Q. What is an electric current?

Answer: Electric current is the amount of charge flowing through a particular area in unit time.

OR,

The rate of flow of electric charges [electrons] is called electric current. The force that move the electrons comes from cell.

If a net charge Q, flows across any cross-section of a conductor in time t,

The current I = Q/t

The SI unit of electric charge is coulomb (C), which is equivalent to the charge contained in nearly $6 \times 10^{18}$ electrons and Charge on 1 electron = $- 1.6 \times 10^{-19}$ C.

The electric current is expressed by a SI unit [ampere] = A

$\Rightarrow$ 1A = 1C/1sec

Hence, When one coulomb of charge flows through a conductor for 1 second then current flowing through it is called One ampere.

$\Rightarrow$ An instrument called ammeter is used to measures electric current in a circuit.

$\Rightarrow$ The electric current flows in the circuit from the positive terminal of the cell to the negative

Q. why is an ammeter always connected in series in a circuit?

Answer: Ammeter is always connected in series in a circuit so that the value of the current in the ammeter remains same independent of its position in the electric circuit.

Q. Calculate the number of electrons constituting one coulomb of charge.

Answer charge (Q) = no. of electrons (n) x charge on one electron (e)

$\qquad$ 1 coulomb = n x ($1.66 \times 10^{-19}$)

$\qquad$ n = $1/1.66 \times 10^{-19}$ = $6.25 \times 10^{18}$ = $6 \times 10^{18}$

Q. A current of 0.5 A is drawn by a filament of an electric bulb for 10 minutes. Find the amount of electric charge that flows through the circuit.

**Solution** We are given, $I$ = 0.5 A; $t$ = 10 min = 600 s. ; We have I = Q/t $\Rightarrow$ $Q$ = $It$ = 0.5 A × 600 s = 300 C

Q. Electric current was considered to be the flow of positive charges and the direction of flow of positive charges was taken to be the direction of electric current. Why?

Answer: This is because electrons were not known at the time when the phenomenon of electricity was first observed. Conventionally, in an electric circuit the direction of electric current is taken as opposite to the direction of the flow of electrons, which are negative charges.

Q. What is the source of electric charge?

Answer: the cells or a battery

Q. The torch gives light only when its switch is on. What does a switch do?

Answer: A switch makes a conducting link between the cell and the bulb.

A continuous and closed path through which an electric current flows is called an electric circuit or closed circuit. If the circuit is broken anywhere or the switch is turned off and the current stops flowing are called an open circuit.

$\Rightarrow$ A switch is a device that makes a circuit open or close.

Q. What do you mean by Electric potential and potential difference?

Answer: The work done to move a unit charge from infinity to a given point is called Electric potential or potential at a point. Hence, potential can be measured in term of the work done in moving charge against the force of repulsion. It is a scalar quantity.

Electric potential difference between two points in an electric circuit is the work done to move a unit charge from one point to the other.

If W work done in bringing unit charge q from one point to the other.

Then Electric potential difference (V) = W/q = 1Joule /1 coulomb= J/C

The SI unit of electric potential difference is volt (V) . The potential difference is measured by means of an instrument called the voltmeter.

Q. Define 1Volt? OR, What is meant by saying that the potential difference between two points  is 1 V?

Answer: When 1 joule of work is done to move a charge of 1 coulomb from one point to the other it is said to be 1V potential difference.

Q. Why is the voltmeter always connected in parallel across the points between which the potential difference is to be measured?

Answer: A voltmeter has a high resistance so when it is connected in parallel consume  a negligible current from the circuit.

Q. Name a device that helps to maintain a potential difference across a conductor.

Answer: Cell or battery

Q. What is a circuit diagram?

Answer: A schematic diagram of electric circuit in which different components of the circuit are represented by the symbols is called a circuit diagram.

Q. How much work is done in moving a charge of 2 C across two points having a potential difference 12 V?

Solution:  V = w/Q  $\Rightarrow$ W = V x Q  =  12 V x  2 C = 24J

Q. State Ohm's law of electricity and write the condition in which this law is obeyed?

Answer: Ohm's law of electricity: The potential difference, V, across the ends of a given metallic wire in an electric circuit is directly proportional to the current flowing through it,  The condition in which this law is obeyed : Temperature remains the same of metallic wire.

