

	LAB
PN Junction (Silicon) Diode Characteristics	3
	WEEK 4

LEARNING OUTCOMES

To observe and draw the Forward and Reverse bias V-I Characteristics of a P-N Junction diode.

EQUIPMENT AND MATERIALS

1. DC Regulated Power supply (0-30v)
2. P-N Diode IN4007
3. Resistor 1k Ω
4. Ammeters (0-200mA, 0-500mA)
5. Voltmeter (0-20v)
6. Bread board
7. Connecting wires

DESCRIPTION

A p-n junction diode conducts only in one direction. The V-I characteristics of the diode are curve between voltage across the diode and current through the diode. When external voltage is zero, circuit is open and the potential barrier does not allow the current to flow. Therefore, the circuit current is zero. When P-type (Anode is connected to +ve terminal and n- type (cathode) is connected to -ve terminal of the supply voltage, is known as forward bias. The potential barrier is reduced when diode is in the forward biased condition. At some forward voltage, the potential barrier altogether eliminated and current starts flowing through the diode and also in the circuit. The diode is said to be in ON state. The current increases with increasing forward voltage.

When N-type (cathode) is connected to +ve terminal and P-type (Anode) is connected -ve terminal of the supply voltage is known as reverse bias and the potential barrier across the junction increases. Therefore, the junction resistance becomes very high and a very small current (reverse saturation current) flows in the circuit. The diode is said to be in OFF state. The reverse bias current due to minority charge carriers

PROCEDURE

FORWARD BIAS:

1. Connect the circuit as per the circuit diagram shown in Fig. 3.1
2. For forward bias, the (Regulated Power supply) RPS +ve is connected to the anode of the diode and RPS -ve is connected to the cathode of the diode
3. Switch on the power supply and increase the input voltage (supply voltage) such that voltage across diode increases in steps of 0.1v
4. Note down the corresponding current flowing through the diode and voltage across the diode for each and every step of the input voltage
5. The reading of voltage and current are tabulated in Table 3.1..
6. Graph is plotted between voltage and current as shown in the Fig. 3.3 forward bias curve.

