Aayush Chauhan
CSE (AIML)-A
Serial no. = 03
"Physics Assignment - 2"

Que-1

(a)

Vortex state in superconductor is a fascinating phenomenon that occurs in a type II superconductors.
And Vortex state is that state at which superconductivity and magnetism coexist.

(b) HTS

Those semiconductor with critical temperature above 77K, the boiling point of liquid nitrogen is termed as High Temperature Semiconductor.

eg; Mercury Barium Thallium Copper oxide

Que-2

(a)

Transition Temperature :- The Temperature at which electrical resistivity of the material suddenly drops at zero & the material change from normal conductor to a superconductor.

Critical current :- The current that can be passed in a super-conductor without destroying superconductivity.

Critical Magnetic field :- The minimum value of applied magnetic field when superconductivity losses its superconductivity or superconducting state.

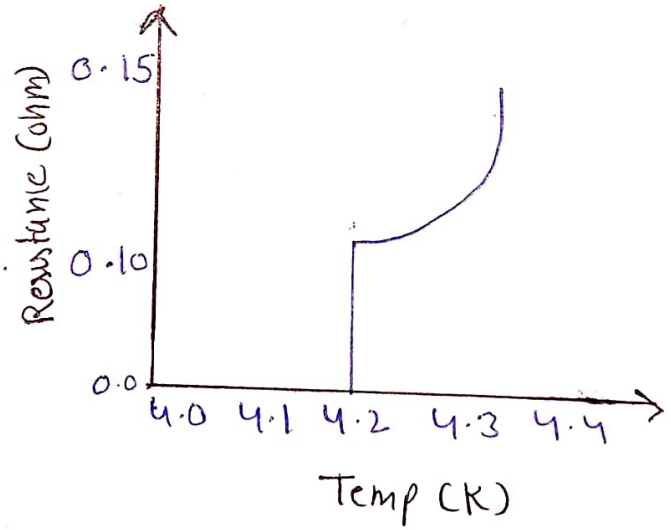
Persistent current:- Persistent current in semiconductors refer to the phenomenon where electric currents continue to flow indefinitely without any applied voltage or power source.

(b) Superconductivity

The phenomenon of losing resistivity when sufficient cooled to a very low temperature (below T_C), is called super conductivity.

(c) Effect of Temperature on superconductor:

It is well known that electrical resistance is a function of temperature that typically decrease as temperature decreases & superconductors have no electrical resistance when their temperature decreases below a critical Temperature.



Que-3

(a)

Isotope effect:-

It has been observed that critical Temperature of superconductor varies with isotopic mass. The transition Temp. changes when different isotopes of same elements are mixed.

$$M^{-1/2} \propto T_C$$

$$T_C M^{1/2} = \text{constant}$$

(b) We know; $H_c = H_0\left[1 - \left(\frac{T}{T_c}\right)^2\right]$

A.T.Q $T = T_c$

So, $H_c = H_0[1-1] = 0$

$$\boxed{H_c = 0}$$

So, Value of critical field of a super conductor at transition temperature is 0T.

Que-4

(a) **Meissner effect**:-

When a superconducting material is placed in a magnetic field & cooled below the T_c (critical Temp), It is behaves as a diamagnetic & repell magnetic line of force. This effect is known as Meissner effect.

(b) There are some properties which shows change in superconducting state in comparison to normal states.

- Zero electrical resistance
- Perfect Diamagnetism
- Entrophy is lower in superconductor, Hence superconducting electrons are more ordered.