

**Ohms Law & Kirchoffs Law - Study Materials****OHM'S LAW**

Ohm's law states that at constant temperature, the current flows in a circuit is directly proportional to the voltage and inversely proportional to the resistance in the circuit.

**Current (Ampere) = Voltage (Volt)/Resistance(ohm) ,  $I = V/R$**

**KIRCHHOFF'S LAWS**

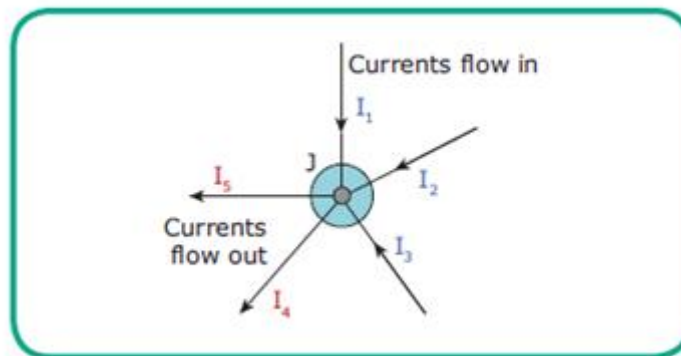
It is used to find out the current flow in the network circuits easily where it is not easy to find values using ohm's law. It is applicable for both DC and AC circuits. There are two types of law viz.

1. **Current law**
2. **Voltage law**

**NOTE: German scientist Robert Kirchhoff created these laws and hence called as Kirchhoff's laws.**

**Current law**

The sum of the currents flowing towards a junction is equal to the sum of the currents flowing away from it. This is called Kirchhoff's current law.

**Kirchhoff's current law**

In the Figure 1.46, J is the junction (or node) formed by five conductors. The current in these conductors are  $I_1$ ,  $I_2$ ,  $I_3$ ,  $I_4$  and  $I_5$ . Here,  $I_1$ ,  $I_2$  and  $I_3$  flow towards the junction and  $I_4$  and  $I_5$  flow away from the junction. According to Kirchhoff's current law,

$$I_1 + I_2 + I_3 = I_4 + I_5$$

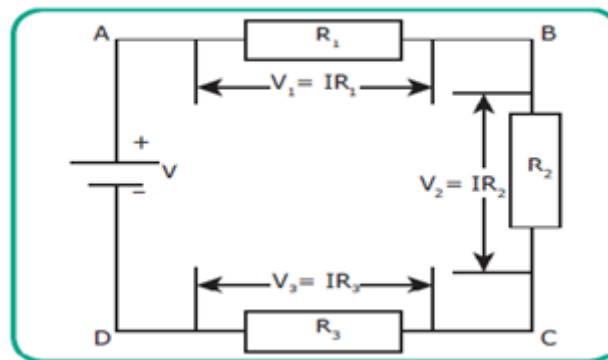
i.e. currents flow towards junction = currents flow away from junction.

On the other hand,  $I_1 + I_2 + I_3 - I_4 - I_5 = 0$ .

This is known As Kirchhoff's current law

### Voltage law

At any closed circuit, the sum of potential drops across each resistor in a series circuit is equal to the supply voltage given to the circuit. The circuit representing the voltage law is shown in Figure.



### Kirchhoff's voltage law

In a closed circuit, the sum of the voltage drops is equal to the sum of the potential applied. This is called Kirchhoff's voltage law (shortly KVL)

$$\text{i.e., } V = IR_1 + IR_2 + IR_3$$

As per ohm's law

$$V = V_1 + V_2 + V_3$$