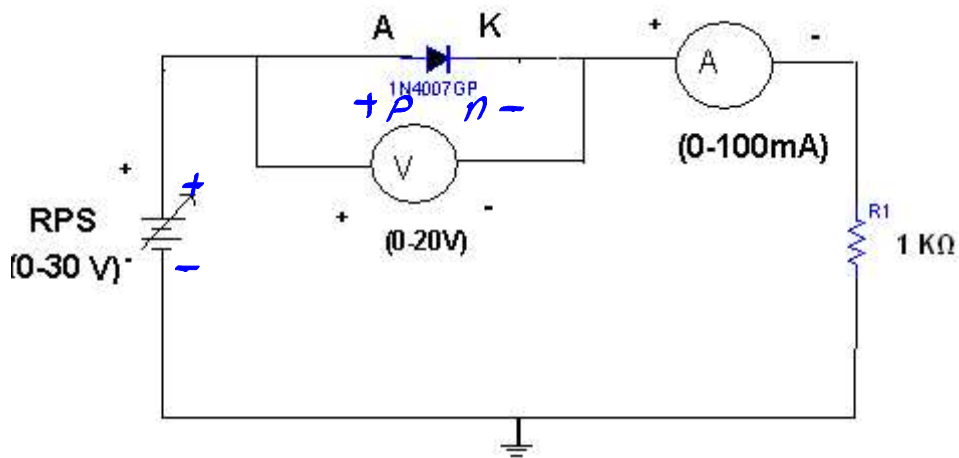


Fig. 3.1: Forward bias

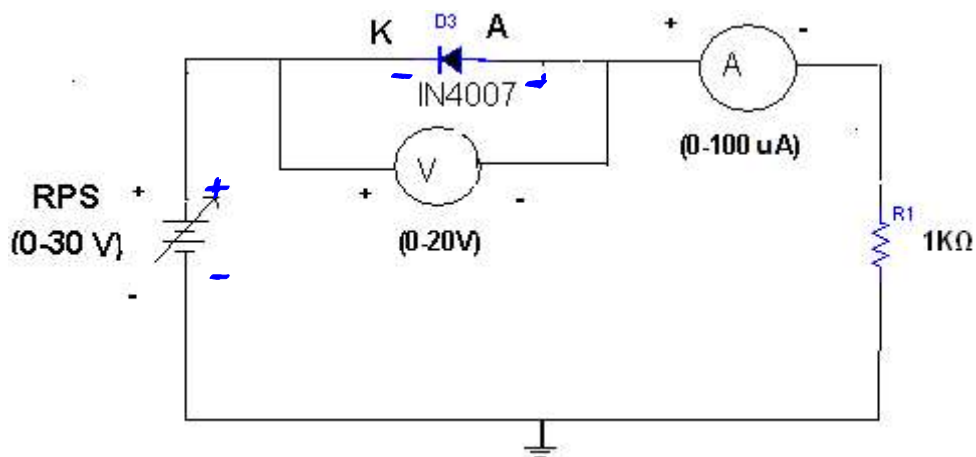


Fig. 3.2: Reverse bias

REVERSE BIAS:

1. Connections are made as per the circuit diagram shown in Fig. 3.2
2. For reverse bias, the RPS +ve is connected to the cathode of the diode and RPS -ve is connected to the anode of the diode.
3. Switch on the power supply and increase the input voltage (supply voltage) such that voltage across diode increases in steps of 1v upto 5v and then in steps of 5v upto 30v
4. Note down the corresponding current flowing through the diode and voltage across the diode for each and every step of the input voltage.
5. The readings of voltage and current are tabulated in Table 3.2
6. Graph is plotted between voltage and current as shown in the Fig. 3.3 reverse bias curve.

EXPECTED RESPONSE:

