



GRADE 10 – PHYSICS
CHAPTER - ELECTRICITY

1. What are the features of a series combination of resistance?

Ans-

- i. The current flowing through each resistance is always the same.
- ii. The voltage of the series combination of a resistor equals the sum of potential difference across each individual resistance.
- iii. The net resistance of the combination is equal to the sum of the resistances of individual resistors.

2. Discuss the cause of heating due to current flow through a conductor.

Ans- When a conductor is connected to a cell, the free electron starts to drift with a velocity and collide with the atoms of the conductor. As a result, the kinetic of free electrons is transferred to the atoms. So, the atoms start vibrating. This increasing energy creates heat energy, that's why it becomes hot.

3. What is joules law of heating?

Ans - The amount of heat produced in a conductor is directly proportional to the square of electrical current flowing through it.

The produced heat is directly proportional to the resistance of the conductor.

4. Write some applications of joules law of heating.

Ans- Electric bulb, Electric fuse, Heating appliance

5. What do you mean by rating a fuse as 5 amperes?

Ans- It means the maximum current that can flow through the fuse wire without melting is 5 amperes.

6. What do you mean by electrical power?

Ans - Electrical power is defined as the amount of electric energy consumed in a circuit per unit of time.

7. How Voltmeter and Ammeter are connected in a circuit?

Ans- Voltmeter is always connected parallel to the circuit, but Ammeter is always connected series.

8. What do you mean by Electric potential?

Ans- The electric potential at a point is defined as the work done to move a unit charge from infinity to that point.

9. State ohms law and its mathematical form.

Ans-Ohms law states that the voltage or potential difference between two points is directly proportional to the amount of current passing through a resistance.

According to ohms law, $V = I \times R$

10. What do you mean by resistance?

Ans -Resistance is a property of a conductor that opposes the flow of electric current through it.

11. On which factors resistance of a conductor depend on?

Ans-

- i. The resistance of a conductor is directly proportional to the length of the conductor.
- ii. Resistance of a conductor is inversely proportional to the area of the cross-sectional of the conductor.
- iii. Resistance of a conductor depends on the resistivity of the material by which the conductor is made of.

12. What do you mean by the resistivity of a conductor?

Ans-Specific resistivity of a conductor is defined as the resistance of a conductor per unit length and per unit cross-section area. It depends on the nature of the materials.

13. What do you mean by effective resistance of a circuit?

Ans- Equivalent Resistance – The total effective resistance of a circuit with a combination of resistances is known as an equivalent resistance of that circuit.

14. What is meant by saying that the potential difference between two points is 1 V?

Ans- When 1 J of work is done to move a charge of 1 C from one point to another, it is said that the potential difference between two points is 1 V.

15. What are the advantages of connecting electrical devices in parallel with the battery instead of connecting them in series?

Ans- When the electrical devices are connected in parallel there is no division of voltage among the appliances. The potential difference across the devices is equal to supply voltage. Parallel connection of devices also reduces the effective resistance of the circuit.

16. Why does the cord of an electric heater not glow while the heating element does?

Ans-The heating element of an electric heater is made of an alloy which has a high resistance. When the current flows through the heating element, the heating element becomes too hot and glows red. The cord is usually made of copper or aluminum which has low resistance. Hence the cord doesn't glow.

17. What determines the rate at which energy is delivered by a current?

Ans-Electric power is the rate of consumption of electrical energy by electric appliances. Hence, the rate at which energy is delivered by a current is the power of the appliance.

18. Which uses more energy, a 250 W TV set in 1 hr, or a 1200 W toaster in 10 minutes?

Ans-

The energy consumed by electrical appliances is given by the equation

$$H = Pt, \text{ where } P \text{ is the power of the appliance and } t \text{ is the time}$$

Using this formula, the energy consumed by a TV of power rating 250 W, can be calculated as follows:

$$H = 250 \text{ W} \times 3600 \text{ seconds} = 9 \times 10^5 \text{ J}$$

Similarly, the energy consumed by a toaster of power rating 1200 W is

$$H = 1200 \text{ W} \times 600 \text{ s} = 7.2 \times 10^5 \text{ J}$$

From the calculations, it can be said that the energy consumed by the TV is greater than the toaster.