V $\propto$ I  $\Rightarrow$  V/I = constant R $\Rightarrow$  V = IR

R is a constant for the given metallic wire at a given temperature and is called its resistance.

Q. What are resistance and resistor?

Answer: The property of a conductor to resist the flow of charges through it is called resistance.

Since, V = IR  $\Rightarrow$  R = V/I

If the potential difference across the two ends of a conductor is 1 V and the current through it is 1 A, then the resistance R, of the conductor is said to be 1 Ω.

$\Rightarrow$ 1 Ω [ohm] = 1 volt /1 ampere

A conductor having some appreciable resistance is called a resistor.

$\Rightarrow$ A component used to regulate current without changing the voltage source is called variable resistance.

$\Rightarrow$ A device that is often used to change the resistance In an electric circuit is called rheostat.

Q. On what factors does the resistance of conductors depend?

Answer: (a) Resistance of a conductor is inversely proportional to amount current passes through it $\Rightarrow R \alpha$ 1/I

(b) Resistance of a conductor is directly proportional to length of wire $\Rightarrow R \alpha$ L ------(i)

The longer a piece of wire the higher is its resistance. Double the length means double the resistance.

(c) Resistance of a conductor is inversely proportional to cross-sectional area of wire $\Rightarrow R \alpha$ 1/A -----(ii)

The resistance of a piece of wire also depends on its cross-sectional area A [thickness] of the conductor. Double the area means half the resistance. A thin wire has a higher resistance than the same thick piece.

From (i) and (ii) ; $R \alpha$ L/A $\Rightarrow$ R = $\rho$ L/A

Here, ρ (rho) is a constant of proportionality and is called the electrical resistivity of the material of the conductor.

$\rho$ = R A/L

The SI unit of resistivity is Ω m. It is a characteristic property of the material

$\Rightarrow$ Both the resistance and resistivity of a material vary with temperature.

(d) Resistance of a piece of wire depends on its temperature also. The higher the temperature the higher is the resistance.

Q. Why are constantan or manganin chosen for the construction of standard resistance?

Answer: Reasons are: High value of resistivity, Least affected by atmospheric conditions, Produce least disturbance in the circuit due to less contact potential with connecting copper wires.

Q. What is the reciprocal of resistivity called?

Answer: Reciprocal of resistance is conductance So the reciprocal of resistivity is called Conductivity.

Q. Why are alloy commonly used in electrical heating devices, like electric iron, toasters etc?

OR, Tungsten is used almost exclusively for filaments of electric bulbs, whereas copper and aluminum are generally used for electrical transmission lines. Give reason.

Answer: Alloys do not oxidized (burn) readily at high temperatures because the resistivity of an alloy is generally higher than that of its constituent metals.

Q. The potential difference between the terminals of an electric heater is 60 V when it draws a current of 4 A from the source. What current will the heater draw if the potential difference is increased to 120 V?

Resistance between the terminals of an electric heater R = V/ I = 60/4 = 15 Ω

Amount of current flow through heater if the potential difference is increased to 120 V = I = V/R = 120/15 = 8A

Hence, the current through the heater becomes two times i.e. 8 A.

Q. Resistance of a metal wire of length 1 m is 26 Ω at 20°C. If the diameter of the wire is 0.3 mm, what will be the resistivity of the metal at that temperature? Predict the material of the wire.

Answer: $\rho$ = R A/L = [R x $\pi$ $r^2$] / L = [26 $\Omega$ x 3.16 x 1.5x $10^{-4}$ m x 1.5x $10^{-4}$ m]/1m = 184.86 x $10^{-8}$ =1.84 × $10^{-6}$ $\Omega$ m

This is the resistivity of manganese

Q. A wire of given material having length l and area of cross-section A has a resistance of 4 $\Omega$. What would be the resistance of another wire of the same material having length l/2 and area of cross-section 2A?

Answer: R1 = $\rho$l/A = 4$\Omega$

R2 = ($\rho$l/2)/2A   = ¼  [$\rho$l/A]= ¼ x 4$\Omega$ = 1$\Omega$

The resistance of the new wire is 1$\Omega$.

Q. Will current flow more easily through a thick wire or a thin wire of the same material, when connected to the same source? Why?

Answer: Current will flow more easily through a thick wire as there is less resistance  because resistance of a conductor is inversely proportional to cross-sectional area of wire.

