

Chapter - 9 (Current Electricity)

9(B) (Potential difference and Resistance)

Exercise 9(B): →

(B) very short ans. type : →

Q1. What is the other name for the unit :

(a) Joule per Coulomb (b) Coulomb per second

Ans

(a) Joule per Coulomb : → $\frac{\text{Joule}}{\text{Coulomb}} = \text{J/C} = \text{Volt (V)}$

(b) Coulomb per second : → $\frac{\text{Coulomb}}{\text{Second}} = \text{C/s} = \text{Ampere (A)}$

Q2 : → For what purpose is a battery connected in a circuit?

Ans : → A battery is connected in the circuit when a strong current is required.

Q3 : → How will the resistance of a wire change if it is stretched?

Ans The resistance of the wire will increase because by stretching wire, its length increases and area of cross-section decreases.

Qus 4:-> How does current change with voltage when it is altered across a given resistance?

Ans:-> Current will increase by increasing the voltage and decrease by decreasing the voltage because voltage is directly proportional to Current by the Ohm's Law.

Qus 5:-> Name the physical quantities whose units are:->

(a) Coulomb and ampere (b) Volt and ohm

Ans:-> (b) Volt and ohm :-> Volt - Potential difference, ohm - Resistance

(a) Coulomb and ampere -> Coulomb - Charge, Ampere - Current

Qus 6:-> Answer given in Book.

Qus 7:-> Determine the term Potential difference?

Ans:-> Potential Difference:-> potential difference between the two conductors is equal to work done in transferring a unit positive charge from one conductor to other conductor. If W is the work done then Potential difference between them is ;

$$V_1 - V_2 = \frac{W}{q}$$

V_1 - Potential of Conductor 1

V_2 - Potential of Conductor 2

q - unit positive charge

Potential difference is a scalar quantity.

Qus 8:- State and define the S.I unit of potential difference ?

Ans The S.I unit of potential ~~differe~~ is Joule per Coulomb or volt.

$$\text{or } 1 \text{ Volt} = \frac{1 \text{ Joule}}{1 \text{ Coulomb}}$$

one Volt:-> The potential difference between the two points is said to be one volt, if work done in transferring one Coulomb of charge from one point to other point is 1 joule.

Qus 1 ^{Not from exercise}:- Define Resistance?

Ans:- The obstruction offered to flow of current by a conductor is called its electrical resistance.

Q. 9:- State and define S.I unit of Resistance?

Ans The S.I unit of resistance is Ohm (Ω) or volt per ampere

$$\text{i.e. } R = \frac{V}{I} = \frac{1 \text{ Volt}}{1 \text{ Ampere}} = 1 \text{ ohm} = 1 \Omega$$

Is the potential difference across its ends the same?

Ans :->

We know that $V = IR$

$$\text{or } V = \frac{I}{R}$$

$$\text{or } I = \frac{V}{R} \quad \text{--- (1)}$$

Acc. to question; Resistance is doubled

$$\text{So } R' = 2R$$

also $V' = V$ (Same)

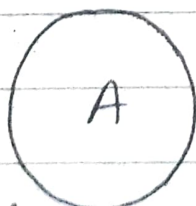
$$\text{So } I' = \frac{V'}{R'} = \frac{V}{2R} = \frac{V}{2R}$$

$$\Rightarrow I' = \frac{1}{2} \frac{V}{R} = \frac{1}{2} I \quad \therefore \boxed{I' = \frac{I}{2}}$$

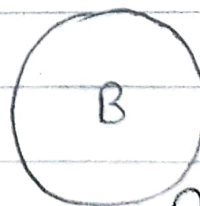
Ques 3 :-> Figure shows two conductors A and B. Their charges and potentials are given in the diagram. State the direction of (a) flow of electrons (b) flow of current when both

conductors are joined by a metal wire.

