Name : Umair Khan
I.d : 14596
Section : A
Semister : 4th
Class Timing : Friday (08 - 11 AM)
Paper : Applied Physics.

Q. No #01.

(a) Discuss the significance of the knee of the characteristics curve in forward Bias?

Ans

Forward Bias:

Definition:

The bias which reduces the potential barrier of the diode and establishes the easy path for the flow of current is called forward bias.

Significance:

Following are the significance of the knee of the characteristics curve in forward bias.

① Voltage - Current:

When a forward bias voltage is applied across a diode, there is current. This current is called forward current. As

the forward-bias voltage is increased positively from 0V. The resistor is used to limit the forward current to a value that will not overheat the diode & cause damage.

(2) Dynamic Resistance:

Unlike a linear resistance the resistance of the forward-biased diode is not constant over the entire curve. Because the resistance changes as you move along the V-I curve, it is called dynamic resistance.

(3) Temperature Effects:

For a forward bised diode, as temperature is increased, the forward current increases for a given value of forward voltage. Also for a given value of forward current, the forward voltage decreases.

(b) What happens to the barrier potential when the temperature increases?

Ans. **Potential Barrier**

Definition:

The barrier in which the charge carrier stopped by the obstructive force is known as the potential barrier.

Relation to temperature:

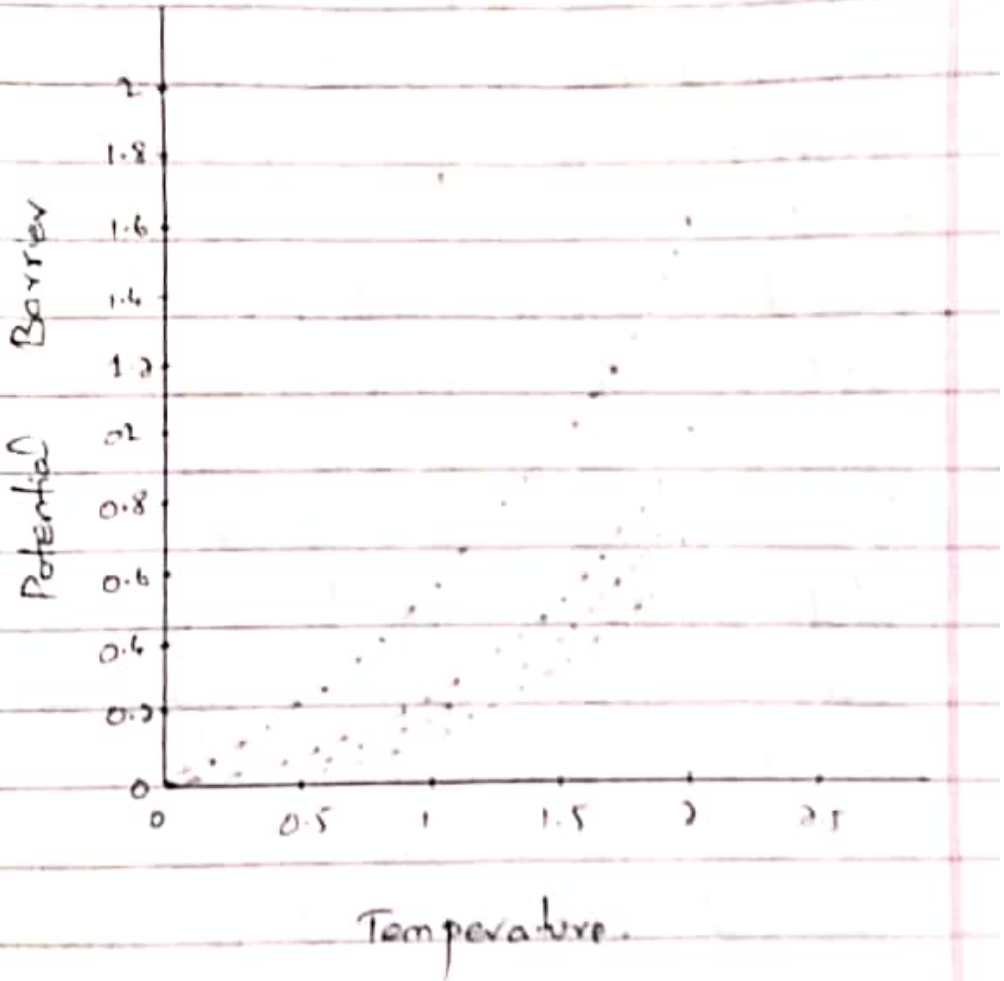
As the temperature increases, the value of the potential barrier is decreasing. The potential barrier has the highest value when temperature is 300 k. At temperature 600 k, the potential barrier has the lowest value.

