MULTIPLE-CHOICE QUESTIONS

Q.1.When electric current is passed, electrons move from:

(a) high potential to low potential.

(b) low potential to high potential.

(c) in the direction of the current.

(d) against the direction of the current.

ANS -b

Q.2. The unit of resistivity is:

(a) V A

(b) V A

(c) V m /A

(d) VA/m

ANS-c

Q.3. What is the commercial unit of electrical energy?

(a) Joules

(b) Kilojoules

(c) Kilowatt-hour

(d) Watt-hour

ANS -c

Q.4. The instrument used for measuring electric current is :

(a) Ammeter

(b) Galvanometer

(c) Voltmeter

(d) Potentiometer

ANS- a

Q.5. Electrical resistivity of any given metallic wire depends upon

(a) its thickness

(b) its shape

(c) nature of the material

(d) its length

ANS -c

Q.6. In an electrical circuit two resistors of 2 Ω and 4 Ω respectively are connected in series to a 6 V battery. The heat dissipated by the 4 Ω resistor in 5 s will be

(a) 5 J

(b) 10 J

(c) 20 J

(d) 30 J

ANS -c

Q.7. The heating element of an electric iron is made up of:

(a) copper

(b) nichrome

(c) aluminium

(d) iron

ANS -b

Q.8. Work of 14 J is done to move 2 C charge between two points on a conducting wire. What is the potential difference between the two points?

(a) 28 V

(b) 14 V

(c) 7 V

(d) 3.5 V

ANS -c

Q.9. While a cell is being charged, energy is converted into energy.

a. mechanical, electrical

b. electrical, chemical

(c) Ampere

(d) Faraday

ANS -a

Q.11. Copper is not preferred to make fuse wire because it .

a. is a good conductor of electricity

b. has a low melting point

c. has a high melting point

d. is not easily available

Q.12. Coulomb is the SI unit of:

(a) Charge

(b) current

(c) potential difference

(d) resistance

ANS-a

ASSERTION-REASON TYPE QUESTIONS

Following questions consist of two statements – Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below:

(a) Both A and R are true and R is the correct explanation of A.

(b) Both A and R are true but R is not the correct explanation of A.

(c) A is true but R is false.

(d) A is false but R is true.

Q.1.. Assertion (A): When resistances are connected between the same two points they are said to be in series.

Reason(R): When resistors are connected in series the current through each resistor is the same.

ANS – d

Q.2. Assertion (A) : Tungsten metal is used for making filaments of incandescent lamps.

Reason (R) : The melting point of tungsten is very low.

ANS -c

Q.3. Assertion (A): If a graph is plotted between potential difference and current the graph is a straight line passing through the origin.

Reason(R): current is directly proportional to the potential difference.

ANS – a

Q.4. Assertion (A) : Longer wires have greater resistance and the smaller wires have lesser resistance.

Reason (R) : Resistance is inversely proportional to the length of the wire.-

ANS - c

Q.5. Assertion (A) : Alloys are commonly used in electrical heating devices, like electrical iron, toasters etc.

Reason (R) : Alloys do not oxidise (burn) readily at high temperatures.

ANS -a

CASE STUDY BASED QUESTION

Electrical resistivities of some substances at 20°C are given in the table. Based on the info in the table, answer the given questions.

Silver	1.60 X $10^{-8}\,\Omega m$
Copper	1.62 X $10^{-8}\,\Omega m$
Tungsten	5.2 X $10^{-8}\,\Omega m$
Mercury	94 X $10^{-8}\,\Omega m$
Iron	10 X $10^{-8}\,\Omega m$
Nichrome	100 X $10^{-8}\,\Omega m$

1. Which is a better conductor of electric current ?

(A) Silver

(B) Copper

(C) Tungsten

(D) Mercury

Ans. Option (A) is correct. Explanation: Silver is a better conductor because it has lower resistivity.

