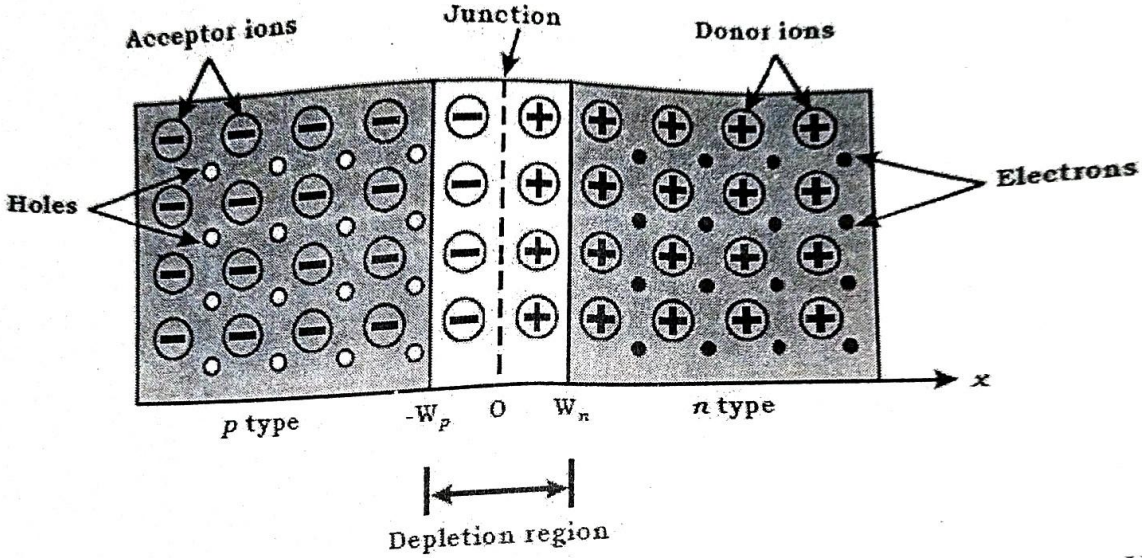
EXPERIMENT 1

AIM: Test the performance of PN-junction diode.

APPARATUS REQUIRED: Diode Characteristics Kit, Power Supply, Ammeter (0-20mA), Voltmeter (0-20V), Connecting Leads. Zener Diode.

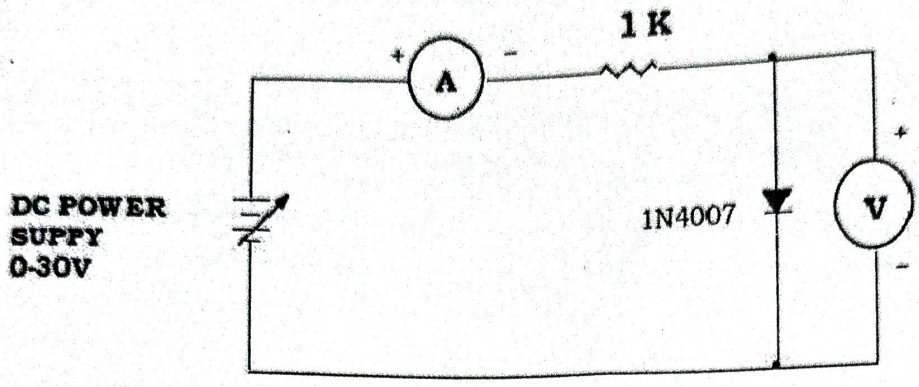
BRIEF THEORY: A P-N junction is known as Semiconductor diode or Crystal diode. It is the combination of P-type & N-type Semiconductor which offers nearly zero resistance to current on forward biasing & nearly infinite Resistance to the flow of current when in reverse biased. The semiconductor diode is formed by doping P-type impurity in one side and N-type of impurity in another side of the semi conductor crystal forming a p-n junction as shown in the following figure.



Acceptor ions p type n type Wn -Wp 0 Depletion region Junction Donor ions Electrons Holes x

At the junction initially free charge carriers from both side recombine forming negatively charged ions in P side of junction(an atom in P-side accept electron and becomes negatively charged ion) and positively charged ion on n side(an atom in n-side accepts hole i.e. donates electron and becomes positively charged ion)region. This region deplete of any type of free charge carrier is called as depletion region. Further recombination of free carrier on both sides prevented because of the depletion voltage generated due to charge carriers kept at distance by depletion (acts as a sort of insulation) layer as shown dotted in the above figure.

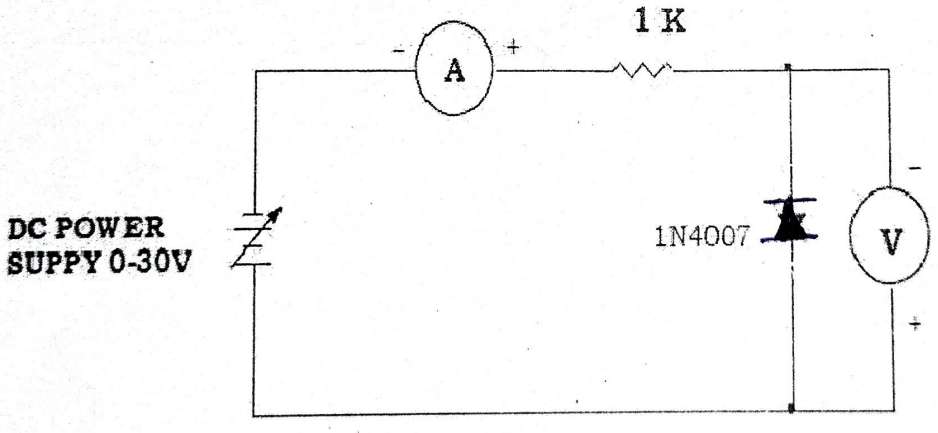
Forward biasing: When P-type semiconductor is connected to the +ve terminal and N-type to –ve terminal of voltage source. Nearly zero resistance is offered to the flow of current. The application of forward bias voltage will force electrons in N-type and holes in P-type material t recombine with the ions near boundary and to flow crossing junction. This reduces width of depletion region. This further will result in increase in majority carriers flow across thejunction. If forward bias is BASIC further increased in magnitude the depletion region width will continu to decrease, resulting in exponential rise in current as shown in ideal diode characteristic curve.



(1) When diode is forward biased

Reverse biasing: When P-type semiconductor is connected to the –ve terminal and N-type to +ve Terminal. Nearly zero current flow in this condition. In this condition the free charge carriers (i.e. electrons in N-type and holes in P-type) will move away from junction widening depletion region width. The minority carriers (i.e. –ve electrons in p-type and +ve holes in n-type) can cross the depletion region resulting in minority carrier current flow called as reverse saturation current (Is). As no of minority carrier is very small so the magnitude of its few microamperes. Ideally current in reverse bias is zero.

Circuit diagram (reverse bias):



(2) When diode is reverse biased

PROCEDURE:

(1) Connect the ckt. as shown in fig.
(2) Switch on the power supply.
(3) Vary the value of input dc supply in steps.
(4) Note down the ammeter & voltmeter readings for each step.
(5) Plot the graph of Voltage Vs Current.
(6) Connect the ckt. as shown in fig.

OBSERVATION TABLE:

Sr. No.	Forward bias Condition		Reverse bias Condition	
	Voltage (V)	Current (I)	Voltage (V)	Current (I)
1				
2				
3				
4				
5				
6				

CONCLUSION: