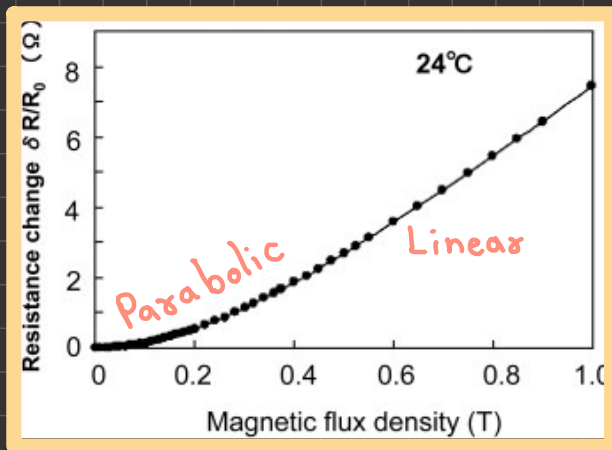


↳ Magnetoresistance:

- Magnetoresistance is the change in resistance of a material in response to an **Applied magnetic field**.
- Materials that exhibit this property are known as **Magnetoresistors**.
- The resistance increases with an increase in magnetic field strength due to interaction of electrons with magnetic field, causing collision among them and restricting the flow of electrons.



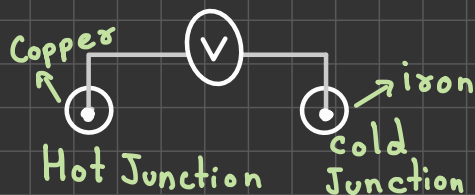
$$R = R_0 \left(1 + \frac{\Delta R}{R} \cos^2 \alpha \right)$$

■ Thermoelectric Sensors

↳ Working:

- Works on the principle of thermoelectric effect.
- The temperature difference between two points generates an electromotive force (EMF), which can be used to determine the temperature.

↳ Seebeck Effect:

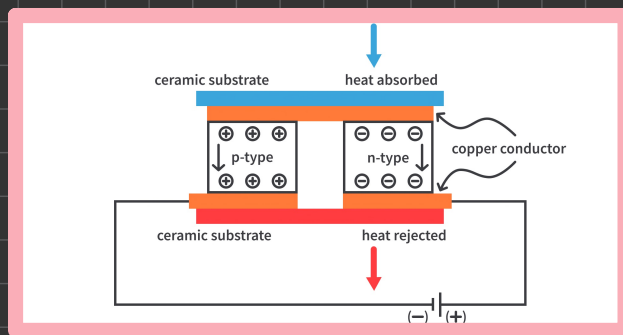


- A thermocouple is formed by joining two wires of different metals at their ends creating a junction.
- Deflection is observed in galvanometer as one junction is hotter than the other, EMF is produced.
- This effect is a result of charged carriers (electrons & holes) in a conductor or semiconductor diffusing from hotter region to colder.

- The diffusion stops when an electric field is generated that stops further movement of charges.
- This effect is positive for P-type semiconductors where holes diffuse, and negative for metals where electrons diffuse.

↳ Peltier effect :

- Occurs when an electric current flows through a circuit of dissimilar conductors.
- Thermal energy is absorbed on one junction and released at other, creating temperature difference.
- The Peltier effect is the reverse of Seebeck effect.



- The effect is caused due to the difference in the average energy of electrons in the two conductors.
- Factors like electron energy spectrum, concentration and scattering under voltage influence this effect.

- Depending on the direction of electric charge flow, heat is either dissipated or absorbed.

↳ Laws of Thermocouple :

> Law of Intermediate Metals :-

↳ This law states that the electromotive force in a circuit is not affected by the insertion of an additional metal, as long as that metal is kept at the same temperature as the point in circuit where it was inserted.

→ This is because the EMF in a circuit depends on the temperature difference in different parts of the circuit, and the added metal does not alter it.

> Law of Intermediate Temperature :-

↳ This Law states that the temperature difference between two bodies in thermal contact is directly proportional to the difference in EMF or Potential difference.

> Variation of EMF with temperature:-

↳ The electromotive force produced by a thermocouple increases with temperature until it reaches maximum, then begins to decrease and returns to zero as the temperature of the hot junction continues to increase while the cold junction is kept at 0°C .