The temperature affects the kinetic energy of the carriers.

(P.T.O)

Graphically

To study the relationship between potential barrier versus depletion region width with four different temperature values as shown in fig.



G. No # 02 :

(a) Compare the depletion regions in forward bias & reverse bias ?

Ans: **Forward Bias :**

Definition :

The bias which reduces the potential barrier of the diode and establishes the easy path for the flow of current is called foward bias.

Depletion Regions in Forward Bias :-

The depletion region results from the barrier potential and barrier potential is from the depletion region. If the barrier potential is high, the charge carriers are stopped at a greater distance away from the region. When we apply a forward bias, the potential barrier decreases.

Reverse Bias

Definition :

The applied d.c voltage that prevent or greatly reduces current flow in a diode is called reverse bias.

Depletion Regions in Reverse Bias :-

Under reverse bias (applying a negative voltage to the P-side with respect to the N-side), the voltage across the depletion region increases. Essentially, majority carriers are pushed away from the junction, leaving behind more charged ion

(b) When does reverse breakdown occur in a diode?

Ans. **Break down Voltage**

Definition:

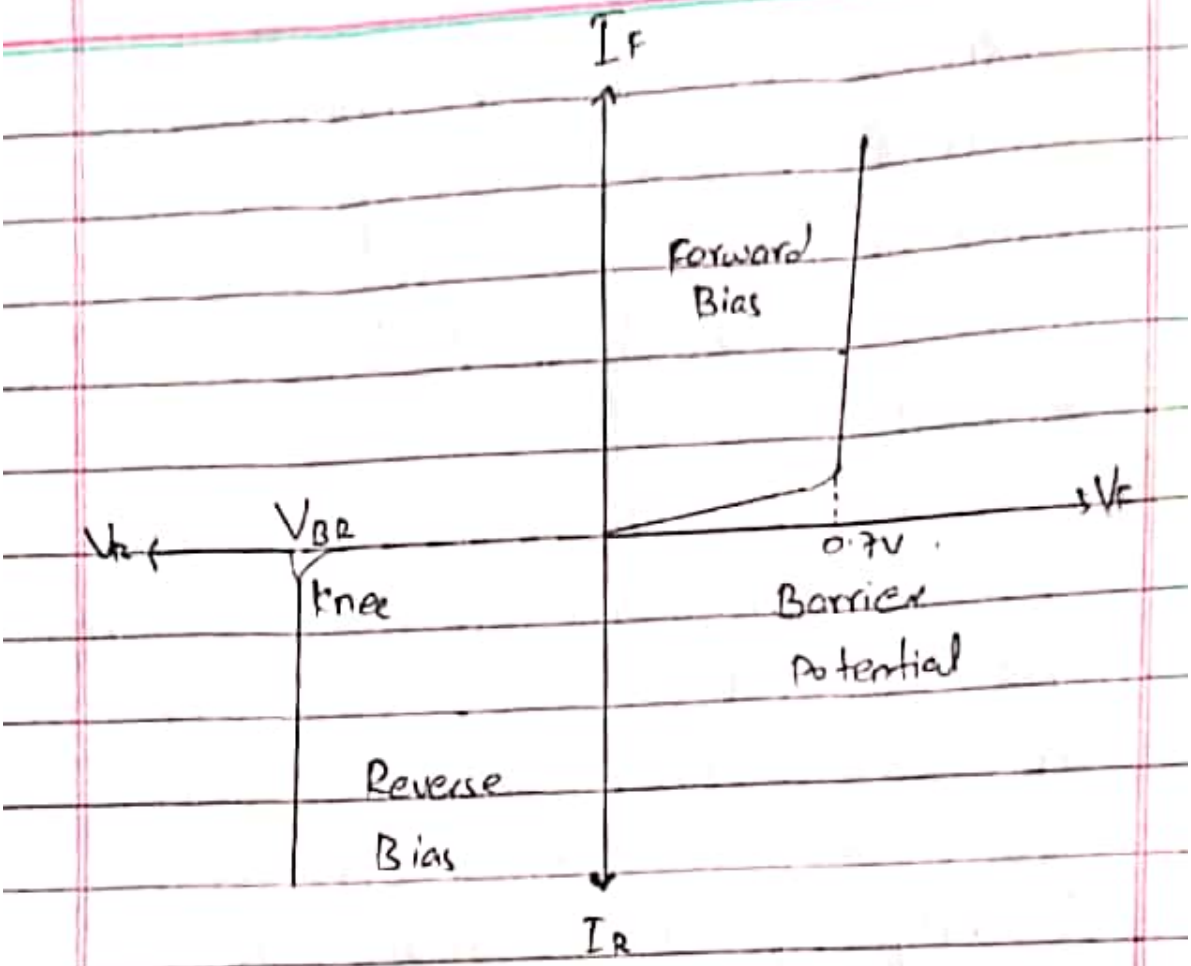
The breakdown voltage is the minimum reverse voltage that makes the diode conduct appreciably in reverse.