2. Which element will be used for electrical transmission lines ?

(A) Iron

(B) Copper

(C) Tungsten

(D) mercury

Ans. Option (B) is correct. Explanation: Copper, because it is economical, less oxidative than other metals and has low resistivity.

3. Nichrome is used in the heating elements of electric heating device because:

higher, hence the current drawn becomes less.

TWO MARKS QUESTIONS

Q.1.Calculate the number of electrons that would flow per second through the cross-section of a wire when 1 A current flows in it.

Ans : Given: I = 1A , t = 1 s , Q = It , Q =1Ax 1s = 1C

But Q = ne or n = Q/e = 1 /1.6x10-19 = 6.25 x 10^8 electrons

Q.2. Define the following terms:

(a) one ampere (b) 1 volt.

Ans: One Ampere: The SI unit of electric current is ampere (A). One ampere is the electric current when one coulomb of charge flows through a conductor in one second.

One Volt: The SI unit of potential difference is volt (V). One volt is the potential difference between two points in an electric circuit when one joule of work is done to move a charge of one coulomb from one point to the other.

Q.3. Keeping the potential difference constant, the resistance of a circuit is doubled. By how much does the current change?

Ansr: V = IR or V/R= I ,

Since the resistance and the current are inversely proportional, the current will become half.

Q.4. How much work is done in moving a charge of magnitude 3 C across two points having a potential difference of 12 V?

Ans: Given : Q = 3 C, V = 12 V

To find: W , as V = W/Q or W = VQ = 12 × 3 = 36 J

Q.5. Define electric power. Write an expression relating electric power, potential difference and resistance.

Ans. Electric power : It is the amount of electric energy consumed in a circuit per unit time. Expression: $P = V^2/R$ Where, P = Electric Power, V = Potential difference, R = Resistance

Q.6.Give reason for the following:

a. Tungsten used almost exclusively for filament of electric lamp.

b. Why do we use copper and aluminium wires for transmission of electric current?

Ans : a. Tungsten is used in making the filament of electric lamp because it has high resistivity and high melting point.

b. The copper and aluminium have low resistivity and high conductivity.

Q.7. Distinguish between resistances in series and resistances in parallel.

Ans:

Resistances in series:

1. If a number of resistances are connected in such a way that the same current flows through each resistance, then the arrangement is called resistances in series.

2. The current across each resistance is same.

3. The equivalent resistance in series combination is greater than the individual resistances.

4. This combination decreases the current in the circuit.

Resistances in parallel:

1. If a number of resistances are connected between two common points in such a way that the potential differences across each of them is the same, then the arrangement is called resistances in parallel.

2. The voltage across each resistance is same.

3. The equivalent resistance in parallel combination is smaller than each of the individual resistances.

4. This combination increases the current in the circuit.

Q. 8. What is the better way of connecting lights and other electrical appliances in domestic wiring? Why?

Ans: The better way of connecting lights and other electrical appliances in domestic wiring is

parallel connection because of the following advantages:

• In parallel circuit, if one appliance stops working due to some defect, then all other appliances keep working normally.

• In parallel circuit, each electrical appliance has its own switch due to which it can be turned on or off, without affecting other appliances.

• In parallel circuit, each electrical appliance gets the same voltage (220 V) as that of the power supply line.

• In parallel circuit, the overall resistance of the domestic circuit is reduced due to which the current from the power supply is high.

THREE MARKS QUESTIONS

Q.1. (a) List the factors on which the resistance of a conductor in the shape of a wire depends.

(b) Why are metals good conductors of electricity whereas glass is a bad conductor of electricity? Give reasons..

(c) Why are alloys commonly used in electrical heating devices? Give reason.

Ans: a. Factors on which resistance of a wire depends:

i. Resistance is directly proportional to length (l)

ii. Resistance is inversely proportional to area of cross-section(A).

i.e. R α l, R α 1/A or R α l/A

or R = ρ l/A, here ρ is the resistivity of the material at a particular temperature (ie, resistivity

depends on material and temperature)

b. Metals are good conductors due to having large number of free electrons and their low

resistivity. Glass is a bad conductor because it has no free electrons and its resistivity is higher.

c. Alloys are commonly used in electrical heating devices due to their high resistivity and high

melting point.

