CHAPTER 12

# ELECTRICITY

## Syllabus

***Electric current, potential difference and electric current, Ohm's law; Resistance, Resistivity, Factors on which the resistance of a conductor depends. Series combination of resistors, parallel combination of resistors and its application in daily life, Heating effect of electric current and its applications in daily life, Electric power, Interrelation between P, V, I and R.***

## STAND ALONE MCQs (1 Mark each)

AI **Q. 1.** A cylindrical conductor of length '*l*' and uniform area of cross section 'A' has resistance 'R'. The area of cross section of another conductor of same material and same resistance but of length '2*l*' is

**(A)** $\frac{A}{2}$ **(B)** $\frac{3A}{2}$

**(C)** 2 A **(D)** 3 A

AE **[OD CBSE, 2020]**

**Ans. Option (C) is correct.**

***Explanation:*** Resistivity of the conductor in the first case, $\rho = \frac{RA}{l}$ ...(i)

Resistivity of the conductor in second case,

$$\rho = \frac{RA'}{2l} \quad ...(ii)$$

Since, both conductors are of same material and are at same temperature, so the resistivity of both the conductors will be same.

Therefore, from equations, (i) and (ii), we have :

$$\Rightarrow \frac{RA}{l} = \frac{RA'}{2l}$$

$$\Rightarrow A' = 2A$$

**Q. 2.** The maximum resistance which can be made using four resistor each of resistance ½Ω is

**(A)** 2 Ω **(B)** 1 Ω

**(C)** 2.5 Ω **(D)** 8 Ω **[OD CBSE, 2020]**

**Ans. Option (A) is correct.**

***Explanation:*** Maximum resistance in series = 4 × ½ = 2 Ohm.

**Q. 3.** When a 4V battery is connected across an unknown resistor there is a current of 100 mA in the circuit. The value of the resistance of the resistor is:

**(A)** 4 Ω **(B)** 40 Ω

**(C)** 400 Ω **(D)** 0.4 Ω AE

**[Board SQP, 2020]**

**Ans. Option (B) is correct.**

***Explanation:*** $V=IR$, $V = 4$ V, I = 100 mA = 0.1 A

Hence, $R=\frac{V}{I}=\frac{4}{0.1} = 40\ \Omega$.

**Q. 4.** Unit of electric power may also be expressed as:

**(A)** Volt-ampere **(B)** Kilowatt-hour

**(C)** Watt-second **(D)** Joule-second R

**[Board SQP, 2020]**

**Ans. Option (A) is correct.**

***Explanation:*** Unit of electric power is volt-ampere.

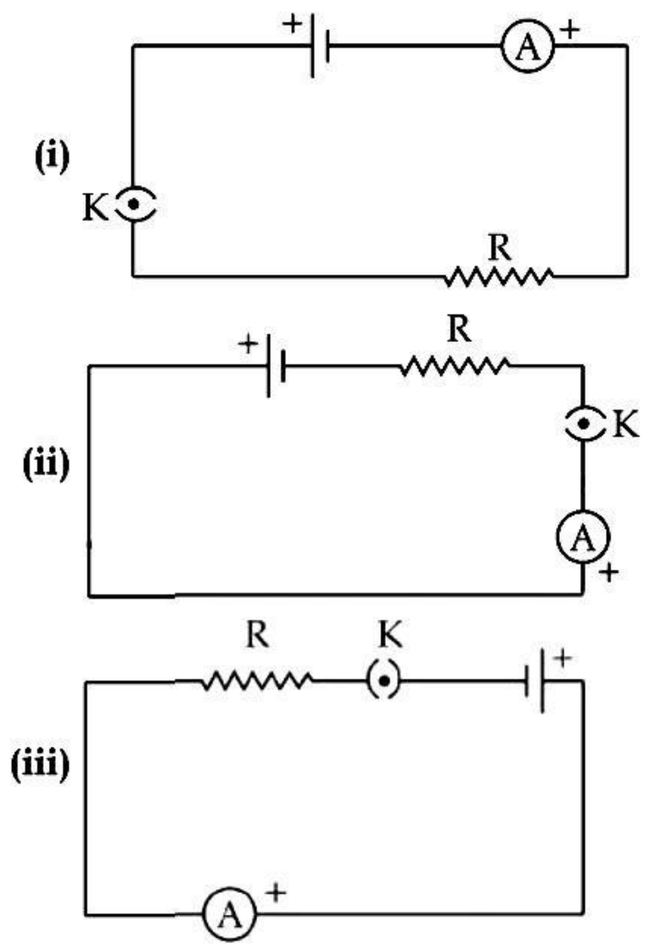
**Q. 5.** A cell, a resistor, a key, and ammeter are arranged as shown in the circuit diagrams given below. The current recorded in the ammeter will be:

**(A)** maximum in (i).

**(B)** maximum in (ii).

**(C)** maximum in (iii).

**(D)** the same in all the cases.




**Ans. Option (D) is correct.**

> ***Explanation:*** In series connections, the order of elements in the circuit will not affect the amount of current flowing in the circuit.

**Q. 6.** Electrical resistivity of a given metallic wire depends upon

**(A)** its length. **(B)** its thickness.
**(C)** its shape. **(D)** nature of the material.

**Ans. Option (D) is correct.**

> ***Explanation:*** The resistivity of a material is constant for a particular material at a constant temperature. It only depends on the temperature. Resistivity of material does not depend on length, thickness, and shape of the material.

