Pauli Paramagnetism :

Spin paramagnetism arises from the fact that each conduction electron carries a spin magnetic moment, which tends to align with the field.

→ Paramagnetic effect is a very weak effect.

→ The magnetic properties of an atom are due to the orbital motion of electron and there spin motion.

→ Each electron bears a magnetic dipolemoment.

$$\mu_B = \frac{e\hbar}{2m_e} \text{ (or) } \frac{-e\hbar}{2m_e}$$

→ The property of electronic magnetic moment is that in the external field H its component along the field direction.

$$\mu_B = \frac{e\hbar}{2m_e} = \frac{eh}{4\pi m_e} = 0.917\times10^{-20} \text{ erg/oersted}$$

μ_B → Bohr magnetron.

→ The expression for paramagnetic Susceptibility associated with conduction e⁻s is equal to

$$\psi_P = \frac{\mu_0^2 N}{K_B T}$$

$$\psi_P \propto \frac{1}{T}$$

→ In the absence of any external field (H=0) and at absolute zero (T=0) all energy levels below fermi level are ocupied & all those above E_F are empty. [The e⁻s are divided into two groups with spin up and spin down]

→ When the magnetic field is applied the e⁻s with their spins parallel to their field have their energy lowered by an amount $\mu_B H$

→ The e⁻s with spin antiparallel raised by some amount.

→ Equilibrium is established when a certain no. of electrons with antiparallel spins has entered the group of parallel ones till both levels are filled upto the same level.

→ The no. of such electron is very small at 0 K and is of the order of nT/T_F per unit volume at temperature.

$K_B T << E_F \cdot T_F$ being the Fermi Temp.