Q. Let the resistance of an electrical component remains constant while the potential difference across the two ends of the component decreases to half of its former value. What change will occur in the current through it?

Answer: By Ohm's law:  I $\alpha$ 1/V $\Rightarrow$ I = Rx1/V

if R remains constant $I_1$ = 1/V

$\Rightarrow I_2$ = 1/(V/2) = 2 x (1/V) = 2 $I_1$

Current increases two times its former value.

Q. On what two factors the current through a conductor depends upon?

Answer: The current through a conductor depends upon its resistance and the potential difference across its ends.

Q. What are the  two methods of joining the resistors together?

Answer:

In a series combination of resistors

(a) An electric circuit in which three or more resistors are joined end to end the resistors are said o be connected in series.

(b) In a series combination of resistors the current is the same in every part of the circuit.

(c) The resistance of the combination in a series Rs equals the sum of their individual resistances and is thus greater than any individual resistance.

(d) The total potential difference across a combination of resistors in series is equal to the sum of potential difference across the individual resistors

In a in parallel combination of resistors

(a) An electric circuit in which three or more resistors are connected together between two points the resistors are said o be connected in parallel.

(b) The potential difference across each resistor remains same.

(c) In a parallel combination of resistors the different amount of current is in every part of the circuit through each resistor.

(d) Total current I, is equal to the sum of the separate currents through each branch of the combination.

Q. It is possible to replace resistors joined in series by an equivalent single resistor of resistance. How?

Answer: The potential difference V across resistors and the current I through the circuit remains the same.

Q. What happens to the value of current when a number of resistors are connected in series in a circuit?

Answer: In a series combination of resistors the current is the same in every part of the circuit.

Q. What would be their equivalent resistance when a number of resistors are connected in series in a circuit?

Answer: Equivalent resistance is equal to the sum of their individual resistances.

Q. Find the expression for the equivalent resistance In a series combination of resistors.

Answer: Let three resistors having resistances R1, R2 and R3, respectively, are joined end to end. Connect them with a battery of V volt, an ammeter and a plug key

The total potential difference across a combination of resistors in series is equal to the sum of potential difference across the individual resistors So, V = V1 + V2 + V3

Applying the Ohm's law: V = I R

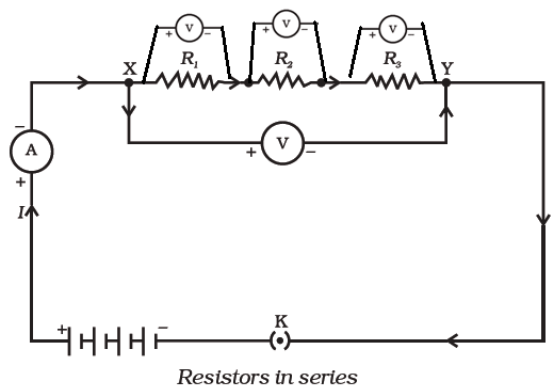I R = I1 R1 + I2 R2 + I3 R3

As we know that the current through each resistor is remain same to I

$\Rightarrow$ I = I1 = I2 = I3

$\Rightarrow$ I R = I (R1 + R2 + R3)

$\Rightarrow$ R = R1 + R2 + R3


*Resistors in series*

Thus, the resistance of the combination in a series Rs equals the sum of their individual resistances and is thus greater than any individual resistance.

Q. Find the expression for the equivalent resistance in a parallel combination of resistors.

Answer: Let three resistors having resistances R1, R2 and R3, respectively, are together between points X and Y. Connect them with a battery of V volt, an ammeter and a plug key.

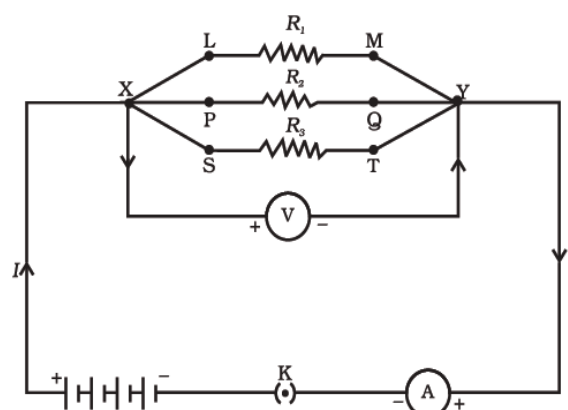It is observed that the potential difference across each resistor remains same to V.

