Shape, rectangle

Description automatically generated

Probability of a state being empty: 

**Fermi Function**

Definition: The probability that an electron can occupy a particular energy level E at finite temperature

Text, letter

Description automatically generated

Diagram

Description automatically generated

- As temperature increase, graph gets more less sharp and curvy.

**Fermi Level**

- The energy level with a 50% probability of being occupied.

- Independent oof temperature

- Chemical potential

**Fermi Energy**

- The highest occupied level at absolute zero.

- No sharply defined fermi energy for finite temperatures as thermal energy is continuously exciting electrons within the band, hence, use fermi level.

- Independent of temperature

**Density of states**

**Text, table

Description automatically generated**

**For a hole in the valence band,**

**Text, whiteboard

Description automatically generated**

*is the lowest energy level in the conduction band.*

*is the highest electron energy level in the valence band.*

*is the minimum energy required to create an electron-hole pair (EHP)*

*Diagram

Description automatically generated*

Totally filled bands and totally unfilled bands do not allow current flow, no free electrons because they are all taking part in interatomic bonds.

**Intrinsic Fermi Energy**

Schematic

Description automatically generated with medium confidence

Diagram, schematic

Description automatically generated

Therefore,

Text

Description automatically generated

A picture containing chart

Description automatically generated

Diagram, schematic

Description automatically generated

Diagram, schematic

Description automatically generated

Density of occupied states per unit volume and unit energy:



**Hence, density of electrons in CB:**

A picture containing text

Description automatically generated

**Mass Action Law (only for non-degenerate)**

Graphical user interface, application, Word

Description automatically generated

Text

Description automatically generated with low confidence

**Intrinsic Carrier Concentrations**

- No. holes and electrons same

- (only for non-degenerate)

Text

Description automatically generated

**:**

1. Assume electrons in CB:

2. Assume

->

Therefore: Text

Description automatically generated with medium confidence

Text

Description automatically generated with medium confidence

Diagram, text

Description automatically generated with medium confidence

**:**

Text

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