netic.

In general, in anti-ferromagnetic materials the dipoles point in opposite directions but the moments balance each other resulting in a net zero magnetisation.

FERRIMAGNETISM

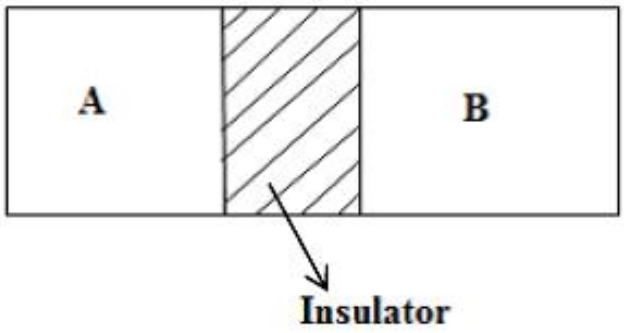
These exhibit a behaviour between ferromagnetism and anti-ferromagnetism. Here quantum mechanical effects make the directions of the magnetic moments in ordered spin structure alternate and the magnitudes un equal resulting in a net non-zero magnetic moment.

Because of partial cancellation, the maximum magnetic flux density attained is substantially lower than that in a ferromagnetic specimen.

Read about:

- Curie-Weiss law.
- Hard and soft magnetic materials.
- Hund rule and Pauli exclusion principle.
- Hysteresis and coercivity as applied to magnets.

TUNNELING



Consider two metals separated by an insulator. It is known that the insulators as a barrier to the flow of conduction electrons from one metal to another. However if the insulator is so thin there is a probability that an electron will pass through this insulator from one metal to another, and if this happens, then the scenario is called Tunneling.

Applications

1. **DC Josephson effect**. Here a DC current flows across the junction in the absence of any electric or magnetic field.

2. **AC Josephson effect**. The DC voltage applied across the junction causes current oscillations across the junction. This effect has been utilised in the precision determination of the value $\frac{h}{e}$.

3. **Macroscopic long-range quantum interference**. A dc magnetic field applied through a superconducting circuit containing two junctions causes the maximum supercurrent to show interference effects as a function of magnetic field intensity. This effect can be utilised in sensitive magnetometers.

HUNDS' RULES