V = V1=V2=V3

It is observed that the total current I, is equal to the sum of the separate currents through each branch of the combination.

I = I1 + I2 + I3

$\Rightarrow$ I/V = I1/V1 + I2/V2 + I3/V3

$\Rightarrow$ 1/R = 1/R1 + 1/R2 +1/R3



Q. Why do we use parallel circuit arrangement for domestic wiring?

Answer: A parallel circuit divides the current through the electrical appliances. The total resistance in a parallel circuit is decreased. This is helpful particularly when each gadget has different resistance and requires different current to operate properly. when one component of the circuit fails rest of them work properly.

Q. What are the disadvantages of connecting electrical devices in series?

Answer: in a series circuit the same amount of current passes throughout the electric circuit. Thus it is obviously impracticable to connect an electric bulb and an electric heater in series; because they need currents of widely different values to operate properly. Another major disadvantage of a series circuit is that when one component fails the circuit is broken and none of the components works.

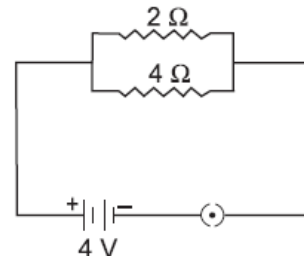Q. Calculate the current flowing through the resistors.

Solution: $1/R = 1/R1 + 1/R2$

$\quad\quad\quad = ½ + ¼ = ¾$

$\quad\quad R = 4/3\ \Omega \quad\quad ; \quad V = 4\ v$

$\quad\quad V = IR \Rightarrow I = V/R$

$\quad\quad\quad\quad = 4 \div 4/3$

$\quad\quad\quad\quad = 3A$
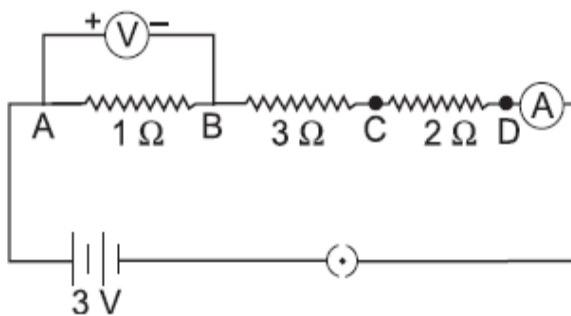
Q. Copper wire has resistance R. If the length of the wire is doubled, find the new resistance in terms of original resistance?

Answer: R is directly proportional to the length of the wire $\Rightarrow R\ \alpha\ l \Rightarrow$ New resistance = 2l = 2x original resistance. Hence resistance increases two times.

Q. How would the reading of (V) change if it is connected between B and C?

Solution:

R total = R1+R2+R3

$\quad\quad\quad = 1+3+2$

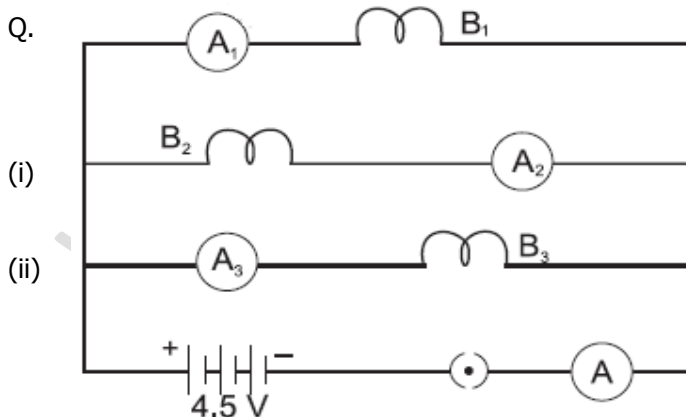$\quad\quad\quad = 6\ \Omega$

V total = 3v

I total = V/R = 3/6=0.5A

In series, the reading of (V) changes if it is connected between

B and C = V2 = I R2 = 0.5 x 3 = 1.5v

Q.

(i)

(ii)

B1, B2 and B3 are three identical bulbs connected as shown in the figure. When all the three bulbs glow, a current of 3A is recorded by the ammeter A.