Occuring of Reverse Breakdown:

The reverse current in a diode is normally very small. If the external bias voltage is increased so on, the reverse current increases drastically at a particular value of the reverse bias voltage.

Graphically:

(P.T.O)



Q. No #03

(a) Find the difference between electrical potential energy & electric potential?

Ans.

Electric Potential:

Definition:

Electric potential is the amount of work needed to move a unit charge from a reference point to a specific point against the direction of electric field.

Mathematically:

$$V = \frac{U}{q_0} = \frac{W}{q_0} \rightarrow (1)$$

Explanation:

Consider a positive charge $+q$ is placed in an electric field E. Force is required to move the charge from point A to point B, because it is against the direction of electric field. The electric potential at point A is represented by V_A and the

electrical potential at point B is represented by V_B such that

$$V_A - V_B = W_{AB}/q \rightarrow (2)$$

Generally point A is taken at infinity, then potential at point A becomes zero. In that case eq (2) becomes

$$V = W/q \rightarrow (3)$$

Unit :

It's unit is Volt.

Electric Potential Energy

Definition :

The work required assembling this system of charges by bringing them close together, as in the system from an infinite distance.

Mathematically:

$$U_E = k \frac{qq}{r}$$

Explanation

Electric potential energy is a potential energy that result from conservative coulomb forces and is associated with the configuration of a particular set of point charges within a defined system. An object may have electrical potential energy by virtue of two key elements: its own electric charges & its relative position.

Unit:

It's unit is joule.

(b) How to find the potential difference between any two points in the electric field lines?

Ans. **Potential Difference**

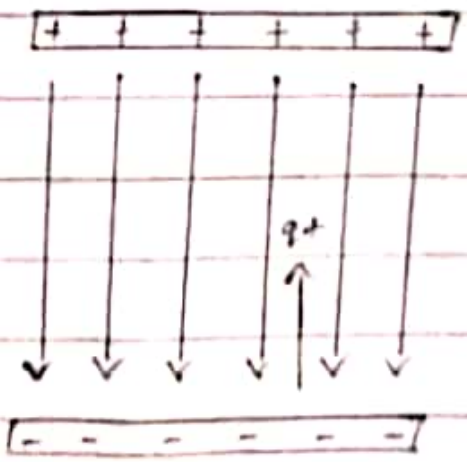
Definition:

The difference of electric potential between two point is called potential difference.

Finding:

We can find potential difference by the following method.

Diagramitically:



Explanation:

In an electric circuit which has an electric device connected across a battery through conducting wire as shown in diagram. The charge leaving the positive terminal of the battery has potential energy in device; part of this energy is lost. Thus, there is a difference of potential energy per coulomb of charge (q) from one side of the electric device to the other, which is termed as potential difference.

Mathematically:

$$\Delta V = \Delta U / q$$