**Q. 7.** A current of 1 A is drawn by a filament of an electric bulb. Number of electrons passing through a cross section of the filament in 16 seconds would be where, $e = 1.6 \times 10^{-19}$ C

**(A)** $10^{20}$ **(B)** $10^{16}$
**(C)** $10^{18}$ **(D)** $10^{23}$

**Ans. Option (A) is correct.**

> ***Explanation:*** Given, $I = 1$ Amp.
> $t = 16$ s
> As $I = \frac{Q}{t} = \frac{ne}{t}$
> $n = \frac{(I \times T)}{t} = \frac{1 \times 16}{1.6 \times 10^{-19}}$
> $n = 10^{20}$

**Q. 8.** The resistivity does not change if :

**(A)** the material is changed.
**(B)** the temperature is changed.
**(C)** the shape of the resistor is changed.
**(D)** both material and temperature are changed.

**Ans. Option (C) is correct.**

> ***Explanation:*** Resistivity always varies with change in temperature, nature of material. But resistivity cannot be change in any shape of conductor.

**Q. 9.** At the time of short circuit, the electric current in the circuit:

**(A)** vary continuously
**(B)** does not change
**(C)** reduces substantially
**(D)** increases heavily U **[CBSE 2020, Delhi]**

**Ans. Option (D) is correct.**

> ***Explanation:*** At the time of short circuiting then the amount of current that is flowing in the circuit increases.

**Q. 10.** Two bulbs of 100 W and 40 W are connected in series. The current through the 100 W bulb is 1 A. The current through the 40 W bulb will be:

**(A)** 0.4 A **(B)** 0.6 A
**(C)** 0.8 A **(D)** 1 A

**Ans. Option (D) is correct.**

> ***Explanation:*** In a series connection, the current through each device remains the same. Therefore, the current through the 40 W bulb will also be 1 A.

**Q. 11.** What is the maximum resistance which can be made using five resistors each of $\frac{1}{5}$ Ω?

**(A)** $\frac{1}{5}$ Ω **(B)** 10 Ω
**(C)** 5 Ω **(D)** 1 Ω

**Ans. Option (D) is correct.**

> ***Explanation:*** The highest resistance is always given by connecting the resistors in series. Here, the highest resistance would be $5 \times \frac{1}{5} = 1$ ohm. Therefore, the maximum resistance is 1 ohm.

AI **Q. 12.** What is the minimum resistance which can be made using five resistors each of $\frac{1}{5}$ Ω?

**(A)** $\frac{1}{5}$ Ω. **(B)** $\frac{1}{25}$ Ω.
**(C)** $\frac{1}{10}$ Ω. **(D)** 25 Ω.

**Ans. Option (B) is correct.**

> ***Explanation:*** Minimum resistance is obtained when resistors are connected in parallel combination.
>
> Thus, equivalent resistance obtained by connecting five resistors of resistance $\frac{1}{5}$ Ω each, parallel to each other :
>
> $\frac{1}{R} = \frac{1}{1/5} + \frac{1}{1/5} + \frac{1}{1/5} + \frac{1}{1/5} + \frac{1}{1/5} \Rightarrow \frac{1}{R} = \frac{5}{1/5}$
>
> $\Rightarrow \frac{1}{R} = \frac{25}{1}$
>
> $\Rightarrow R = \frac{1}{25}\Omega$

**Q. 13.** Which of the following represents voltage?

**(A)** $\frac{\text{Work done}}{\text{Current} \times \text{Time}}$

**(B)** Work done × Charge

**(C)** $\frac{\text{Work done} \times \text{Time}}{\text{Current}}$

**(D)** $\frac{\text{Work done} \times \text{Charge}}{\text{Time}}$ R

**Ans. Option (A) is correct.**

*Explanation:* As we know that,
Work done = Charge × Potential difference
⇒ Work done = (Current × Time) × Potential Difference
[∵ Charge = Current × time]

$$\Rightarrow \text{Potential difference} = \frac{\text{Work done}}{\text{Current} \times \text{Time}}$$

**Q. 14.** If the current *I* through a resistor is increased by 100% (assume that temperature remains unchanged), the increase in power dissipated will be

**(A)** 100% **(B)** 200%

**(C)** 300% **(D)** 400% AE

**Ans. Option (C) is correct.**

*Explanation:* If I is current and R is resistance then,
Power, $P = I^2R$
Power in first case, $P_1 = I^2R$

100% increase in current means that current becomes 2I
Power in second case, $P_2 = (2I)^2R = 4I^2R$
Now, increase in dissipated power $= P_2 - P_1$
$= 4I^2R - I^2R$
$= 3I^2R$
Percentage increase in dissipated power $= \frac{3P_1}{P_1} \times 100$
$= 300\%$

AI **Q. 15.** In an electrical circuit three incandescent bulbs A, B, and C of rating 40 W, 60 W, and 100 W, respectively are connected in parallel to an electric source. Which of the following is likely to happen regarding their brightness?

**(A)** Brightness of all the bulbs will be the same.

**(B)** Brightness of bulb A will be the maximum.

**(C)** Brightness of bulb B will be more than that of A.

**(D)** Brightness of bulb C will be less than that of B. AE

**Ans. Option (C) is correct.**

*Explanation:* We know that power is defined as rate of doing work. A bulb consumes electric energy and produces heat and light. Now, bulb with more power rating will produce more heat and light or we can say that power rating of bulb is directly proportional to the brightness produced by bulb. Therefore, brightness of bulb B with power rating 60 W will be more than the brightness of bulb A having power rating as 40 W.

**Q. 16.** An electric kettle consumes 1 kW of electric power when operated at 220 V. A fuse wire of what rating must be used for it?

**(A)** 1 A **(B)** 2 A

**(C)** 4 A **(D)** 5 A

**Ans. Option (D) is correct.**

*Explanation:* Given that,
power = P = 1 kW = 1000 W
Voltage = V = 220

$$\text{Now, } I = \frac{P}{V} = \frac{1000}{220} = 4.5 \text{ A}$$

Now rating of fuse wire must be slightly greater than 4.5 A, that is, 5 A.