Q. 2. A nichrome wire has a resistance of 10 Ω. Find the resistance of another nichrome wire, whose length is three times and area of cross-section four times the first wire.

Ans: we have resistance R = ρ l/A

For first wire length L1= l, Area of cross section A1= A

So, for first wire resistance R1= ρ l/A = 10 Ω

For second wire length L2 = 3l, Area of cross section A2 = 4A

So, for second wire resistance R2 = ρ 3l/4A

Q.3. State the formula co-relating the electric current flowing in a conductor and the voltage applied across it. Also, show this relationship by drawing a graph. What

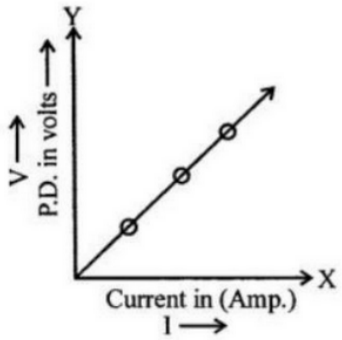
would be the resistance of a conductor, if the current flowing through it is 0.35 ampere when the potential difference across it is 1.4 volt?

Ans: potential difference V = IR where I is electric current and R, resistance of conductor

ie, V α I

If we plot a graph b/w V and I, it is a straight line.

Graph b/w V and I:



Given current I = 0.35 A, potential difference V = 1.4 V

Resistance R = = V/I , R = 1.4 / .35 = 4 Ω

Q. 4.Calculate the total cost of running the following electrical devices in April month if the rate of 1 unit of electricity is Rs. 6.00. (i) Electric heater of 1000 W for 5 hours daily. (ii)

Electric refrigerator of 400 W for 10 hours daily

Ans. P1 = 1000 W = 1kW, t1= 5h,

P2 = 400 W = 400 /1000 kW = 0.4KW, t2 = 10h

No. of days in September, n = 30

E1 =P1 × t1 × n = 1 kW × 5h × 30 = 150 kWh

E2 =P2 × t2 × n = 0.4kW x 10h x 30 = 120kWh

∴ Total energy = (150 + 120) kWh = 270 kWh ,so Total cost = 270 x 6 = Rs. 1620/-

Q. 5. (i) Consider a conductor of resistance ‘R’, length ‘L’, thickness ‘d’ and resistivity ‘ρ’. Now this conductor is cut into four equal parts. What will be the new resistivity of each of these parts? Why?

(ii) Find the resistance if all of these parts are connected in:

(a) Parallel (b) Series

(iii) Out of the combinations of resistors mentioned above in the previous part, for a given voltage which combination will consume more power and why?

Ans. (i) Resistivity will not change as it do not depend on the dimensions of the conductor. It depends on the nature of material of the conductor.

(ii) The length of each part become L/4, ρ is constant and R = ρL/A

Resistance of each part = R_{part} = $\frac{\rho L/4}{A} = \frac{R}{4}\Omega$

(a) In parallel the $\frac{1}{Rp} = \frac{1}{R1} + \frac{1}{R2} + \frac{1}{R3} + \frac{1}{R4}$

Here $R1 = R2 = R3 = R4 = R_{part} = \frac{R}{4}\Omega$

ie, $\frac{1}{Rp} = \frac{4}{R} + \frac{4}{R} + \frac{4}{R} + \frac{4}{R} = \frac{16}{R}\Omega$

(b) In series the $Rs = \frac{R}{4} + \frac{R}{4} + \frac{R}{4} + \frac{R}{4} = R\,\Omega$

(iii) We know that Power P given as P=V.I =V2/R (V= IR)

For given voltage parallel connection consume more power because it have low equivalent resistance.