Zener Diode

To draw the reverse characteristic curve of a Zener diode and to find its reverse breakdown voltage.

The Theory:

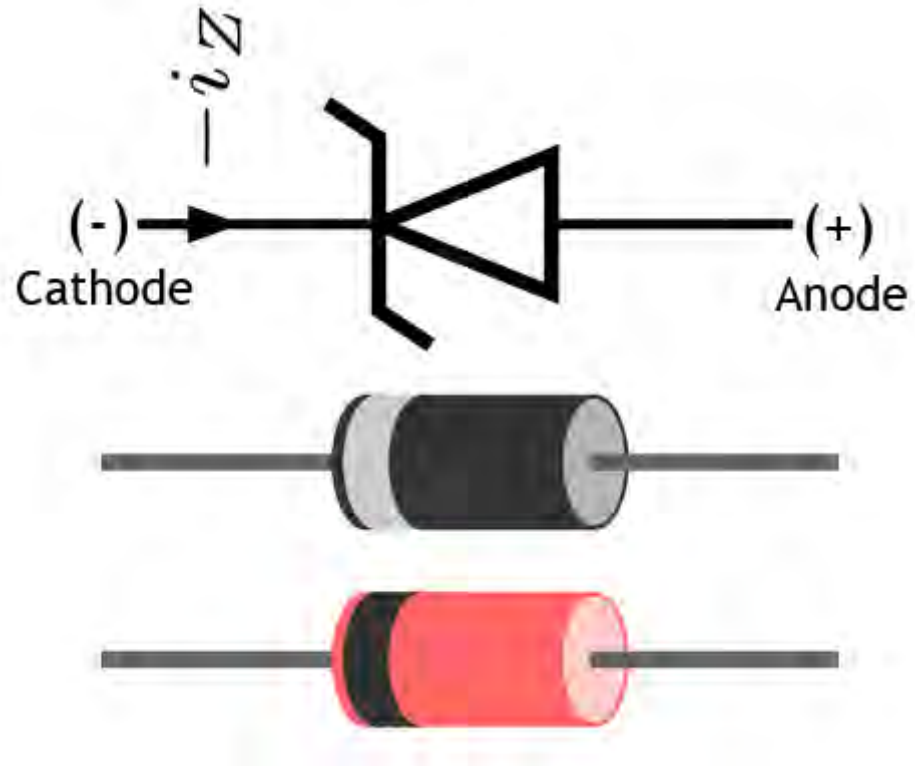
Zener diode

A Zener diode is a heavily doped silicon crystal diode which allows current to flow in the forward direction in the same manner as an ideal diode. It also permits the current to flow in the reverse direction when the voltage is above a certain value known as the breakdown voltage. Breakdown voltage is also known as Zener knee voltage.

The device was named after an American Physicist, Clarence Zener, who described the property concerning the breakdown of electrical insulators.

The device consists of a reverse biased, highly doped, p-n junction diode operating in the breakdown region. Conventional diodes and rectifiers never operate in the breakdown region, but the Zener diode can safely be operated at this point.

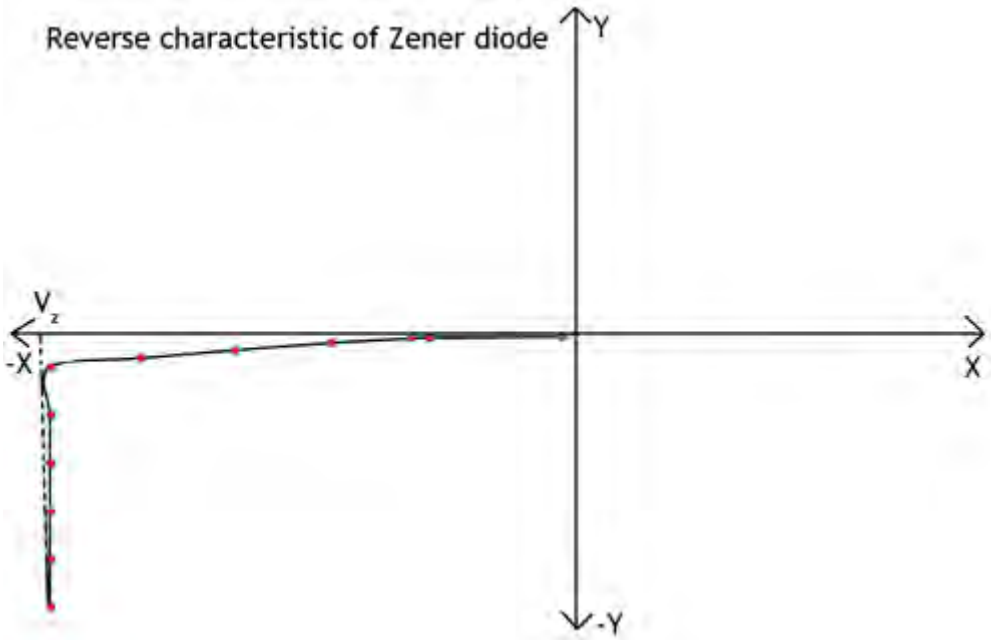
Clarence Zener
(1905 - 1993)



Working of Zener diode

As the reverse voltage applied to the Zener diode increases, it reaches the breakdown voltage at which Zener current increases to a large value. In the breakdown region, further increase in reverse voltage will not increase the voltage across the Zener diode, it only increases the current. Thus, a constant voltage called Zener voltage (V_z) is maintained across the Zener diode when the supply voltage changes. Hence, it acts as a voltage regulator.