## ASSERTION AND REASON BASED MCQs (1 Mark each)

**Directions : In the following questions, A statement of Assertion (A) is followed by a statement of Reason (R). Mark the correct choice as.**

**(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 and R is true.

**Q. 1. Assertion (A):** A conductor has + 3.2 × $10^{-19}$ C charge.
**Reason (R):** Conductor has gained 2 electrons.

**Ans. Option (C) is correct.**

*Explanation:* Conductor has positive charge, so it has lost two electrons.

**Q. 2. Assertion (A):** The resistivity of conductor increases with the increasing of temperature.
**Reason (R):** The resistivity is the reciprocal of the conductivity.

**Ans. Option (B) is correct.**

*Explanation:* The resistivity of the conductors is directly proportional to temperature.

**Q. 3. Assertion (A):** Bending a wire does not affect electrical resistance.
**Reason (R):** Resistance of wire is proportional to resistivity of material.

**Ans. Option (A) is correct.**

*Explanation:* Resistance of wire $R = \rho\left(\frac{l}{A}\right)$

Where ρ is resistivity of material which does

not depend on the geometry of wire. Since when wire is bent its, resistivity, length and area of cross-section do not change, therefore resistance of wire also remains same.

**Q. 4. Assertion (A):** Two resistance having value R each. Their equivalent resistance is $\frac{R}{2}$.

**Reason (R):** Given Resistances are connected in parallel.

**Ans. Option (A) is correct.**

*Explanation:* When two resistances $R_1$ and $R_2$ connected in parallel than their equivalent resistance will be $R = \frac{R_1 R_2}{R_1 + R_2}$.

**Q. 5. Assertion (A):** Alloys are commonly used in electrical heating devices like electric iron and heater.

**Reason (R):** Resistivity of an alloy is generally higher than that of its constituent metals but the alloys have low melting points then their constituent metals.

**Ans. Option (C) is correct.**

*Explanation:* Alloys have high resistivity and high melting point as compared to pure metals. So alloys cannot easily burn or oxidize at higher temperature. Now as we want higher temperature in heating devices so we use alloys in heating devices.

**Q. 6. Assertion (A):** In a simple battery circuit the point of lowest potential is positive terminal of the battery.

**Reason (R):** The current flows towards the point of the lower potential as it flows in such a circuit from the positive to the negative terminal.

**Ans. Option (D) is correct.**

*Explanation:* In a simple battery circuit, the point of lowest potential is the negative terminal of the battery and the current flows from higher potential to lower potential.

**Q. 7. Assertion (A):** Electric appliances with metallic body have three connections, whereas an electric bulb has a two pin connection.

**Reason (R):** Three pin connections reduce heating of connecting wires.

**Ans. Option (C) is correct.**

*Explanation:* The metallic body of an electrical appliances is connected to the third pin which is connected to the earth. This is a safety precaution and avoids eventual electric shock. By doing this the extra charge flowing through the metallic body is passed to earth and avoid shocks. There is nothing such as reducing of the heating of connecting wires by three pin connections.

**Q. 8. Assertion (A):** The electric bulbs glow immediately when switch is ON.

**Reason (R):** The drift velocity of electrons in a metallic wire is very high.

**Ans. Option (A) is correct.**

*Explanation:* In a conductor there are large numbers of free electrons. When we close the circuit, the electric field is established instantly with the speed of electromagnetic wave which causes electron drift at every portion of the circuit. Due to which the current is set up in the entire circuit instantly. The current which is set up does not wait for the electrons flow from one end of the conductor to another end. It is due to this, the bulb glows immediately when switch is ON.

**Q. 9. Assertion (A):** Copper is used to make electric wires.

**Reason (R):** Copper has very low electrical resistance.

**Ans. Option (A) is correct.**

*Explanation:* A low electrical resistance of copper makes it a good electric conductor. So, it is used to make electric wires.

**Q. 10. Assertion (A):** Silver is not used to make electric wires.

**Reason (R):** Silver is a bad conductor.

**Ans. Option (C) is correct.**

*Explanation:* Silver is a good conductor of electricity but it is not used to make electric wires because it is expensive.

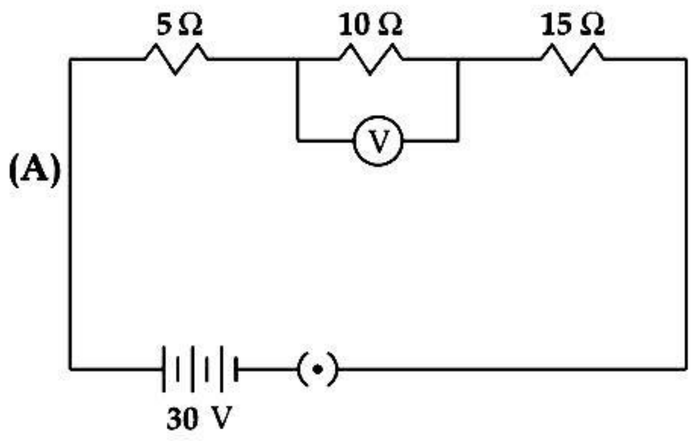
# CASE-BASED MCQs

**Attempt any 4 sub-parts from each question. Each sub-part carries 1 mark.**

**AI I. Read the passage and answer any four questions from Q.1. to Q.5.**

Three resistors of 5 Ω, 10 Ω and 15 Ω are connected in series and the combination is connected to the battery of 30 V. Ammeter and voltmeter are connected in the circuit.

