S.G.V.C. VIDYA PRASARK TRUST'S

M.G.V.C.ARTS, COMMERCE AND SCIENCE COLLEGE MUDDEBIHAL

DEPARTMENT OF PHYSICS

ORGANISED

SPECIAL GUEST LECTURE

ON

"SEMICONDUCTOR DEVICES"

GPS Map Camera

Muddebihal, Karnataka, India

84wh+c86, Muddebihal, Karnataka 586212, India

Lat 16.345817° Long 76.128792°

19/04/2025 10:30 AM GMT +05:30

S. G. V. C. Vidya Prasarak Trust's,
Matoshri Gangamma Veerappa Chiniwar Arts, Commerce & Science College,
MUDDEBIHAL-586212. Dist. Vijayapur (Karnataka)
(Accredited with CGPA of 3.31 on seven point scale at 'A+' Grade)
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Ref. No. : ....

Date : ....

NOTICE

Department of Physics organized Special Guest Lecture topic is "SEMICONDUCTOR DEVIES" by Prof. Asma kabbaragi M.G.V.C Arts commerce and Science PU College Muddebihal on 19.04.2025 at 10.30.am. Hence all the Teaching, Non- Teaching staff members and Students are here by informed to attend the function.

PRINCIPAL,
M.G.V.C. Arts, Commerce & Science College
MUDDEBIHAL-586212. Dist: Vijayapur.

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PHOTO GALLARY

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DEPARTMENT OF PHYSICS
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ON
"SEMICONDUCTOR DEVICES"

REPORT

Department of Physics organized Special Guest Lecture topic is "SEMICONDUCTOR DEVICES" by Asma Kabbaragi M.G.V.C Arts, Commerce and Science PU College Muddebihal on 19.04.2025 at 10.30.am. Prof. S.N. Poleshi Principal presided over the function. Prof. M.I. Biradar, IQAC Coordinator. Prof. S.M. Nimbalagundi and all other teaching and non teaching staff members graced the occasion. Prof. A.B. Katti proposed vote of thanks.

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SEMICONDUCTOR DEVICES

SEMICONDUCTOR MATERIALS:

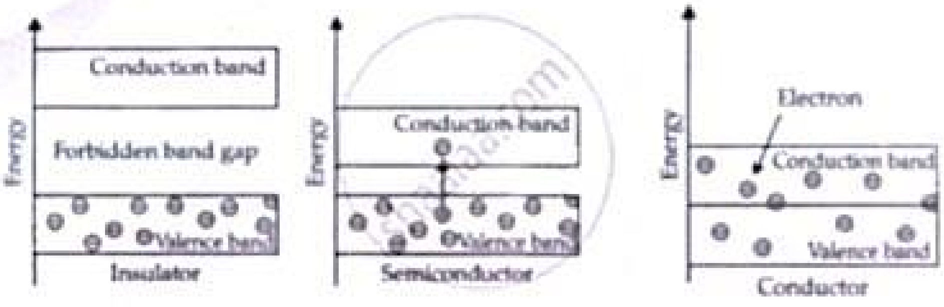


Fig: Energy band structure of a) Insulator b) semiconductor c) Conductor

INSULATOR:

An insulator is a material that offers a very low level of conductivity under Pressure from an applied voltage source. In this material Forbidden energy gap is large (EG6e.V). So, electron cannot acquire enough energy and hence conduction is not possible

Ex: Diamond is a perfect insulator.

SEMI CONDUCTOR:

A semiconductor is a material that has a conductivity level somewhere in between the extremes of an insulator and a conductor. Energy gap is only about 1ev.

Ex: Germanium, Silicon (Energy gap of Germanium is about 0.785ev and for silicon its 1.21ev).

CONDUCTOR:

Conductor is a material that will support a generous flow of charge when a voltage source of limited magnitude is applied across its terminals. There is no energy gap in conductors. Conduction band and valence band are overlapped.

Ex: Copper, Aluminium.

DOPING:

Adding impurities to the semiconductor is known as doping. Pure semiconductor is called as intrinsic semiconductor & impure semiconductor is called extrinsic semiconductor materials.

EXTRINSIC MATERIALS-n and p-type:

The characteristics of semiconductor materials can be altered significantly by the addition of certain impurity atoms into the relatively pure semiconductor material .These impurities, although only added to perhaps 1partin10million,can alter the band structure sufficiently to totally change the electrical properties of the material. A semiconductor material that has been subjected to the doping process is called an extrinsic material. There are two extrinsic materials of immeasurable importance to semiconductor device fabrication: n-type and p-type.

