PRISM WORLD

Std.: 9 (English) **Science 1**

Chapter: 3

Q.1 **Match the pair** **1**

1

Column "A"	Column "B"
i. Resistivity	a. VA / LI
ii. Resistance in series	b. V/R
	c. Increase the resistance in circuit

Ans

i. Resistivity	**VA / LI**
ii. Resistance in series	**Increase the resistance in circuit**

Q.2 **Solve Numerical problems** **6**

1 The resistance of a 1 m long nichrome wire is 6Ω. If we reduce the length of the wire to 70 cm, what will be its resistance?

Ans **Data :** Initial length (L_1) = 1 m.
Final length (**L_2**) = 70 cm = 0.7 m.
Initial Resistance (**R_1**) = 6 Ω.
To find : Final resistance (**R_2**) = ?
Solution : R =

Since the wire is same in both the cases, ρ and A will be the same.

$$R_1 = \frac{pL_1}{A} \quad \text{.....(1)}$$

$$\text{and } R_2 = \frac{pL_2}{A} \quad \text{.....(2)}$$

Dividing eq. (1) and (2), we get,

$$R_2 = R_1 \times \frac{L_2}{L_1}$$

$$\mathbf{R_2 = 4.2\ \Omega}$$

Result : The resistance of the reduced length is **4.2 Ω.**

2 If a charge of 420 C flows through a conducting wire in 5 minutes. What is the value of current.

Ans **Given:** Charge (Q) = 420 C
Time (t) = 5 min = 5 × 60
= 300 seconds
To find: Current (I)

$$I = \frac{Q}{t}$$

$$I = \frac{420}{300}$$

= 1.4 A

3 The resistance of a conductor of length x is r. If its area of cross section is a, what is its resistivity? What is its unit?

Ans Resistance of a conductor = r
Length of a conductor = x
Area of cross section = a

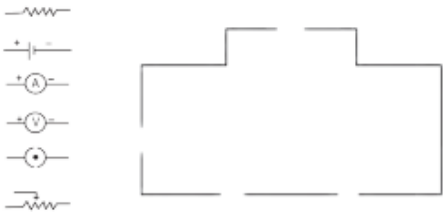
$$\text{Resistivity } P = \frac{RA}{l}$$

$$P = \frac{RA}{x}$$

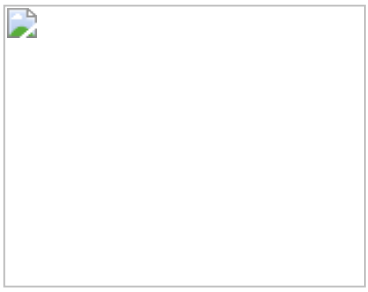
unit of resistivity is ohm metre (Ωm).

Q.3 Answer the following. **2**

1 The following figure shows the symbols for components used in the accompanying electrical circuit. Place them at proper places and complete the circuit. Which law can be proved with the help of circuit.



Ans



The above circuit proves Ohm's law

Q.4 Solve Numerical problems **6**

1 The resistance of a 1m long nichrome wire is 6 Ω If we reduce the length of the wire to 70 cm. What will be the resistance.

Ans Initial length = 1m = 100 cm

Initial resistance = 6 Ω

Reduced length = 70 cm = 0.7 m

$$P = \frac{RA}{l}$$

$$R_1 = \frac{Pl_1}{A}, R2 = \frac{Pl_2}{A}$$

$$\frac{R_1}{R_2} = \frac{\frac{Pl_1}{A}}{\frac{Pl_2}{A}}$$

$$= \frac{Pl_1}{A} \times \frac{A}{Pl_2}$$

$$\frac{R_1}{R_2} = \frac{l_1}{l_2}$$

$$\frac{6}{R_2} = \frac{1}{0.7}$$

$$R_2 = 6 \times 0.7$$

$$= 4.2\ \Omega$$

Resistance of reduced length will be 4.2Ω

2 When two resistors are connected in series, their effective resistance is 80Ω when they are connected in parallel, there effective resistance is 20Ω What are the values of the two resistances ?