What happens to the glow of the other two bulbs when the bulb B1 gets fused?

What happens to the reading of A1, A2, A3 and A when the bulb B2 gets fused?

Answer: (a) The other two bulbs when the bulb B1 gets fused glow properly.

(b) The reading of A1, A2, A3 and A when the bulb B2 gets fused remain same.

Q. What is the (a) highest (b) lowest resistance that can be secured by combining four coils of resistance 4 Ω, 8 Ω, 12 Ω and 24 Ω

Answer: (a) highest resistance that can be secured by combining four coils of resistance in series R= 4 Ω + 8 Ω+ 12 Ω + 24 Ω = 48Ω

(b) Lowest resistance that can be secured by combining four coils of resistance in parallel R=1/4 + 1/8 + 1/12 +1/24 =1/2=0.5Ω

Q. Explain the term the heating effect of electric current?

Answer: An electric appliances becomes warm if used continuously for longer time because a part of the source energy is used for work it and rest of the source energy may be expended in heat to raise the temperature .

The effect of electric current due to which heat is produced in a wire when current is passed through it is called heating effect of current or Joule heating.

In 1841 Joule found that when current is passed through a conductor the heat produced across it is:

**(i)** Directly proportional to the squire of the current through the conductor i.e. $H \propto I^2$

**(ii)** Directly proportional to the resistance of the conductor i.e. $H \propto R$

**(iii)** Directly proportional to the time for which the current is passed i.e. $H \propto t$

Combining the above three equations we have $H \propto I^2 Rt$

Q. Find the expression for the electrical energy dissipated or consumes when current flows through a conductor.

Answer: Suppose a current I flowing through a resistor of resistance R and the potential difference across it be V  for time  t .

The work done in moving the charge Q through a potential difference V = W = QV

But Q = I × t [By the definition of electric current]

Therefore, the amount of work done, W = V X I X t

This energy expended by the source gets dissipated in the resistor as heat. Thus for a steady current I, the amount of heat H produced in time t is

$$W = H = V I t$$

By substituting the expression for V from Ohm's law, V = IR

We finally get W = IR x I t =   $I^2 R t$

This shows that the electrical energy dissipated or consumes depends on the product of the square of the current I. flowing through the resistance R and the time t.

Q.Define power and derive expression for it?

Answer: The rate, at which electric energy is dissipated or consumed, is termed as electric power. The power P is given by,

$P = W/t = I^2 R$

Or, P = w/t = VQ/t = VI [using w=VQ and I =Q/t]

Formula for calculating electric power: VI  or, $P = I^2 \times R$ or, $P = V^2/R$

Unit of power: The S.I. unit of electric power 'watt' which is denoted by the letter W. The power of 1 watt is a rate of working of 1 joule per second.

A bigger unit of electric power is kilowatt. 1 kilowatt (kW) = 1000 watt.

Power of an agent is also expressed in horse power (hp). 1 hp = 746 watt.

Q. Find the expression for the energy supplied to the circuit by the source in time t to run an appliances.

Answer: $P = W/t \Rightarrow W = P \times t$

The energy supplied to the circuit by the source in time t is $E = P \times t$

The S.I. unit of electrical energy is joule and we know that for commercial purposes we use a bigger unit of electrical energy which is called "kilowatt - hour". One kilowatt - hour is the amount of electrical energy consumed when an electrical appliance having a power rating of 1 kilowatt and is used for 1 hour.

1 kilowatt-hour = 1000 w x 3600 sec = 3600000 joules = $3.6 \times 10^6$ J

Power - Voltage Rating of Electrical Appliances: if we look at a particular bulb in our home it may have the figures 220 V, 100W written on it. Now 220 V means that this bulb is to be used on a voltage of 220 volts and 100 W Which means it has a power consumption of 100 watts or 100 joules per second.

Q. 15 bulbs of 60W each, run for 6 hours daily and a refrigerator of 300 W runs for 5 hours daily. Work out per day bill at 3 rupees per unit.

Solution : Total wattage of 15 bulbs = 15 x 60 W = 900 W

Now, Electrical energy consumed by bulbs per day = $P \times t$ = 900 × 6 = 5400 Wh

And electrical energy consumed by refrigerator per day = 300 × 5 = 1500 Wh

Total electrical energy consumed per day = (5400 + 1500) Wh = 6900 Wh

Electrical energy consumed per day = (6900 /1000)KWh = 6.9KWh

Electricity per day bill = Rs. 6.9 × 3 = Rs. 20.7

Q. Two lamps, one rated 100 W at 220 V and other 60 W at 220 V are connected in parallel to a 220 V supply. What is current drawn from the supply line?

