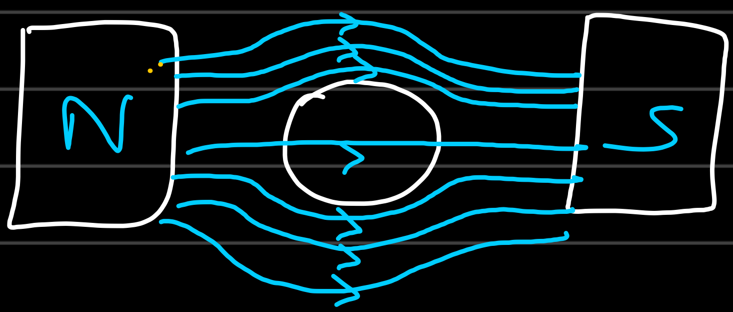
Lecture 33

special diamagnetism → Superconductivity:

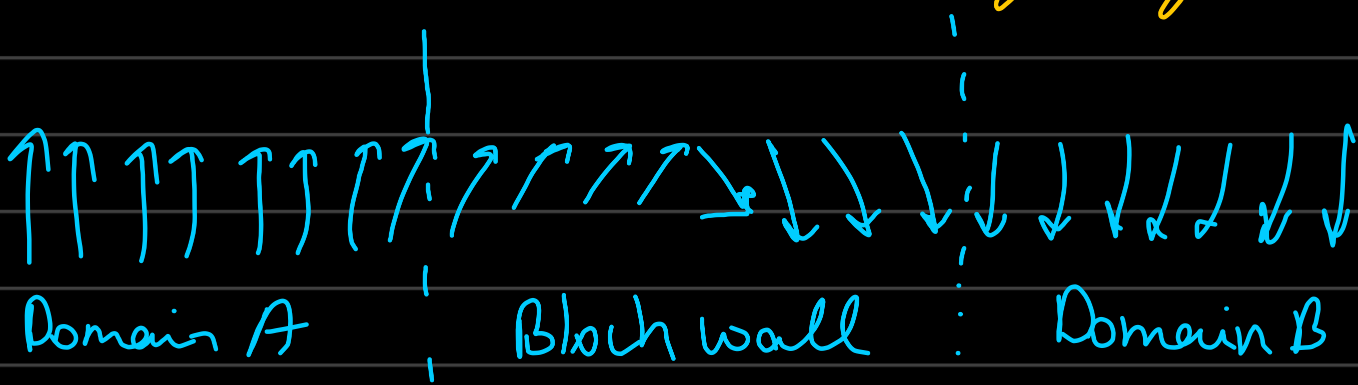


Curie Temperature: $M = \frac{C}{T - T_c} H$

Magnetostatic Energy: stored in magnetic field

↳ leads to large internal energy.

→ Domains breakdown in a single crystal.

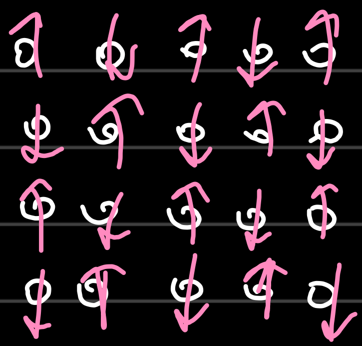


→ due to exchange interactions.

Anti-ferro magnets:

↳ MnO, MnF_2, FeO, NiO

{2 sublattices}



→ net magnetic moment is zero below a temperature called as Neel's temperature.

→ Above Neel's temperature it becomes a paramagnet.

Ferri-magnetism: special case of anti-ferro.

↳ The two sublattices do not have equal moments.

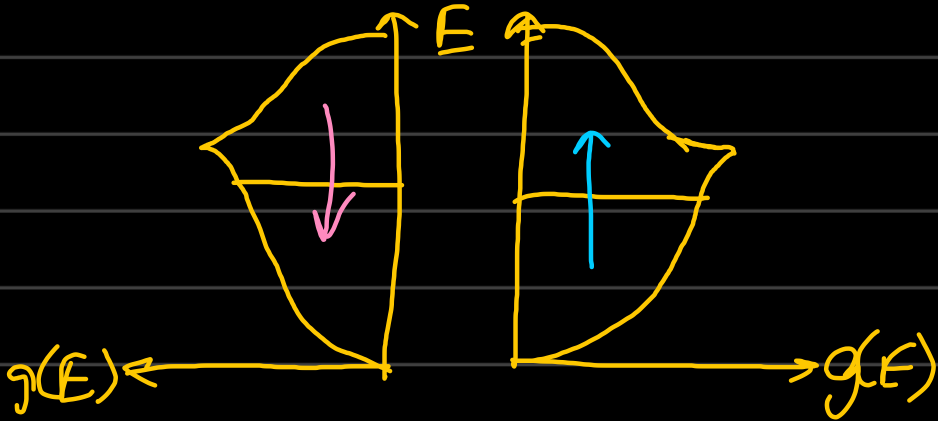
↳ Magnetism in ceramics {poor electrical conductors}