Ans Effective series resistances $R_2 = 80\ \Omega$

Effective parallel resistance $R_p = 20\ \Omega$

To find : R_1 and R_2

$$R_s = R_1 + R_2 \quad \text{..... (i)}$$

$$\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2} \quad \text{..... (ii)}$$

$$\frac{1}{20} = \frac{R_2 + R_1}{R_1 \times R_2}$$

$$\frac{1}{20} = \frac{80}{R_1 \times R_2}$$

$\therefore$ $R_1 + R_2 = 80$

$$R_1 \times R_2 = 1600$$

$$R_1 = \frac{1600}{R_2}$$

Substituting the value of R_1 in equation (i)

$$80 = \frac{1600}{R_2} + R_2$$

$$80\ R_2 = 1600 + (R_2)^2$$

$$R_2^2 - 80\ R_2 + 1600 = 0$$

$$R_2^2 - 40\ R_2 - 40\ R_2 + 1600 = 0$$

$$R_2(R_2 - 40) - 40\ (R_2 - 40) = 0$$

$$(R_2 - 40)\ (R_2 - 40) = 0$$

$$R_2 = 40\Omega$$

$$R_1 + 40 = 80$$

$\therefore$ $R_1 = 40\ \Omega$

The Value of R_1 is 40Ω and R_2 is 40Ω .

Q.5 Answer the following **3**

1 Umesh has two bulbs having resistances of 15Ω and 30Ω . He wants to connect them in a circuit but if he connects them one at a time the filament gets burnt. Answer the following.

i. Which method should be used to connect the bulbs.

ii. What are the characteristics of connecting the bulbs using the above method.

iii. The effective resistance in the above circuit will be.

Ans i. If bulbs are connected in series, the effective resistance of the circuit increases and hence current through the bulb decreases. In this way, both the bulbs can be saved from burning.

ii. Following are the characteristics of series connection :

. The effective resistance of the circuit is the sum of individual resistance of the resistors present in the circuit.

. The effective resistance of the series circuit is always larger than the greatest resistance in the circuit.

. Current through various electrical components connected in series is same.

. The source voltage gets divided across the electrical components connected in series.

iii. The effective resistance of the circuit =15 + 30 = 45Ω

Q.6 Extra data (Not to be Use) **5**

1 Umesh has two bulbs having resistances of 15Ω and 30Ω . He wants to connect them in a circuit but if he connects them one at a time the filament gets burnt. Answer the following.

i. Which method should be used to connect the bulbs.

ii. What are the characteristics of connecting the bulbs using the above method.

iii. The effective resistance in the above circuit will be.

Ans i. He should use parallel combination to connect the bulbs.

ii. a.The Potential difference across all resistors is the same.

b.The effective resistance of resistors connected in parallel in less than the least resistance of individual resistors.

c.This arrangement is used to reduce the resistance in a circuit.

d.The current flaming through an individual resistor is proportional to the inverse of its resistance.

e.The inverse of the effective resistance is equal to the sum of the inverses of individual resistances.

iii. $\frac{1}{R_P} = \frac{1}{R_1} + \frac{1}{R_2}$

$R_1 = 15\Omega$, $R_2 = 30\Omega$

$\frac{1}{R_P} = \frac{1}{15} + \frac{1}{30}$

$\frac{1}{R_P} = \frac{3}{30}$

$R_p = 10\Omega$

Hence the effective resistance of the above circuit will be 10Ω.

Q.7 Answer the following in detail **5**

1 The accompanying figure shows some electrical appliances connected in a circuit in a house. Answer the following

i. By which method are the appliances connected.
ii. What must be the potential difference across individual appliances.
iii. Will the current passing through each appliance be the same? Justify your answer.
iv. Why are the domestic appliances connected in this way.
v. If the T.V stops working will the other appliances also stop working.

Ans i. Appliances are connected in parallel combination.
ii. The potential difference across individual appliance is same i.e. 220V.
iii. No, the current passing through each appliance will not be same.
a. Appliances are connected in parallel combination.
b. current flowing across each appliance depends upon the resistance of appliance.
iv. The domestic appliances are connected in this way so that the potential difference across each appliance remain same.
v. If T.V stops working other appliances will not stop working as the appliances are connected in parallel. The circuit does not break in parallel combination and current passes through other appliances.