Solution. Given that V = 220 V ; P1 = 100W and P2 = 60 W

Current $I_1 = P_1/V_1$ = 100/220 = 5/11 A

Similarly, $I_2 = P_2/V_2$ = 60/220 = 3/11 A

Hence, total current drawn from the supply line = 5/11 + 3/11 = 8/11A

Q. In a series combination the two bulbs each rated with 60 W and 100 W. (a) which bulb will glow more? (b) which bulb will have a more potential difference?

Answer: When connected in series the bulbs will have same current flowing through them. but given $R_1 < R_2$

Power dissipated across the 100 W bulb, $P_{100} = I^2 R_1$ ; Power dissipated across the 60 W bulb, $P_{60} = I^2 R_2$

$$\frac{P_{100}}{P_{60}} = \frac{I^2 R_1}{I^2 R_2} = \frac{R_1}{R_2} < 1 \Rightarrow P_{100} < P_{60}$$

Thus, the 60 W bulb will glow more when the bulbs are connected in series

Potential difference across the 100 W bulb is, $V_{100} = I R_1$

Potential difference across the 60 W bulb is, $V_{60} = I R_2$

Since, $R_1 < R_2$ Therefore, $V_{100} < V_{60}$

Q. The two bulbs each rated with 60 W and 100 W are arranged in parallel combination. Which bulb will glow more?

Answer: **In parallel combination** the voltage across the two bulbs will be constant. Let it be V. Let the resistance of the 60 W bulb be $R_1$ and that of the 100 W bulb be $R_2$.

The power dissipated across the 60 W bulb is, $P_{60} = V^2 / R_1$

The power dissipated across the 100 W bulb is $P_{100} = V^2 / R_2$

$\Rightarrow [P_{60}] \div [P_{100}] = [V^2 / R_1] \div [V^2 / R_2]$

$\Rightarrow [P_{60}] \div [P_{100}] = R_2 \div R_1$

But, $R_2 > R_1 \Rightarrow R_2 / R_1 > 1$

$P_{100} > P_{60}$

Q. If three resistors of equal resistance each of 2 Ohm. Arranged in a triangular manner.
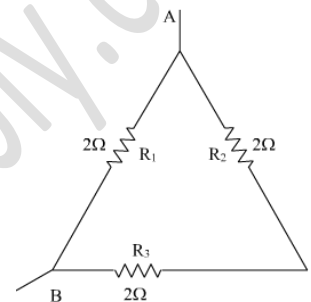
What is the resistance between any two vertices?

Ans: $R_1 = R_2 = R_3 = 2\Omega$

Since $R_2$ and $R_3$ are in series so

so net resistance $R' = R_2 + R_3 = 2 + 2 = 4\Omega$

Now, $R_1$ and $R'$ are in parallel.

So $R_{eq}$ = Resistance between point A and B = $1/R$ = ½ + ¼ = ¾ $\Rightarrow$ R = 4/3 = 1.33$\Omega$

Q. Why the current flowing in series combination is same every where ?

Ans: The current is the same everywhere, since the electron density and this drift velocity are the same all round the circuit.

Q. Differentiate between resistivity and resistance?

Ans:

| Resistivity | Resistance |
|---|---|
| 1. It is the measure of a material's ability to oppose the flow of current. | 1. It is a measure of the opposition that a circuit (or an electrical element) offers to the flow of electric current. |
| 2. It depends on the property of the material. Its value is constant for a particular range of temperature. | 2. Resistance of a conductor is directly proportional to its length and inversely proportional to its area of cross-section. |
| 3. Unit of resistivity is Ohm meter, $\Omega$ m. | 3. Unit of resistance is Ohm, $\Omega$. |

Q. Resistivity of 3 substances A,B,C are $7.5 \times 10^{17}$ ohm/m, $49 \times 10^{-6}$ohm/m, $1.6 \times 10^{-8}$ ohm/m respectively. Which materials is a good conductor of electricity.

Ans: A wire has less resistivity that means it has more conductivity.