Ans :->



$Q = -10 \text{ Coulomb}$
 $V = 5 \text{ Volt}$



$Q = 5 \text{ Coulomb}$
 $V = 10 \text{ Volt}$

(a) A to B. (c. as conductor A has excess of negative charge)

(B) Current will flow from B to A ($\because$ B is at higher potential and conductor A is at lower potential)

Ques 4 $\rightarrow$ how is the resistance of a wire affected if
(a) its length doubled (b) radius is doubled

Ans (a) length of a wire is doubled $\rightarrow$
because Resistance of wire is directly proportional
to the length of wire ($R \propto l$)
So resistance doubles

(b) if radius is doubled $\rightarrow$ because R (resistance)
of wire is inversely proportional to area of cross-section of
a wire. ($R \propto \frac{1}{A}$)

Wire cross-section area is πr^2

radius is doubled so $\pi(2r)^2$

$$A' = 4\pi r^2$$

So area becomes 4 times

$$R' \propto \frac{1}{A'}$$
$$\therefore R' \propto \frac{1}{4A}$$

$\therefore$ So resistance becomes less or
one fourth of original
resistance

Ques 5 $\rightarrow$ The potential difference between two conductors is
'One Volt'. What is the meaning of this statement?

Ans 5: $\rightarrow$ It means that 1 Joule of work is done in transferring 1 Coulomb of Charge from one conductor to another.

$$[\because 1 \text{ Volt} \Rightarrow \frac{1 \text{ Joule}}{1 \text{ Coulomb}}]$$

Qus 6: $\rightarrow$ The resistance of a wire is one ohm? Explain the meaning of this statement?

Ans 6: $\rightarrow$ It means that Current of one ampere flows through it when the potential difference across its ends is one Volt.

(Q) Long Answer Type: $\rightarrow$

Qus 7: $\rightarrow$ State and explain three factors on which the resistance of a wire depends?

Ans 7: $\rightarrow$

(1) Length of wire: $\rightarrow$ resistance of a wire $\propto$ length of the wire. It means long wire offers more resistance than a short wire. It is because, the number of electrons suffered by the moving electrons will be more when ~~can~~ have to travel a longer distance in a wire.

(2) The area of Cross-section of wire: $\rightarrow$ resistance of wire is inversely proportional to area of cross-section of wire (i.e. $R \propto \frac{1}{A}$).

It means thick wire offers less resistance because electrons get a larger area of cross-section to flow as compared to a thin wire.

(3) Temperature of wire: $\rightarrow$ resistance of a wire increases with the increase of temperature. It is because, with the increase of temperature, the number of collisions increases which increases the resistance of wire.

Page-8(E) Numericals : →

- ① In transferring 1.5C charge through a wire, 9J of work is done. Find the potential difference across the wire.

Ans : → Given $q = 1.5C$
 $W = 9J$

We know Potential difference, $V = \frac{W}{q} = \frac{9}{1.5} = \frac{9 \times 10^3}{155}$

$V = 6V$

- Qus 2 → The cell of pot. difference 12V is connected to a bulb. The resistance of the filament of the bulb when it glows is 24Ω . Find the current drawn from the cell.

Ans Given ; $V = 12V$
 $R = 24\Omega$

($\because$ by ohm's law $V = IR$) $I = \frac{V}{R} = \frac{12}{24} = \frac{1}{2} A = 0.5A$

$I = 0.5A$

- Q 3 → A bulb draws a current of 1.5A at 6V. Find the resistance of the bulb when it is glowing.

Ans →

$I = 1.5A, V = 6V$

$R = ?$ as $V = IR$

so $\frac{V}{I} = R$

$\therefore R = \frac{V}{I} = \frac{6}{1.5}$

$R = \frac{6 \times 10^2}{155} = 4\Omega$

so $R = 4\Omega$

- Q 4 → A current of 2A flows in a wire of resistance 15Ω . Find the Pot. difference across the ends of the wire?

Ans $I = 2A, V = ?$
 $R = 15\Omega$

as $V = IR$

$V = 2 \times 15 = 30V$

Ans $V = 30V$