N-Type Material:

Both the n-and p type materials are formed by adding a predetermined number of impurity atoms in to a germanium or silicon base. The n-type is created by introducing those impurity elements that have five valence electrons (pentavalent), such as antimony, arsenic, and phosphorus. The effect of such impurity elements is indicated in Figure.1 Antimony impurity in n-type material

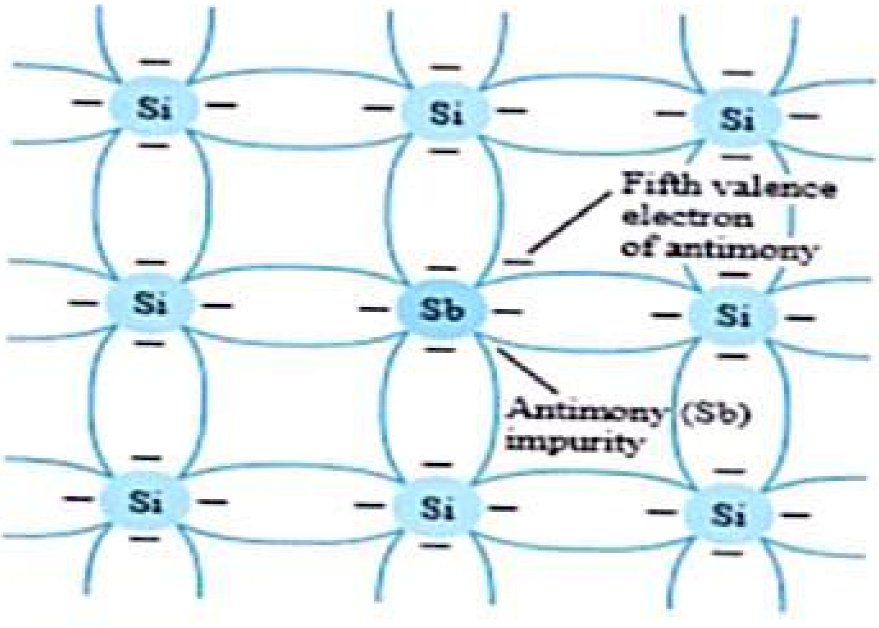


Figure. Antimony impurity in n-type material

Note that the four covalent bonds are still present. There is, however, an additional fifth electron due to the impurity atom, which is unassociated with any particular covalent bond. This remaining electron, loosely bound to its parent (antimony) atom, is relatively free to move within the newly formed n-type material. Since the inserted impurity atom has donated a relatively free electron to the structure: Diffused impuritieswith five valence electrons are called donor atoms.

P-Type Material:

The p-type material is formed by doping a pure germanium or silicon crystal with impurity atoms having three valence electrons. The elements most frequently used for this purpose are boron, gallium, and indium. The effect of one of these elements, boron, on a base of silicon.

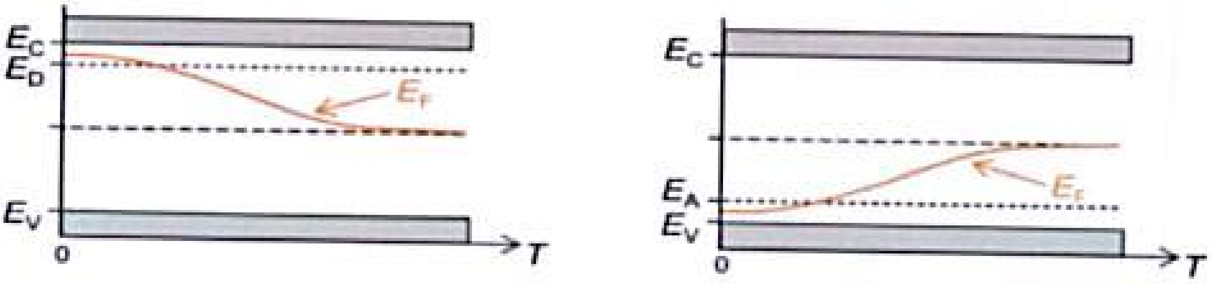
Note that there are now an insufficient number of electrons to complete the covalent bonds of the newly formed lattice. The resulting vacancy is called a hole and is represented by a small circle or positive sign due to the absence of a negative charge. Since the resulting vacancy will readily. Accept a free electron: The diffuse impurities with three valence electrons are called acceptor atoms.