The reverse characteristic is obtained by taking reverse voltage along – ve X-axis and reverse current along –ve Y-axis. As the reverse voltage reaches a certain value, the reverse current increases to a large value, but the voltage across the diode remains a constant. This is the break down voltage V_z.


Reverse characteristic of Zener diode
Y
V_z
-X
X
-Y

Experiment Procedure:

1.Connect the power supply, voltmeter, current meter with the diode as shown in the figure for reverse bias. You can use two multimeter (one to measure current through diode and other to measure voltage across diode)

2.Increase voltage from the power supply from 0V to 20V in step as shown in the observation table

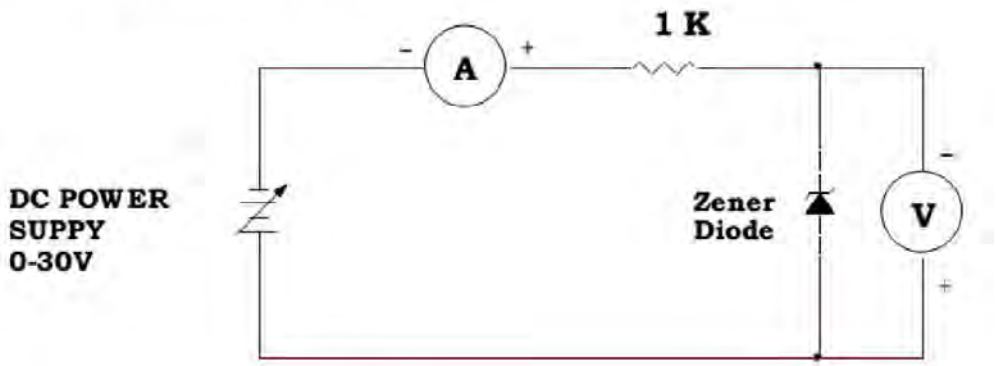
3.Measure voltage across diode and current through diode. Note down readings in the observation table.

4.Reverse DC power supply polarity for forward bias.

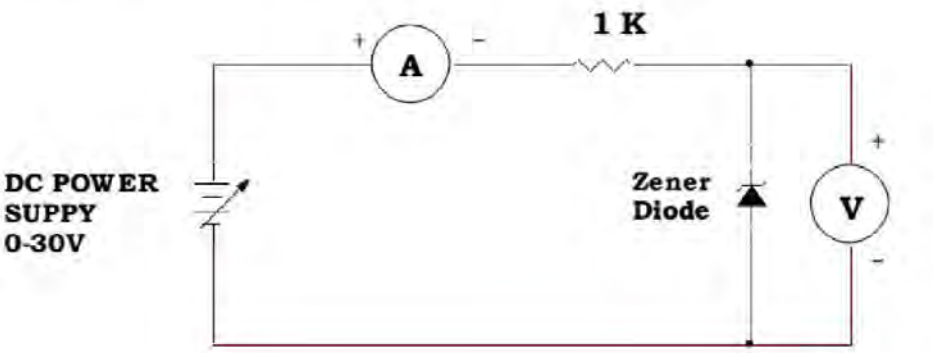
5.Repeat the above procedure for the different values of supply voltage for reverse bias

6.Draw VI characteristics for reverse bias and forward bias in one graph

Circuit diagram (forward bias):



Circuit diagram (reverse bias):



Observation Table : (Forward Bias)

Sr. No.	Supply voltage (Volt)	Diode voltage (Vd)(v)	Diode current (Id)(mA)
1	**0**		
2	**0.2**		
3	**0.4**		
4	**0.6**		
5	**0.8**		
6	**1.0**		
7	**2**		
8	**4**		
9	**6**		
10	**8**		
11	**10**		
12	**15**		
13	**20**		

Observation Table (Reverse Bias)

Sr. No.	Supply voltage (Volt)	Diode voltage (Vd)(V)	Diode current (Id)(mA)
1	**0**		
2	**0.2**		
3	**0.5**		
4	**1.0**		
5	**2.0**		
6	**5**		
7	**8**		
8	**10**		
9	**15**		
10	**20**		
11	**25**		
12	**30**		

Conclusion:

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