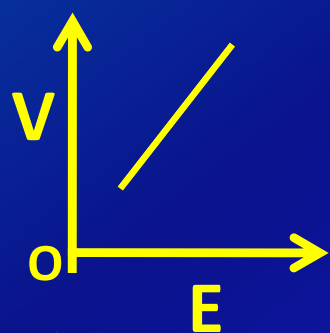
OHM'S LAW AND KIRCHHOFF'S LAW

MAGNETIC EFFECT OF AN ELECTRIC CURRENT

1

A conductor obeys Ohm's law. Which of the following correctly represents the variation of drift velocity 'v' with applied electric field 'E'?

1)



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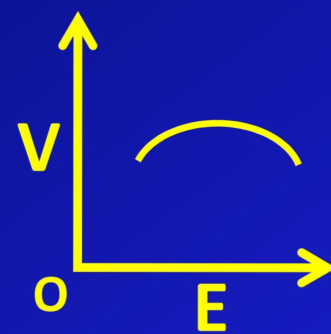

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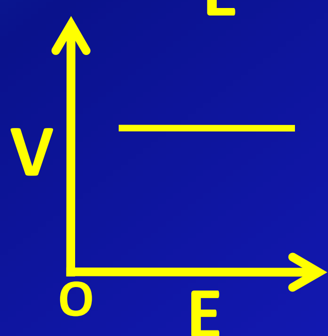

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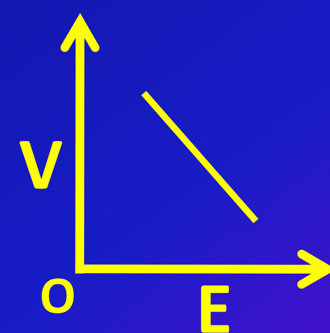

2

The drift velocity of electrons in a wire of radius 'r' is proportional to

1) r
2) r^2
3) r^3
4) none of the above

3

A current of 10A flows through a conductor of resistance 10Ω for 10 minutes. The number of electrons moved is

1) 6.25×10^{20}

2) 3.75×10^{22}

3) 6.25×10^{22}

4) 3.75×10^{20}

4

A wire of length 2m is stretched uniformly so that the length becomes 6m. Then its resistance will be

1) decreases to 1/3 of the original value
2) increase to 3 times the original value
3) decreases 1/9 times the original value
4) increases to 9 times the original value

5

The resistance of a conductor is 5Ω at 50°C and 6Ω at 100°C. Its resistance at 0°C is

1) 4Ω

2) 4.5Ω

3) 5Ω

4) 5.5Ω

6

The colour of the first three rings in a resistor for a resistance of 1.2 MΩ is

1) brown, orange, green
2) brown, red, blue
3) brown, red, green
4) brown, blue, green

7

A 3°C rise of temperature is observed in a conductor by passing a certain current. When the current is doubled the rise of temperature will be

1) 15°C

2) 12°C

3) 9°C

4) 30°C

8

A cell of emf E is connected to a resistance of R, the potential difference between the terminals of the cell is V. Then the internal resistance of the cell must be

1) $\frac{2(E-V)V}{R}$

2) $\frac{2(E-V)R}{E}$

3) $\frac{(E-V)R}{V}$

4) $(E-V)R$

9

The essential requirements of a fuse wire are

1) high resistance and high melting point
2) high resistance and low melting point
3) low resistance and low melting point
4) low resistance and high melting point

10

The variation of resistance R of a thermistor with temperature T is represented by $R = a\,e^{b/T}$. In the above relations the units of a and b are respectively.

1) ohm, per kelvin

2) ohm, kelvin

3) per ohm, per kelvin

4) both have no units

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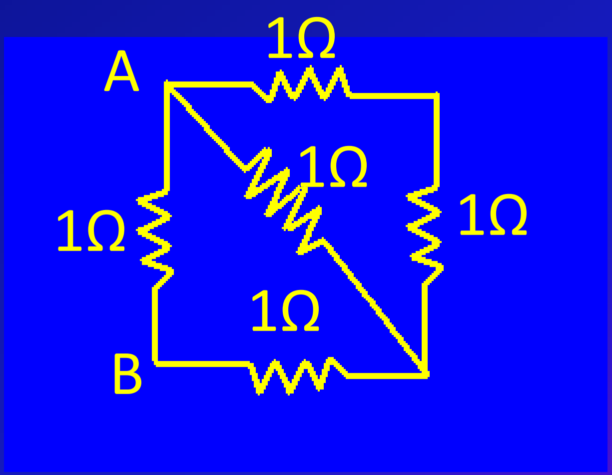
The resistance between A and B in the figure is



1) 5/8 Ω

2) 8/5 Ω

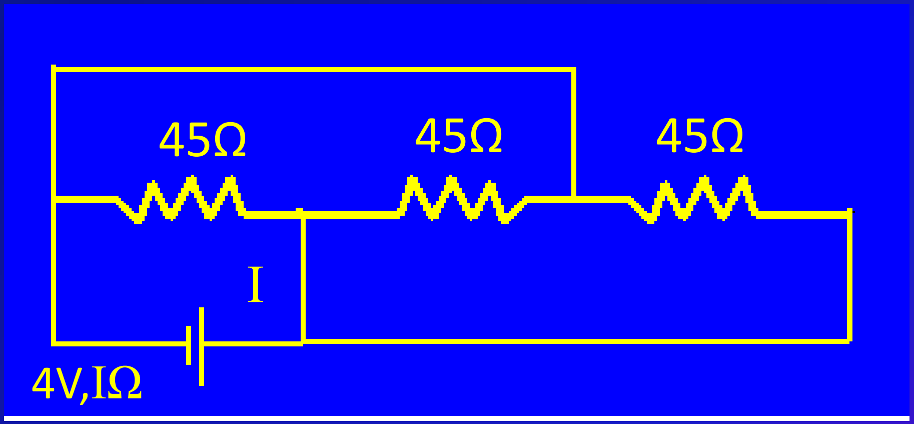
3) 3/2 Ω

4) 2/3 Ω

12

Find the value of I in the following circuit

1) 0.25 A
2) 0.5 A
3) 1 A
4) 2 A



13

How many 400Ω resistors connected in parallel are required to carry a total current of 1.5A on a 150V line?

1) 10
2) 20
3) 4
4) 80

KEA

14

The effective resistance of two resistors when connected in parallel is 10Ω. If one of the resistors is 20Ω , then the other resistance is

1) 10 Ω

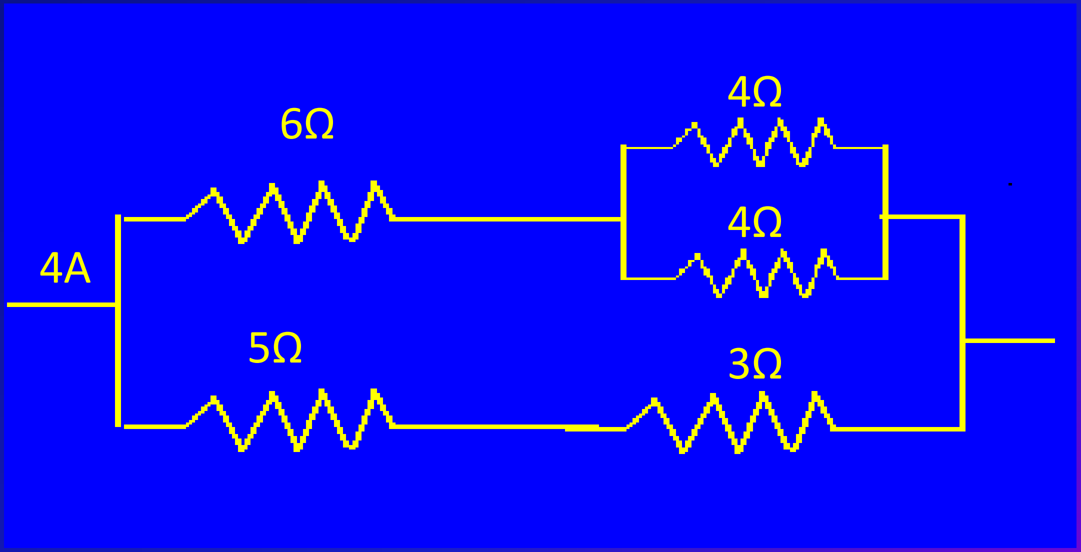
2) 15 Ω

3) 20 Ω

4) 100 Ω

15

What is the p.d. across 4Ω ?



1) 3.2 V
2) 8V
3) 4 V
4) 2 V

16

In a metre bridge, when the resistances in the two gaps are in the ratio 3 : 5, then the balancing length ‘ℓ’ is given by

1) 0.475 m

2) 0.5 m

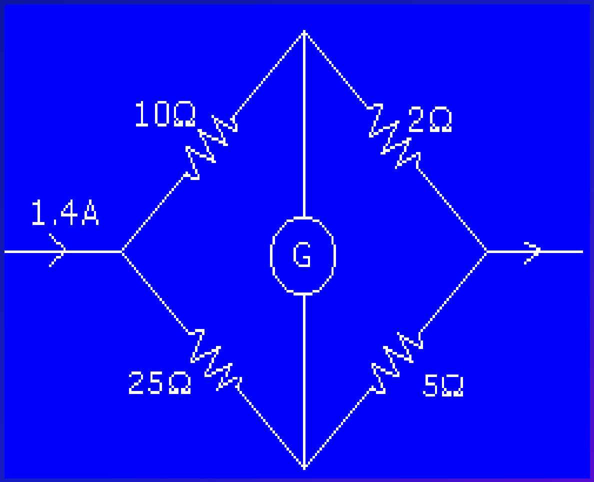
3) 0.375 m

4) 0.675 m

17

In the circuit shown in the figure, the current through two ohm resistor is

1) 1.2 A
2) 1 A
3) 0.8 A
4) 0.4 A



18

Four resistances 15, 12, 4 and 10Ω are connected in cyclic order to form Wheatstone network. The resistance to be connected in parallel with 10 Ω to balance the network is

1) 5 Ω

2) 10 Ω

3) 8 Ω

4) 20 Ω

19

Consider the following statements

i) Kirchhoff's voltage law follows from the law of conservation of energy

ii) Kirchhoff's Current law follows from the law of conservation of charge

iii) Kirchhoff's voltage law propounds the conservation nature of electric field

The correct statements are

1) i) and ii) 2) i) and iii)

3) ii) and iii) 4) all the three

20

In the diagram $V_A - V_B =$

1) 2 V
2) 1 V
3) 3.5 V
4) 1.5 V

21

When a current flows in a conductor, the order of magnitude of drift velocity of electrons through it is

1) 10^{-7} ms^{-1}

2) 10^{-5} ms^{-1}

3) 10^{4} ms^{-1}

4) 10 ms^{-1}

22

When a current I is set up in a wire of radius 'r', the drift speed is 'v_d' If the same current is set up through a wire of radius '2r' the drift speed will be

1) $v_d / 4$

2) $v_d / 2$

3) $2 v_d$

4) $4 v_d$

23

If the flash gun of a camera operates for a milli second and during this time 0.05 coulomb of charge flows then the current will be

1) 5×10^{-3} A

2) 5×10^{-5} A

3) 0.02 A

4) 50 A

24

Two aluminium wires are of same length, one is twice as thick as the other. The resistances are in the ratio

1) 16 : 1

2) 8 : 1

3) 4 : 1

4) 2 : 1

25

The temperature coefficient of resistance of a wire is 0.00125/°C. At 0°C its resistance is 1Ω. The resistance of the wire will be 2Ω at

1) 800°C

2) 1073°C

3) 125°C

4) 400°C

26

'Ampere second' is the unit of

1) Current
2) Power
3) Charge
4) emf

27

A 100 W and 25 W bulb are designed for the same voltage. They have filament of same length and material. The ratio of the diameter of the 100 W bulb to that of the 25W bulb is

1) 4 : 1

2) 2 : 1

3) √ 2 : 1

4) 1 : 2

28

The resistivity of a wire depends upon its

1) length
2) mass
3) material
4) area of cross-section

29

The colour bands in a certain resistor are in the order red-orange-brown. The resistance of the resistor is

1) 230 Ω

2) 2300 Ω

3) 320 Ω

4) 32 Ω

30

The essential requirements for a good heating element are

1) high resistivity and low melting point
2) high resistivity and high melting point
3) low resistivity and low melting point
4) low resistivity and high melting point

31

An electron is moving in a circle of radius ‘r’ in a uniform magnetic field B. Suddenly the field is reduced to B/2. The radius of the circle now becomes

1) r/2

2) r/4

3) 2r

4) 4r

32

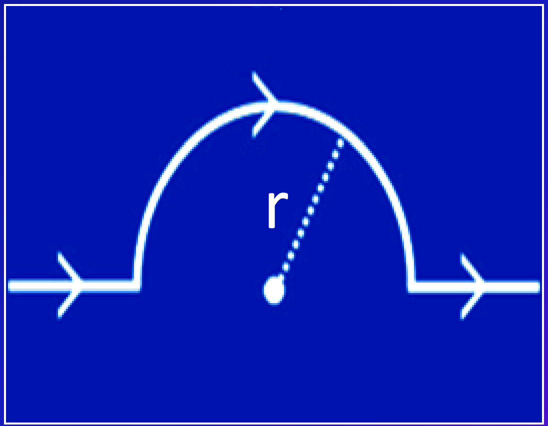
A portion of a long straight wire carrying a current I, is bent in the form of a semicircle of radius 'r' as shown in the figure. The magnetic field at the centre O of the semicircle, in tesla is