19. An electric heater of resistance 8Ω draws 15 A from the service mains 2 hours. Calculate the rate at which heat is developed in the heater.

Ans -The rate at which the heat develops in the heater can be calculated using the following formula

$$P = I^2 R$$

Substituting the values in the equation, we get

$$P = (15\text{A})^2 \times 8 \Omega = 1800 \text{ watt}$$

The electric heater produces heat at the rate of 1800 watt

20. A current of 10 A flows through a conductor for two minutes.

(i) Calculate the amount of charge passed through any area of cross section of the

Conductor

(ii) If the charge of an electron is $1.6 \times 10^{-19} \text{ C}$, then calculate the total number of electrons

Flowing

Ans-

Given that: $I = 10 \text{ A}$, $t = 2 \text{ min} = 2 \times 60 \text{ s} = 120 \text{ s}$

(i) Amount of charge Q passed through any area of cross-section is given by

$$I = Q/t$$

$$\text{or } Q = I \times t \therefore Q = (10 \times 120) \text{ A s} = 1200 \text{ C}$$

(ii) Since, $Q = ne$

where n is the total number of electrons flowing and e is the charge on one electron

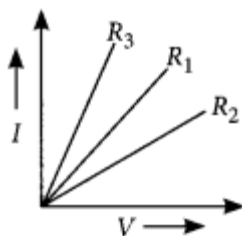
$$\therefore 1200 = n \times 1.6 \times 10^{-19} \quad \text{or } n = 1200/1.6 \times 10^{-19} = 7.5 \times 10^{21}$$

21. Draw the symbols of commonly used components in electric circuit diagrams for
- (i) An electric cell
 - (ii) Open plug key
 - (iii) Wires crossing without connection
 - (iv) Variable resistor
 - (v) Battery
 - (vi) Electric bulb
 - (vii) Resistance

Ans-

S. No.	Component	Symbol
(i)	An electric cell	
(ii)	Open plug key	
(iii)	Wires crossing without connection	
(iv)	Variable resistor	
(v)	Battery	
(vi)	Electric bulb	
(vii)	Resistance	

22. A student plots V-I graphs for three samples of nichrome wire with resistances R_1 , R_2 and R_3 . Choose from the following the statements that holds true for this graph. (2020)

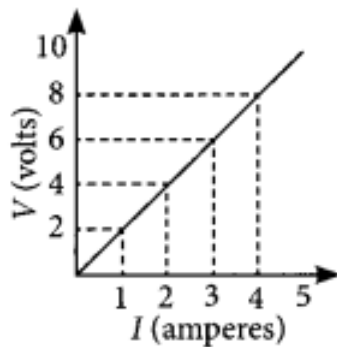


- (a) $R_1 = R_2 = R_3$
- (b) $R_1 > R_2 > R_3$
- (c) $R_3 > R_2 > R_1$
- (d) $R_2 > R_1 > R_3$

Ans - The inverse of the slope of I-V graph gives the resistance of the material.
Here the slope of $-R_j$ is highest. Thus, $R_2 > R_1 > R_3$

23. Study the V-I graph for a resistor as shown in the figure and prepare a table showing the values of I (in amperes) corresponding to four different values V (in volts). Find the value of current for V = 10 volts. How can we determine the resistance of the resistor from this graph?

Ans-



the value of current for V = 10 volts is 5 amperes (or 5 A).

From Ohm's law, $V = IR$

We can write, $R = V/I$

At any point on the graph, resistance is the ratio of values of V and I. Since, the given graph is straight line (ohmic conductor) so, the slope of graph will also give the resistance of the resistor

$$R = 10V/5A = 2\Omega$$

$$\text{Alternately, } R = (8-2)V/(4-1)A = 6V/3A = 2\Omega$$

- 24 .Calculate the resistance of a metal wire of length 2m and area of cross section $1.55 \times 10^{-6} \text{ m}^2$, if the resistivity of the metal be $2.8 \times 10^{-8} \Omega\text{m}$

Ans - $R=0.036 \text{ Ohm}$

- 25 . Calculate the resistivity of the material of a wire of length 1 m, radius 0.01 cm and resistance 20 ohms.

Ans - $6.28 \times 10^{-7} \Omega \text{ m}$