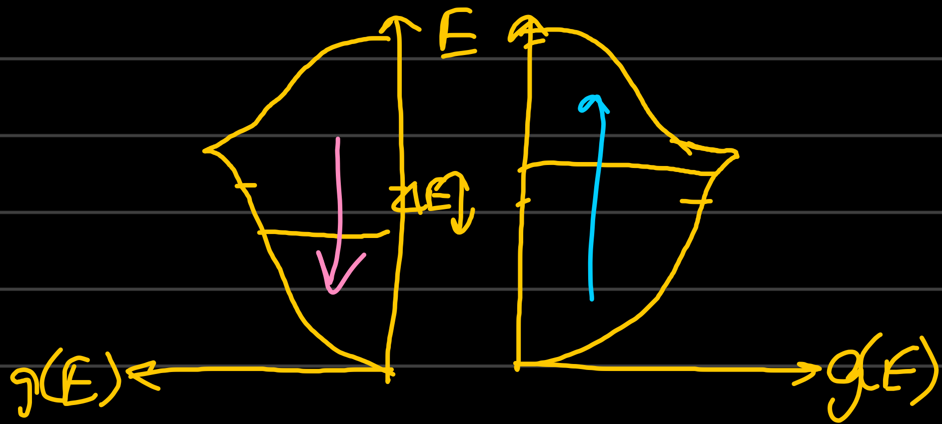
↳ eg: Ferrites ⇒ $NiO \cdot Fe_2O_3$

Quantum Mechanical picture of Magnetism:

→ not all electrons shall contribute to magnetization.

→ All electrons have moments, however only the valence electrons align to external field.





$$\Delta E = \mu_0 \mu_{ms} H$$

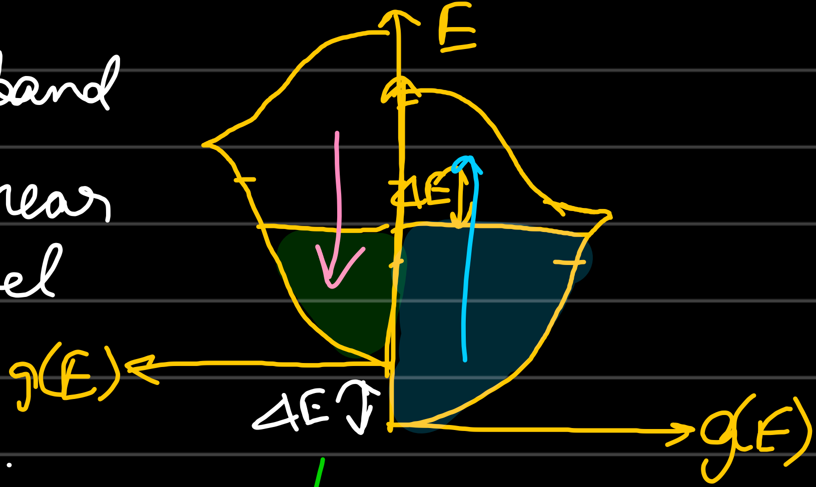
Total no. of electron shifting field:

$$\Delta N = G(E_F) * \Delta E$$

Magnetization: moments per unit volume $= \dfrac{\Delta N \mu_m}{V}$

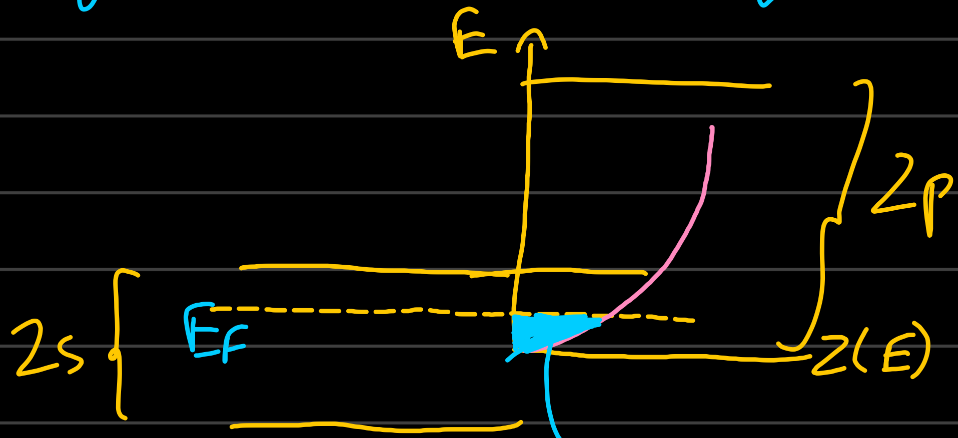
$$= \frac{\mu_0 \mu_m^2 H G(E_F)}{V}$$

There is a band of electrons near the Fermi level that flips its orientation.



↳ Ziemann shift of energy level.

\# Why is Be, Cu diamagnetic?



very small DOS makes flipping of spins very difficult

∴

END OF COURSE