$\rho A = 7.5 \times 10^{17}$ ohm/m, $\rho B = 49 \times 10^{-6}$ohm/m, $\rho C = 1.6 \times 10\text{-}8$ ohm/m.

Since, resistivity of material C is minimum. So, material C is good conductor of electricity.

Q. A 4 ohm resistance wire is doubled on it calculate the new resistance of the wire

Ans: We consider wire double on it means to fold the length of wire. It means its length will get half and area of cross section will get double. $L_1 = L/2$ and $A_1 = 2A$

Let the resistance of the wire originally 'R' of length 'l' and area of cross-section 'A' with resistivity of material is 'ρ',

Then $R = \rho L/A = 4\Omega$

$R_1 = \rho L_1/A_1 = (\rho L/2) / (2A) = \frac{1}{4}(\rho L/A) = \frac{1}{4} \times 4 = 1\Omega$

Q. Why is the tungsten metal more coiled in the bulb and not installed in straight parallel wire form?

Answer: The coiled wire of tungsten increases the surface area of the wire in very less space so as to emit more light and helps in glowing with more intensity.

Q. Why are fairy decorative lights always connected in parallel?

Answer: When the fairy lights are connected in series the resistance offered will be greater and brightness of the bulbs will be affected. But in parallel connection all the bulbs will glow with same intensity and if any more bulbs gets fused the other bulbs will continue to glow.

Q. What will happen when - (a) Voltmeter is connected in series? (b) Ammeter is connected in parallel?

Answer: (a) Negligible current will pass through the circuit because the voltmeter has a very high resistance.

 (b) Ammeter will get damaged due to flow of large amount of current through it, because it has low resistance

Q. The filament of an electric bulb made up of tungsten. Give reason?

Answer: The filament of must retain as much of the heat generated as is possible, so that it gets very hot and emits light. It must not melt at such high temperature. Since tungsten has high melting point (3380°C) it is used for making bulb filaments.

Q. The bulbs are usually filled with chemically inactive nitrogen and argon gases why?

Answer: This is because at the high temperature tungsten cannot get oxidized and work for long time.

Q. Why is the fuse used in electric circuits?

Answer: It protects circuits and appliances by stopping the flow of any unduly high electric current. The fuse is placed in series with the device.

If a current larger than the specified value flows through the circuit, the temperature of the fuse wire increases. This melts the fuse wire and breaks the circuit.

Q. Ammeter burns out when connected in parallel.Give reasons.

Ans: Ammeter consists of a wire of low resistance. When connected in parallel a large amount of current passes through it hence gets burnt i.e. short circuited.

Q. A charge of 2C moves between two plates, maintained at a Potential diffrence of 1V. What is the energy acquired by the charge?

Ans: $W = QV = 2 \times 1 = 2J$

Q. Why are copper wires used as connecting wires?

Answer: The electrical resistivity of copper is low

Q. A wire of resistivity 10 ohm meter is stretched to double its length. What is its new resistivity?

Answer: It remains same because resistivity depends on nature of material.

Q. What is the resistance of connecting wire?

Answer: The resistance of a connecting wire, which is made of good conductor, is negligible.

Q. What should be the resistance of an ammeter?

Answer: The resistance of an ammeter should be very small and for an ideal ammeter, its value is zero.

Q. What should be the resistance of a Voltmeter?

Answer: The resistance of a voltmeter should be very high and for an ideal voltmeter, its value is infinity.

Q. Which has more resistance: 100W bulb or 60W bulb?

Answer: As R is inversely proportional to P for constant V. Thus, the resistance of 60W bulb is more.

Q. A wire of length L and resistance R is stretched so that its length it's doubled. How will it (a) Resistance change (b) Resistivity change?

Ans:  (a) If the original length of the wire is l and its cross-sectional area is A, then

R = ⍴l/A. When length becomes 2l, cross-sectional area reduces to A/2 because volume does not change. The new resistance = ⍴(2l)/A/2=4 ⍴l/A = 4R

(b) Resistivity does not change

Q. How much work is done in moving a charge of 3 coulomb from a point at the volts 115 to a point at 125 volts?

Ans. Potential difference V= 125 - 115=10 volts

Charge Q = 3 coulomb   Now,    V= W /Q   ⍴W=V x Q ⍴10 x 3= 30 Joules.

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