Majority and Minority Carriers:

In the intrinsic state, the number of free electrons in Ge or Si is due only to those few electrons in the valence bands that have acquired sufficient energy from thermal or light sources to break the covalent bond or to the few impurities that could not be removed. The vacancies left behind in the covalent bonding structure represent our very limited supply of holes. In an n-type material, the number of holes as not changed significantly from this intrinsic level. Then result, therefore, is that the number of electrons far outweighs the number of holes. In an n-type material the electron is called the majority carrier and the hole the minority carrier .For the p-type material the number of holes far outweighs the number of electrons ,as shown in Fig. Therefore: In a p-type material the hole is the majority carrier and the electron is the minority carrier. When the fifth electron of a donor atom leaves the parent atom, the atom remaining acquires a positive charge: hence the positive sign in the donor-ion representation.

n-type and p-type Semiconductor

n-type Semiconductor p-type Semiconductor



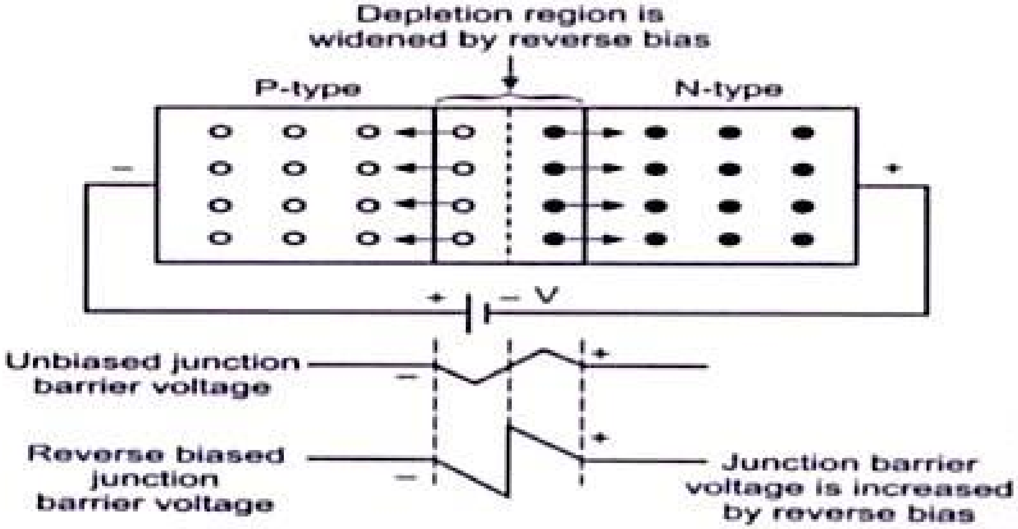
n-type *p*-type

In N type material Fermi level is just below the conduction band. In P type material Fermi level is just above the valence band

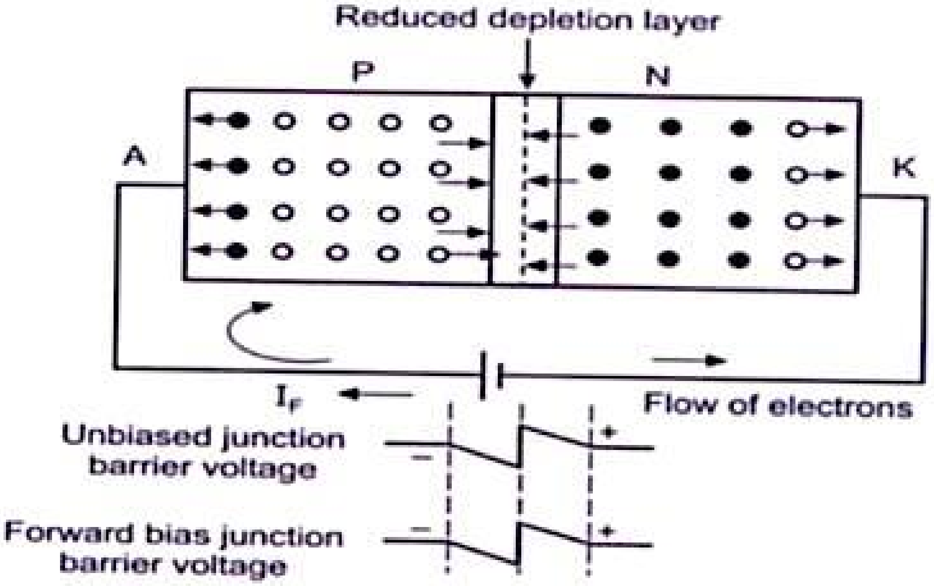
BAISING OF PN DIODE:

