resistor will be **[GUJCET 2014]**

(a) $49.9\,K\Omega$

(b) $39.6\,K\Omega$

(c) $33\,K\Omega$

(d) $26.4\,K\Omega$

Ans. b

A carbon resistor $(47 \pm 4.7)\ k\Omega$ is to be marked with rings of different colours for its identification. The colour code sequence will be **[NEET 2018]**

(a) Violet – Yellow – Orange – Silver

(b) Yellow – Violet – Orange – Silver

(c) Yellow – Green – Violet – Gold

(d) Green – Orange – Violet – Gold

Ans. b

PYQs on Following Subtopic:

Earthing of instruments, Fuse wire

Assertion: A domestic electrical appliance, working on a three pin will continue working even if the top pin is removed.

Reason: The third pin is used only as a safety device.

(1995, 2008)

AIIMS

Ans. a

Assertion: Electric appliances with metallic body. *e.g.*, heaters, presses etc., have three pin connections, whereas an electric bulb has a two pin connection.

Reason: Three pin connections reduce heating of connecting cables.

AIIMS

(1996, 2000, 2013)

Ans. c

Fuse wire is a wire of [CBSE AIPMT 2003]

(a) low resistance and low melting point
(b) low resistance and high melting point
(c) high resistance and high melting point
(d) high resistance and low melting point

Ans. d

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