**Q. 1.** Which of the following is the correct circuit diagram to connect all the devices in proper correct order.



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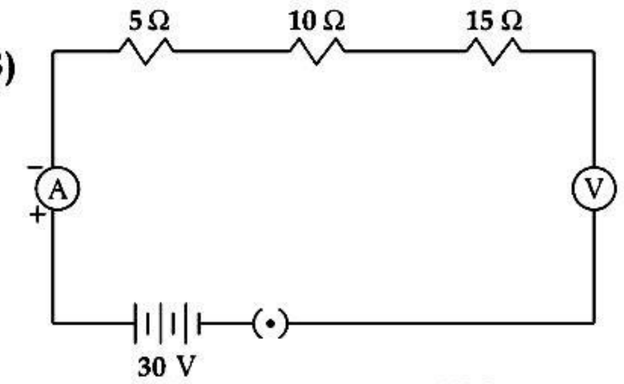


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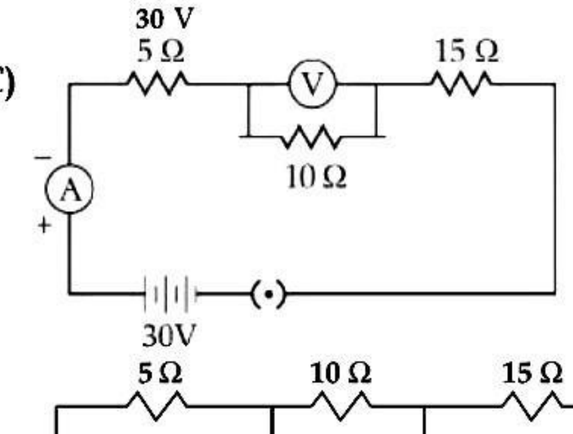
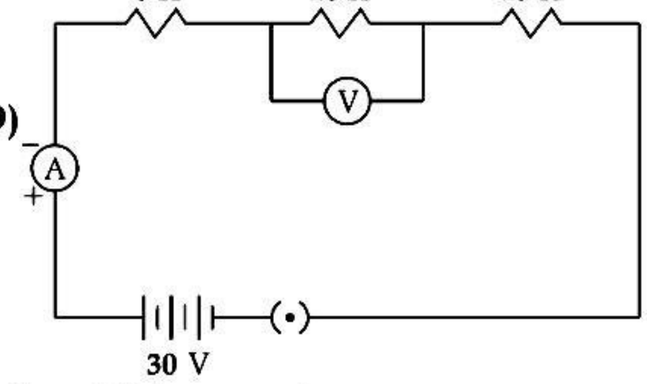
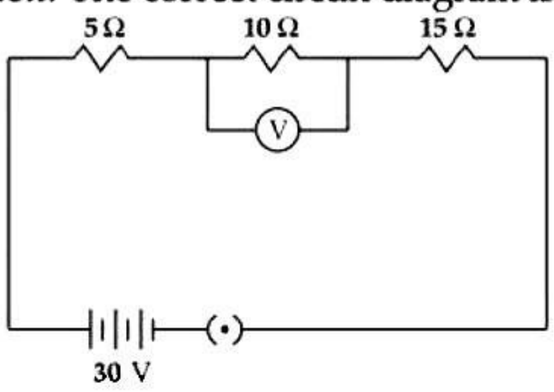



(D)



**Ans. Option (D) is correct.**

***Explanation:*** The correct circuit diagram is :




**Q. 2.** How much is the total resistance?

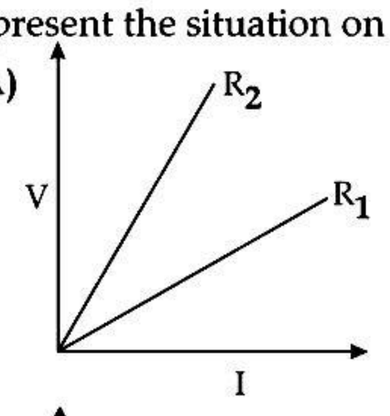
**(A)** 30 Ω **(B)** 20 Ω

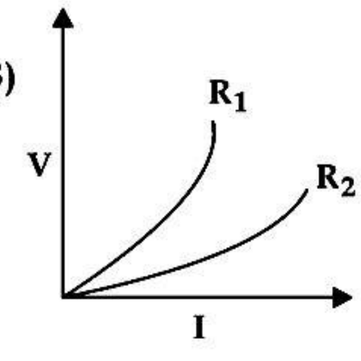
**(C)** $\frac{11}{30}\Omega$ **(D)** $\frac{30}{11}\Omega$

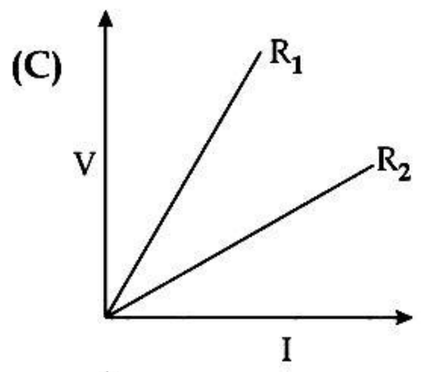
**Ans. Option (A) is correct.**

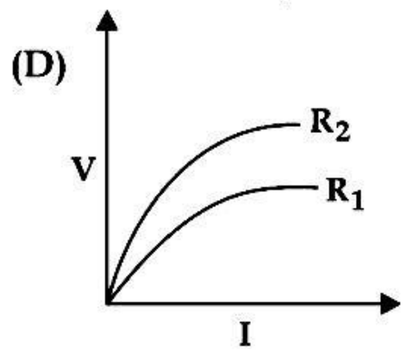
***Explanation:*** $R = R_1 + R_2 + R_3 = 30\ \Omega$

**Q. 3.** Two students perform experiments on two given resistors $R_1$ and $R_2$ and plot the following V-I graphs. If $R_1 > R_2$, which of the diagrams correctly represent the situation on the plotted curves?

