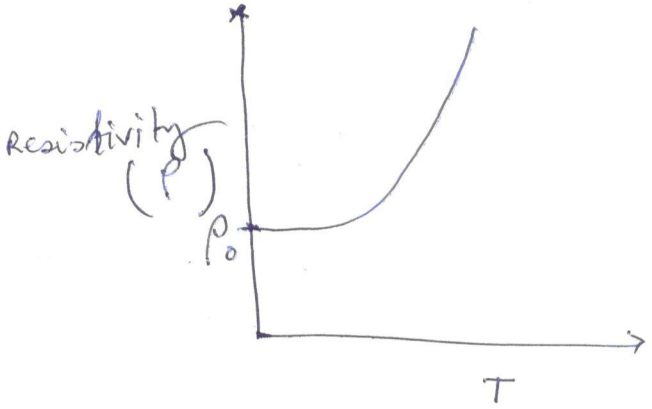
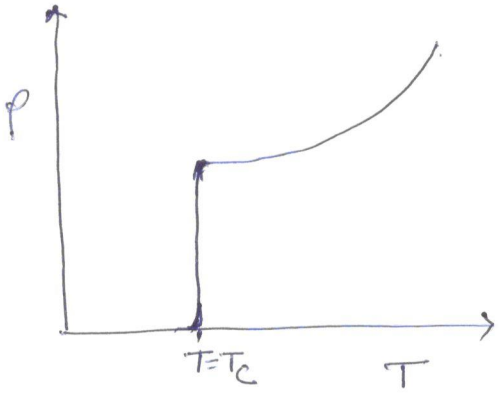
Introduction to superconductivity

Superconductors :- materials whose resistance drops abruptly to zero (very very low value) below a critical temperature and also turn into complete diamagnet ($\chi = -1$) below the critical temperature, are know as superconductors. Resistivity falls by atleast 14 order of magnitude.



Normal metals.

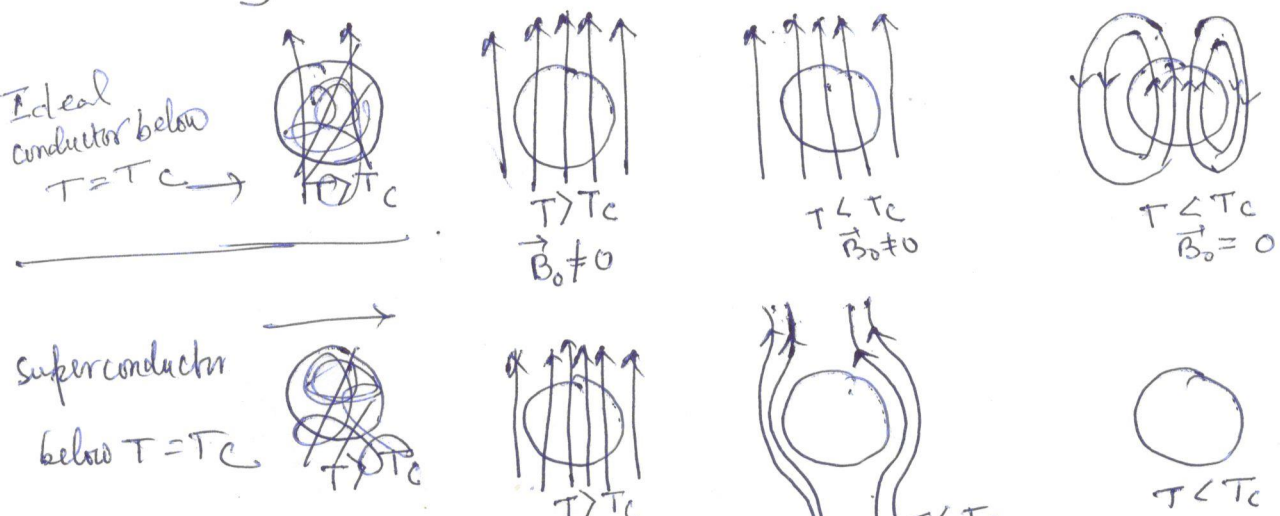


Superconductors

→ Superconductors are not just ideal conductors but they possesses special magnetic property below T_c (complete diagmagnetism).

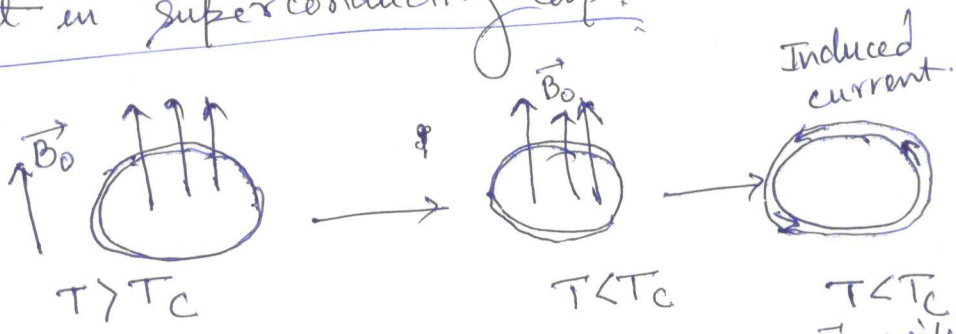
~~Difference bet. ideal conductor and superconductor~~

Suppose above T_c, two materials behave as normal conductors and below T_c, one of them turns into ideal conductor and other turns into superconductor. How to distinguish bet^n these two?
They can be identified on the basis of their behavior



Meissner effect: The phenomenon of perfect diamagnetism of superconductor in magnetic field is known as Meissner effect. The magnetic field lines nearly perfectly excluded from the speciment. The penetration of field occurs over hardly 10^{-6} to 10^{-5} cm from the surface.

Persisten current in superconducting loop:-



current at any instantaneous time.

$$I = I_0 e^{-R/L}$$

BCS theory :- Laltice distorsion induced electron-electron attraction.