The semiconductor diode is formed by simply bringing these materials together (constructed from the same base Ge or Si), as shown in Fig. At the instant the two materials are joined the electrons and holes in the region of the junction will combine, resulting in a lack of carriers in the region near the junction. This region of uncovered positive and negative ions is called the depletion region due to the depletion of carriers in this region. Since the diode is a two-terminal device, the application of a voltage across its terminals leaves three possibilities: no bias (VD = 0 V), forward bias (VD >0 V), and reverse bias (VD< 0 V).No Applied Bias (VD = 0 V) under no-bias (no applied voltage) conditions, any minority carriers (holes) in the n-type material that find themselves within the depletion region will pass directly into the p-type material. The closer the minority carrier is to the junction, the greater the attraction for the layer of negative ions and the less the opposition of the positive ions in the depletion region of the n type material. For the purposes of future discussions we shall assume that all the minority carriers of the n-type material that find themselves in the depletion region due to their random motion will pass directly into the p-type material. Similar discussion can be applied to the minority carriers (electrons) of the p-type material. This carrier flow has been indicated in fig for the minority carriers of each material. The majority carriers (electrons) of the n-type material must overcome the attractive forces of the layer of positive ions in the n-type material and the shield of negative ions in the p-type material to migrate into the area beyond the depletion region of the p-type material. However, the number of majority carriers is so large in the n-type material that there will invariably be a small number of majority carriers with sufficient kinetic energy to pass through the depletion region into the p-type material. Again, the same type of discussion can be applied to the majority carriers (holes) of the p-type material. The resulting flow due to the majority carriers is also shown in Fig. In the absence of an applied bias voltage, the net flow of charge in any one direction for a semiconductor diode is zero. The symbol for a diode is repeated in Fig. with the associated n- and p-type regions. Note that the arrow is associated with the p-type component and the bar with the n-type region. As indicated, for VD= 0 V, the current in any direction is 0 mA.

Reverse-Bias Condition (VD < 0 V): The external potential is connected such that n-type material is connected to positive terminal and p-type is connected to negative terminal of the battery. As shown in Fig. the number of uncovered positive ions in the depletion region of the n- type material will increase due to the large number of free electrons drawn to the positive potential of the applied voltage. For similar reasons, the number of uncovered negative ions will increase in the p-type material. The net effect, therefore, is a widening of the depletion region. This widening of the depletion region will establish too great a barrier for the majority carriers to overcome, effectively reducing the majority carrier flow to zero as shown in Fig.



The number of minority carriers, however, that find themselves entering the depletion region will not change, resulting in minority-carrier flow vectors of the same magnitude. With no applied voltage the current that exists under reverse-bias conditions is called the reverse saturation current and is represented by Io.



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S. G. V. C. Vidya Prasarak Trust's,

MATOSHRI GANGAMMA VEERAPPA CHINIWAR ARTS, COMMERCE & SCIENCE COLLEGE, MUDDEBIHAL.

Subject : Physics Date : .... Time : ....

Class : B.Sc - IV Sem **ATTENDANCE REPORT** Jr. Supervisor : ....

DEGREE ______ SEMESTER EXAMINATION 2024-2025

Roll No.	University Seat No.	Name of the Candidate	Signature
01	U15NU2350025	Ashwini S. Naykodi	Naykodi..
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03	U15NU2380107	Sushmita Malipatil	Patil
04	U15NU2350088	Nisarga gangamata	
05	U15NU2350099	Pruthvi P. Budni	
06	U15NU2350027	Netravati B. Padashetti	
07	U15NU2350091	Shriraksha A. Ghatage	S.R. Ghatage
08	U15NU2350002	Soumya Sajjan	Sajjan
09	U15NU2350030	Muskan B Kolur	
10	U15NU2350009	Mubeena S. Mulla	Mulla:
11	U15NU2350070	Guskan Lakkadahar	Guskan.
12	U15NU2350047	Bibiayisha Attar	Attar
13	U15NU2350069	Suchitra Rathod	S.S. Rathod
14	U15NU2350049	prema chavan	P.M. chavan
15	U15NU2350022	Keertana Gowdar	
16	U15NU2350095	laxmi D. pattar	L.D. Pattar
17	U15NU2350055	pallavi Angadi	P.G. Angadi
18	U15NU2350098	Bhagya M	Bhagya. M
19	U15NU2350073	Amruta S Patil	A.S. Patil
20	U15NU2350060	Bharati Y. Managuli	B.Y. Managuli
21	U15NU2350084	Mallikarjun Hulikeri	
22	U15NU2310103	Asif Attar	
23	U15NU2350013	Vinod S. Angadi	
24	U15NU2350048	Soumya S. Hallur	S.S. Hallur
25	U15NU2350071	Jyothi Vastrad	J. Vastrad
26	U15NU2350033	Pooja Goded	P.K. Goded.

Roll No.	University Seat No.	Name of the Candidate	Signature
27	U15NU2350032	Neha. Lamani	N.K.Lamani
28	U15NU2350046	Soujanya H Biradar	
29.	U15NU2350013	Vinod.S. Angadi	
30	U15NU23S0001	Rakshita. Kulkarni	R. Kulkarni
31	U15NU23S0008	Gouramma.	Gouramma
32	U15NU23S0068	Aishwarya. Dindwar	
33	U15NU23S0041	Bhoomika	Bhoomika
34-	U15NU2350044	Shrinidhi	

Number of Candidates Present : ....

Number of Candidates Absent : ....

Total Number of Candidates Present : ....

Jr. Supervisor
Name & Signature