**(A)**


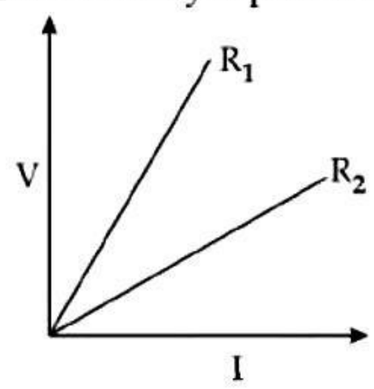

**(B)**



**(C)**



**(D)**



**Ans. Option (A) is correct.**

***Explanation:*** Diagram 1 is correct as $R_1$ is large so the slope of V–I graph (V/I) is greater in diagram and is correctly represented as $R_1$.




**Q. 4.** The device used to measure the current:

**(A)** Ammeter **(B)** Galvanometer

**(C)** Voltmeter **(D)** None of these

**Ans. Option (A) is correct.**

***Explanation:*** Ammeter is used to measure the current.

**Q. 5.** Which of the following is connected in series in circuit:

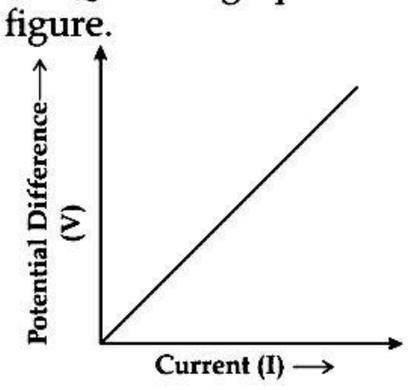
**(A)** Ammeter **(B)** Voltmeter

**(C)** Both of these **(D)** None of these

**Ans. Option (A) is correct.**

***Explanation:*** Ammeter is used to measure the current. It is connected in series in the circuit.

**II. Observe the graph and answer any four questions from Q.1. to Q.5.** V-I graph for a conductor is as shown in figure.




**Q. 1.** What do you infer from this graph ? AE

**(A)** $V \propto \frac{1}{I}$ **(B)** $V \propto I^2$

**(C)** $V \propto I$ **(D)** $V \propto \frac{1}{I^2}$

**Ans. Option (C) is correct.**

*Explanation:* Inference $V \propto I$.
This states that the current passing through a conductor is directly proportional to the potential difference across its ends, provided the physical conditions like temperature, density, etc, remain unchanged. This is ohm's law.

**Q. 2.** Name the physical quantity represented by the slope of this graph. R
**(A)** Current **(B)** Resistance
**(C)** Potential difference **(D)** None of the above
**Ans. Option (B) is correct.**

*Explanation:* The physical quantity represented by the slope of the graph is resistance.

**Q. 3.** Ohm is the SI unit of: R
**(A)** Potential difference **(B)** Resistance
**(C)** Current **(D)** Resistivity
**Ans. Option (B) is correct.**

*Explanation:* SI unit of resistance is ohm.

**Q. 4.** Which of the following law justify the above graph: A
**(A)** Faradays Law **(B)** Ohm's Law
**(C)** Faradays Law **(D)** Joule's Law
**Ans. Option (B) is correct.**

**Q. 5.** Resistance of a conductor depends on: U
**(A)** length of conductor **(B)** area of cross-section
**(C)** temperature **(D)** all of the above
**Ans. Option (D) is correct.**

*Explanation:* The resistance of the conductor depends on the following factors:
**(i)** The temperature of the conductor
**(ii)** The cross-sectional area of the conductor
**(iii)** Length of the conductor
**(iv)** Nature of the material of the conductor

**AI III. Study the given table and answer any four questions from Q.1. to Q.5.**

| | Material | Resistivity (Ω m) |
|---|---|---|
| Conductors | Silver | $1.60 \times 10^{-8}$ |
| | Copper | $1.62 \times 10^{-8}$ |
| | Aluminium | $2.63 \times 10^{-8}$ |
| | Tungsten | $5.20 \times 10^{-8}$ |
| | Nickel | $6.84 \times 10^{-8}$ |
| | Iron | $10.0 \times 10^{-8}$ |
| | Chromium | $12.9 \times 10^{-8}$ |
| | Mercury | $94.0 \times 10^{-8}$ |
| | Manganese | $1.84 \times 10^{-6}$ |
| Alloys | Constantan [alloy of Cu and Ni] | $49 \times 10^{-6}$ |
| | Manganin [alloy of Cu, Mn and Ni] | $44 \times 10^{-6}$ |
| | Nichrome [alloy of Ni, Cr, Mn and Fe] | $100 \times 10^{-6}$ |

**Q. 1.** Which is a better conductor ? U
**(A)** Chromium **(B)** Nickel
**(C)** Mercury **(D)** Iron
**Ans. Option (B) is correct.**

*Explanation:* Nickel is better conductor because its resistivity value is lower than others.

**Q. 2.** Element used to make heating element of electric geyser: AE
**(A)** Iron **(B)** Silver
**(C)** Nichrome **(D)** Tungsten
**Ans. Option (C) is correct.**

*Explanation:* Nichrome is used to make the heating element of an electric geyser.

**Q. 3.** Element used to make filament of incandescent bulb: AE
**(A)** Copper **(B)** Silver
**(C)** Nichrome **(D)** Tungsten
**Ans. Option (D) is correct.**

*Explanation:* Tungsten is used to make filament of incandescent bulb.