1) $\frac{\pi I}{2r} \times 10^{-7}$

2) $\frac{\pi I}{2r}$

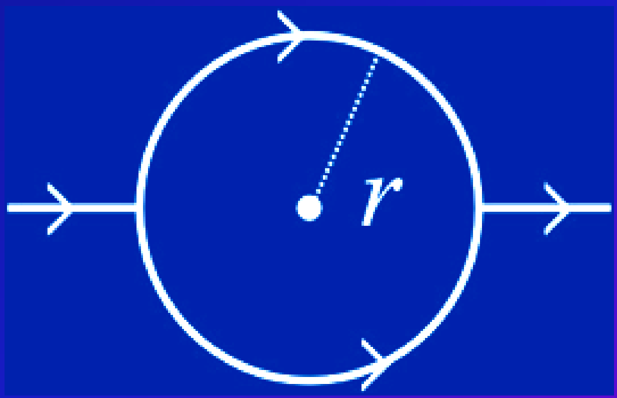
3) $\frac{\pi I}{r} \times 10^{-7}$

4) Zero



33

A straight conductor carrying a current I, is split into a circular loop of radius 'r' as shown in the figure. The magnetic field at the centre O of the circle, in tesla is



1) $\frac{\mu_o I}{\pi r}$

2) $\frac{\mu_o I}{2\pi r}$

3) $\frac{\mu_o I}{2r}$

4) Zero

KEA

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A current I flows in a circular arc of wire which subtends an angle $3\pi/2$ at the centre. If the radius of the circle is r, then the magnetic induction B is

1) $\frac{\mu_o I}{2r}$

3) $\frac{2\mu_o I}{4r}$

2) $\frac{\mu_o I}{\pi r}$

4) $\frac{3\mu_o I}{8r}$

35

A current I flows along infinitely long straight thin conductor, then the magnetic field at any point on the conductor is

1) ∞

2) 0

3) $\frac{\mu_o I}{4\pi}$

4) $\frac{\mu_o I}{2\pi}$

36

A circular current carrying coil has a radius R. The distance from the centre of the coil on the axis where B will be $^1/_8$ of its value at the centre of the coil is

1) $r / \sqrt{3}$

2) $\sqrt{3}\ r$

3) $2\sqrt{3}\ r$

4) $2r / \sqrt{3}$

37

A charge 'q' coulomb is circulating in an orbit of radius 'r' metres making 'n' revolutions per second. The magnetic field produced at the centre of the circle in N/Am is

1) $\frac{2\pi q}{nr} x10^{-7}$

3) $\frac{2\pi nq}{r} x10^{-7}$

2) $\frac{2\pi q}{r} x10^{-7}$

4) $\frac{2\pi rn}{q} x10^{-7}$

38

Two tangent galvanometers A and B are connected in series a current flowing through them produces deflection of 30° and 60° respectively. The reduction factors of the galvanometers in the ratio

1) $\sqrt{3} : 1$
2) $1 : \sqrt{3}$
3) 3:1
4) 1:3

39

Two tangent galvanometers A and B have radii in the ratio 2 : 3 and turns in the ratio 1 : 3. When a certain current flows through both of them a deflection of 30° is produced in A. What is the deflection produced in B?

1) $\theta = \tan^{-1} (2/\sqrt{3})$

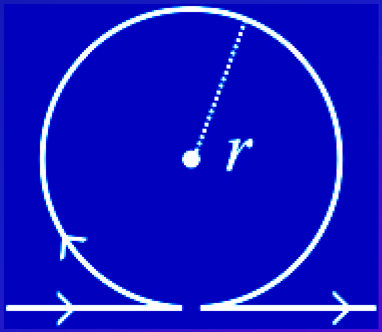
2) $\theta = \tan^{-1} (3/2)$

3) $\theta = \tan^{-1} (\sqrt{3})$

4) $\theta = \tan^{-1} (\sqrt{2})$

40

A long straight conductor carrying a current I; is bent into the shape shown in the figure. The radius of the circular loop is r. The magnetic field at the centre of the loop is



1) $\frac{\mu_o I}{2r}(1-\frac{1}{\pi})$ into the page

3) $\frac{\mu_o I}{2r}(1-\frac{1}{\pi})$ out of the page

2) $\frac{\mu_o I}{2r}(1+\frac{1}{\pi})$ out of the page

4) $\frac{\mu_o I}{2r}(1+\frac{1}{\pi})$ into the page

THANK YOU