**Q. 4.** What happens to resistance of a conductor when its area of cross section is increased? A
**(A)** Resistance increases **(B)** Resistance decreases
**(C)** No change **(C)** Resistance doubles
**Ans. Option (B) is correct.**

*Explanation:* Electrical resistance is directly proportional to the length (L) of the conductor and inversely proportional to the cross-sectional area (A).

**Q. 5.** A given length of a wire is doubled and this process is repeated once again. The resistance of wire becomes: U
**(A)** $1/4^{th}$ of original resistance
**(B)** 16 times of original resistance
**(C)** Double the original resistance
**(D)** Half of original resistance
**Ans. Option (B) is correct.**

*Explanation:* Let resistance of the wire be R. When the wire is doubled and the process is repeated then the length of the wire reduced by $\frac{1}{4}$ times.

So, resistance $\frac{R}{4}$

The total resistance of the wire when the resistance are arranged in parallel,

$$\frac{1}{R_p} = \frac{1}{\frac{R}{4}} + \frac{1}{\frac{R}{4}} + \frac{1}{\frac{R}{4}} + \frac{1}{\frac{R}{4}} + \frac{1}{\frac{R}{4}} \Rightarrow \frac{16}{R}$$

$$\frac{1}{R_p} = \frac{16}{R}$$

The resistance of the wire reduced by 16 times

**IV. Observe the following table and answer any four questions from Q.1. to Q.5. Electrical resistivities of some substances, at 20°C are given as follows:**

| | |
|---|---|
| **Silver** | $1.60 \times 10^{-8}\ \Omega.m$ |
| **Copper** | $1.62 \times 10^{-8}\ \Omega.m$ |
| **Tungsten** | $5.2 \times 10^{-8}\ \Omega.m$ |
| **Mercury** | $94 \times 10^{-8}\ \Omega.m$ |
| **Iron** | $10 \times 10^{-8}\ \Omega.m$ |
| **Nichrome** | $10 \times 10^{-6}\ \Omega.m$ |

**Q. 1.** Which is a better conductor of electric current ? U

**(A)** Silver **(B)** Copper
**(C)** Tungsten **(D)** Mercury

**Ans. Option (A) is correct.**

*Explanation:* Silver is a better conductor because it has lower resistivity.

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

**(A)** Iron **(B)** Copper
**(C)** Tungsten **(D)** mercury

**Ans. Option (B) is correct.**

*Explanation:* Copper, because it is economical and has low resistivity.

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

**(A)** It has high resistivity
**(B)** It does not oxidise readily at high temperature
**(C)** Both of the above
**(D)** None of the above

**Ans. Option (C) is correct.**

*Explanation:* Nichrome as it has very high resistivity / as it is an alloy, it does not oxidize readily at high temperature.

**Q. 4.** Series arrangement is not used for domestic circuits because: R

**(A)** Current drawn is less
**(B)** Current drawn is more
**(C)** Neither of the above
**(D)** Both of the above

**Ans. Option (A) is correct.**

*Explanation:* In series arrangement, same current will flow through all the appliances which is not required and the equivalent resistance becomes higher, hence the current drawn becomes less.

**Q. 5.** If the resistance is to be increased, then the resistors are to be increased in: A

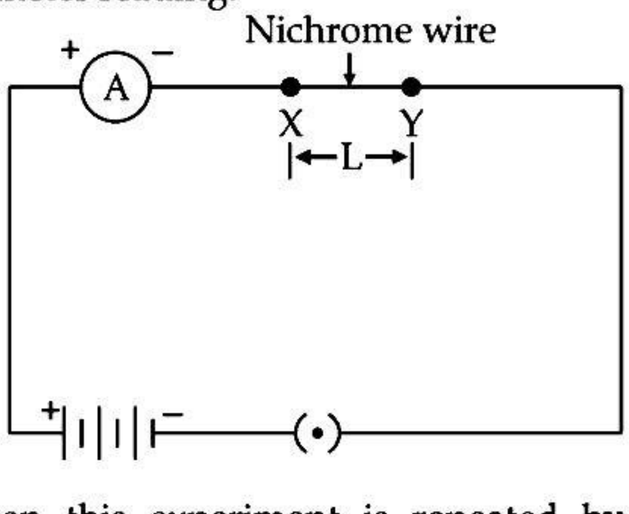
**(A)** Series
**(B)** Parallel
**(C)** Mixed arrangement
**(D)** None of the above

**Ans. Option (A) is correct.**

*Explanation:* The effective resistance in the series is the sum of individual resistances. So, the resistances should be connected in series in order to increase the effective resistance.

**V. Based on the given diagram, answer any of the four questions form Q.1. to Q.5.**

In the given circuit, connect a nichrome wire of length '*L*' between points X and Y and note the ammeter reading.




**Q. 1.** When this experiment is repeated by inserting another nichrome wire of the same thickness but twice the length (2*L*), what changes are observed in the ammeter reading ? A

**(A)** Ammeter reading will increase
**(B)** Ammeter reading will decrease
**(C)** Will show double the increase
**(D)** No change in ammeter reading

**Ans. Option (A) is correct.**

*Explanation:* The ammeter reading will decrease (becomes half). This is because with the increase in length, resistance of the circuit increases, hence current decreases.

**Q. 2.** State the changes that are observed in the ammeter reading if we double the area of cross-section without changing the length in the above experiment. AE

**(A)** Ammeter reading will increase
**(B)** Ammeter reading will decrease
**(C)** Will decrease to half
**(D)** No change in ammeter reading

**Ans. Option (B) is correct.**

*Explanation:* The ammeter reading will increase (becomes two times). This is because as area increases, resistance decreases and hence current increases.

**Q. 3.** In a circuit two resistors of 5 Ω and 10 Ω are connected in series. Compare the current passing through the two resistors. U

**(A)** 1 : 2 **(B)** 1 : 3
**(C)** 2 : 1 **(D)** 1 : 1

**Ans. Option (D) is correct.**

*Explanation:* In a series connection of resistors, same current passes through all the resistors. Hence, current will be same. Ratio of the currents will be 1 : 1.

**Q. 4.** The instrument used to measure current is _____. R

**(A)** Ammeter **(B)** Voltmeter
**(C)** Galvanometer **(D)** manometer

**Ans. Option (A) is correct.**

***Explanation:*** Ammeter is used to measure current.

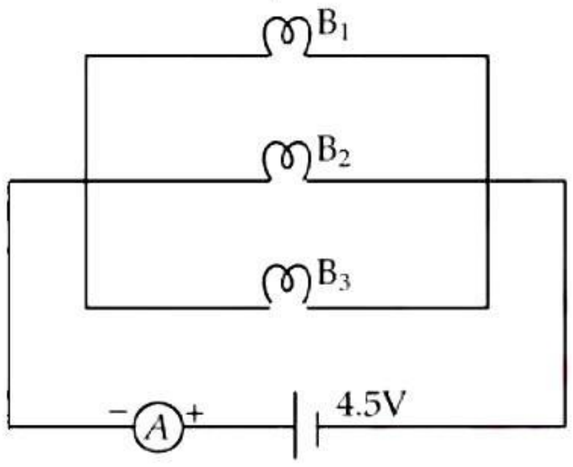
**Q. 5.** When nichrome and copper wire of same length and same radius are connected in series and current I is passed through them. Which wire gets heated up more? A

**(A)** Nichrome wire
**(B)** Copper wire
**(C)** Both will heat up at the same temperature
**(D)** None of the wire will get heated up.

**Ans. Option (A) is correct.**

***Explanation:*** In series combination current I is same in nichrome and copper wires. Thus nichrome wire will produce more heat.

**VI. Study the given circuit diagram and answer any of the four questions form Q.1. to Q.5. In this circuit, three identical bulbs $B_1$, $B_2$ and $B_3$ are connected in parallel with a battery of 4.5 V.**




**Q. 1.** What will happen to the other two bulbs if the bulb $B_3$ gets fused ?

**(A)** They will also stop glowing
**(B)** Other bulbs will glow with same brightness
**(C)** They will glow with low brightness
**(D)** They glow with more brightness

**Ans. Option (B) is correct.**

***Explanation:*** Other bulbs will glow with same brightness

**Q. 2.** If the wattage of each bulb is 1.5 W, how much readings will the ammeter A show when all the three bulbs glow simultaneously.

**(A)** 1.0A **(B)** 2A
**(C)** 1.5W **(D)** None of the above

**Ans. Option (A) is correct.**

***Explanation:*** When the bulbs are in parallel, wattage will be added (4.5 W) and the ammeter reading would be,

$$I = P/V = \frac{4.5}{4.5} = 1A$$

**Q. 3.** Find the total resistance of the circuit:

**(A)** 1.0Ω **(B)** 4.5Ω
**(C)** 1.5Ω **(D)** 2.0Ω

**Ans. Option (B) is correct.**

***Explanation:*** Ammeter reading = 1.0A

$$V = 4.5V$$
$$R = V/I$$
$$= 4.5 = 4.5\,\Omega$$

**Q. 4.** How many resistors of 88 W are connected in parallel to carry 10 A current on a 220 V line ?

**(A)** 2 resistors **(B)** 1 resistors
**(C)** 3 resistors **(D)** 4 resistors

**Ans. Option (D) is correct.**

***Explanation:*** **Equivalent resistance,**

$$= \frac{1}{R_p} = \frac{n}{88}$$

$$R_p = \frac{88}{n}$$

$$V = IR$$

$$R = \frac{88}{n}$$

$$\frac{88}{n} = \frac{220}{10}$$

$$n = 4 \text{ resistors}$$

**Q. 5.** Find the statement which does not justify parallel connection:

**(A)** The voltage of each component is same
**(B)** Overall resistance is lower than the resistance of single component
**(C)** Automobile headlight is connected in parallel
**(D)** There is a single path for the flow of electrons/ charge

**Ans. Option (D) is correct.**

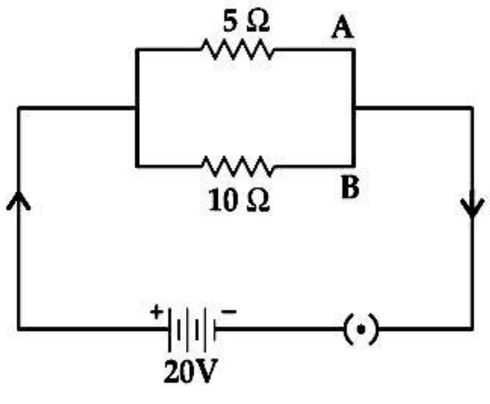
***Explanation:*** There is path of flow of electron change through each resistor. So there are several path.

AI **VII. Study the given passage and answer any of the four questions from Q.1. to Q.5.**

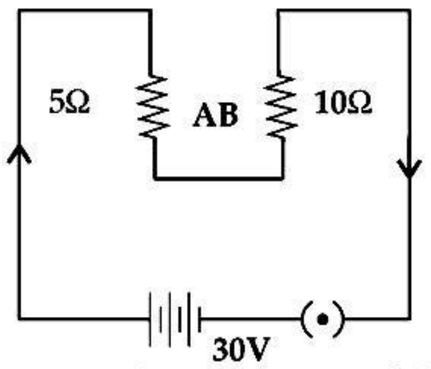
Two conductors A and B of resistances 5 Ω and 10 Ω respectively are first joined in parallel and then in series. In each case the voltage applied is 20 V.

**Q. 1.** Which of these circuit diagram shows the correct connection when A and B are joined in parallel? U

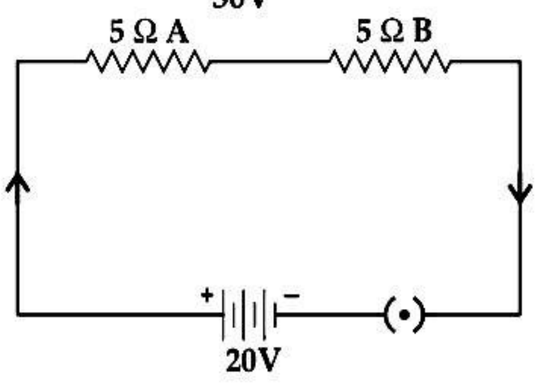
**(A)**



(B)




(C)




(D) none of these

**Ans. Option (A) is correct.**

> ***Explanation:*** The diagram (A) correctly shows the combination of these conductors in each case.

**Q. 2.** In which combination will the voltage across the conductors A and B be the same ? C

**(A)** Series arrangement
**(B)** Parallel arrangement
**(C)** Both of the above
**(D)** None of the above

**Ans. Option (B) is correct.**

> ***Explanation:*** Voltage across A and B will be same in parallel arrangement.

**Q. 3.** In which arrangement will the current through A and B be the same ? C

**(A)** Series arrangement
**(B)** Parallel arrangement
**(C)** Both of the above
**(D)** None of the above

**Ans. Option (A) is correct.**

> ***Explanation:*** Current in A and B will be same in series arrangement.

**Q. 4.** Equivalent resistance in parallel combination is: A

**(A)** 15 Ω **(B)** 3.33 Ω
**(C)** 0.3 Ω **(D)** None of the above

**Ans. Option (B) is correct.**

> ***Explanation:*** $\frac{R_1R_2}{R_1+R_2} = \frac{5\times10}{5+10}$
> $= 3.33\ \Omega$

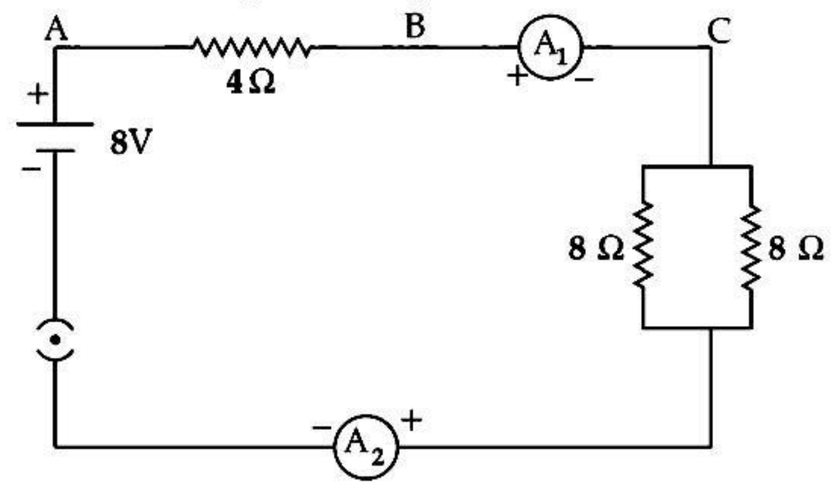
**Q. 5.** Equivalent resistance in series combination is: A

**(A)** 15 Ω **(B)** 3.33 Ω
**(C)** 0.3 Ω **(D)** None of the above

**Ans. Option (A) is correct.**

> ***Explanation:*** Series combination $R_s = R_1 + R_2$
> $= 5 + 10 = 15\ \Omega$

**AI VIII. Study the given circuit diagram and answer any of the four questions given below from Q.1. to Q.5.**




**Q. 1.** Effective resistance of two 8 Ω resistors in the combination. U

**(A)** 4Ω **(B)** 16Ω
**(C)** 8Ω **(D)** 1Ω

**Ans. Option (A) is correct.**

> ***Explanation:*** $\frac{1}{R} = \frac{1}{8}+\frac{1}{8} = \frac{2}{8}$
> $R = 4\Omega$

**Q. 2.** Current flowing through 4 Ω resistor is : A

**(A)** 1A **(B)** 2A
**(C)** 8A **(D)** 4A

**Ans. Option (A) is correct.**

> ***Explanation:*** Current flowing through the circuit = Current flowing through 4 Ω
> Equivalent resistance of the circuit = 4Ω + 4Ω = 8Ω
> Current flowing in the circuit = $\frac{V}{R} = \frac{8V}{8\Omega} = 1A$

**Q. 3.** Potential difference across 4 Ω resistor is : R

**(A)** 1V **(B)** 2V
**(C)** 4V **(D)** 8V

**Ans. Option (C) is correct.**

> ***Explanation:***
> Potential difference across 4Ω = $V_1$
> $V_1 = IR_1$
> $V_1 = 1A \times 4\Omega = 4V$

**Q. 4.** Power dissipated in 4 Ω resistor is : A

**(A)** 4W **(B)** 2W
**(C)** 1W **(D)** 8W

**Ans. Option (A) is correct.**

> ***Explanation:*** Power dissipated in 4Ω = P
> $P = VI = 4V \times 1A = 4$ watt

**Q. 5.** Difference in reading of ammeter $A_1$ and $A_2$

**(A)** will become double **(B)** will become half
**(C)** remains the same **(D)** 8A

**Ans. Option (C) is correct.**

> ***Explanation:*** Since the resistance are in series combination, hence same current will flow through each resistor. Hence ammeter reading will be same.

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