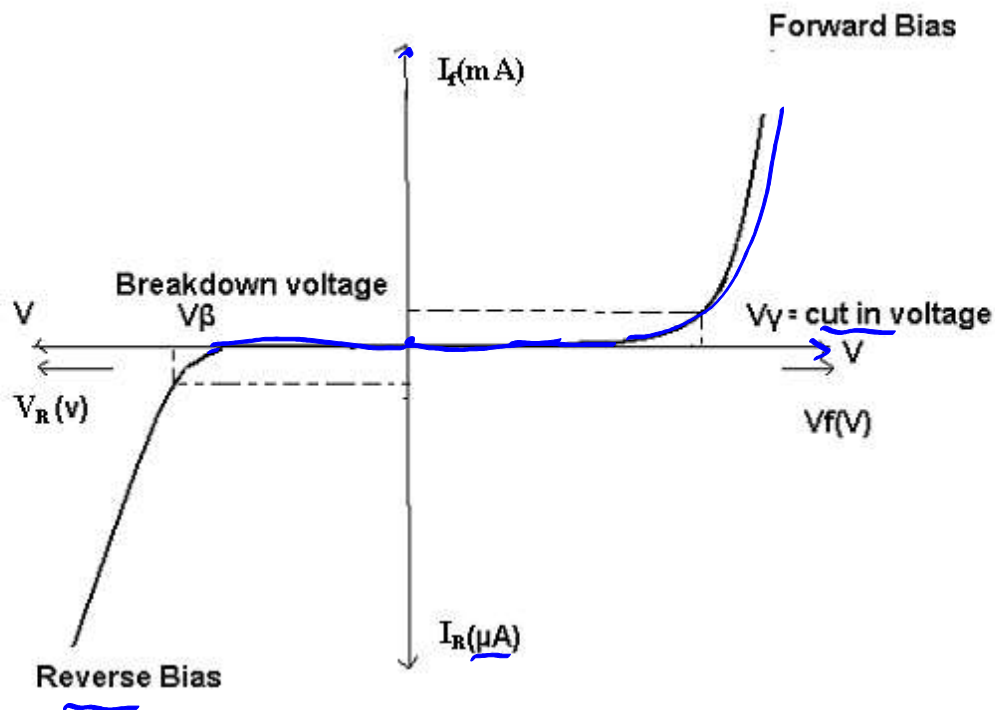


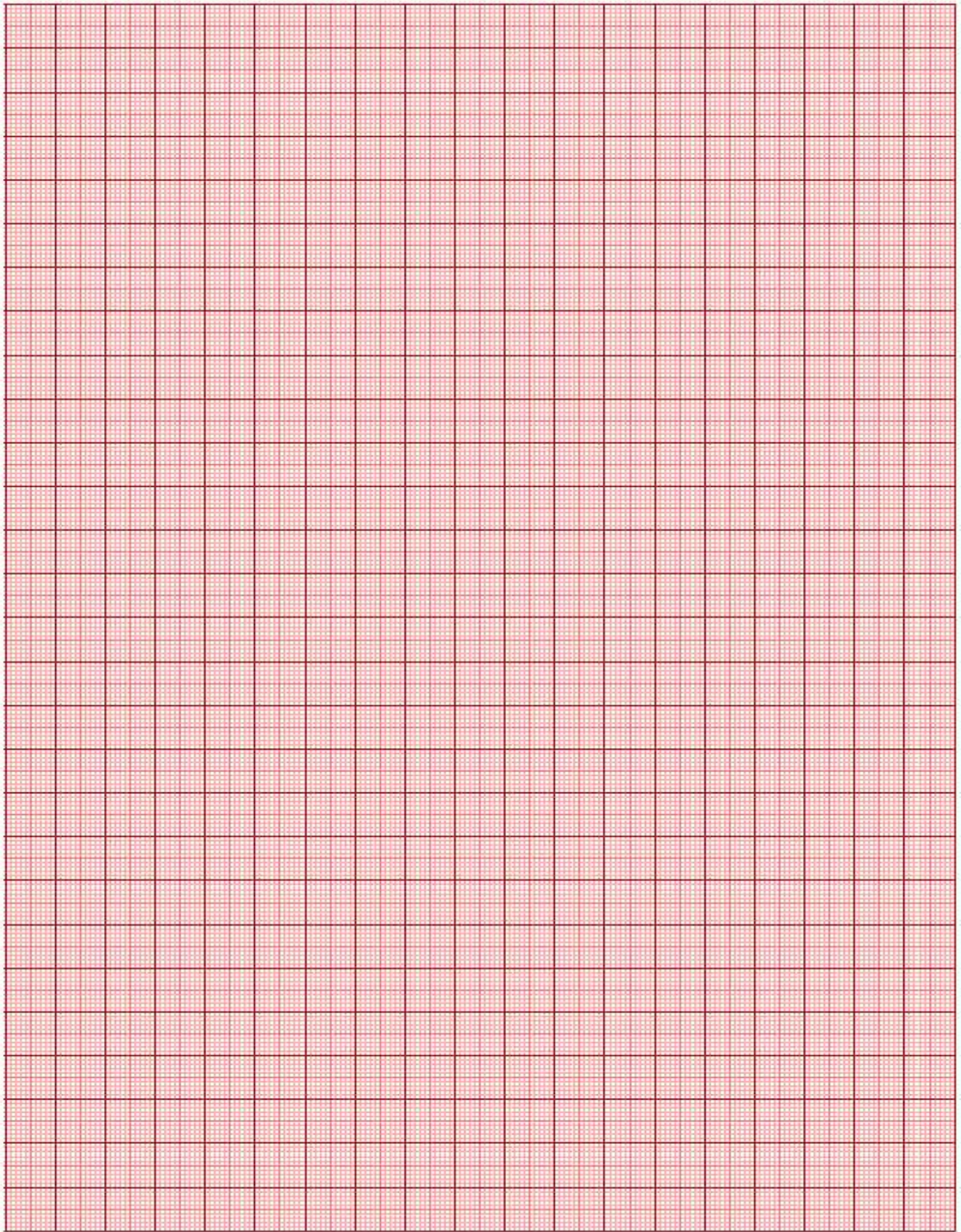
Fig. 3.3: Diode characteristics

OBSERVATION AND CALCULATIONS

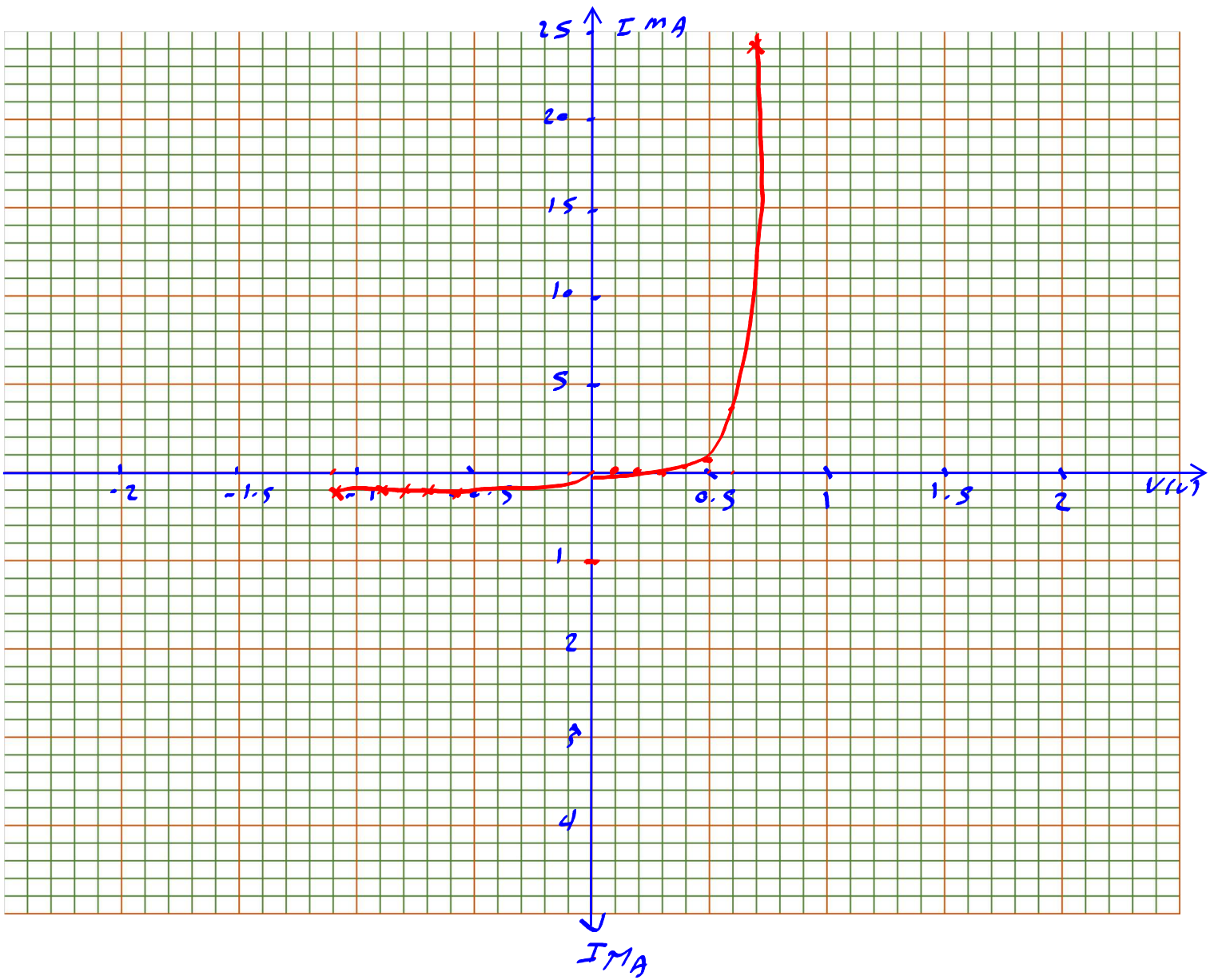
S.NO	VOLTAGE ACROSS DIODE [V _D](volts)	CURRENT THROUGH DIODE [I _D](mA)
1	0.1	0
2	0.2	0
3	0.3	0
4	0.4	0.076
5	0.5	0.5
6	0.6	3.5
7	0.7	24
8	0.8	147
9	0.9	
10	1	
11		

S.NO	VOLTAGE ACROSS DIODE [V _D](volts)	CURRENT THROUGH DIODE [I _D](μA)
1	0.1	0.037
2	0.2	0.051
3	0.3	0.082
4	0.4	0.078
5	0.5	0.082
6	0.6	0.09
7	0.7	0.1
8	0.8	0.1
9	0.9	0.1
10	1	0.1
11	1.1	0.1

RESULT & CONCLUSION



Free Multi-color Graph Paper from <http://incompetech.com/graphpaper/multi-color/>



Multisim Simulation:

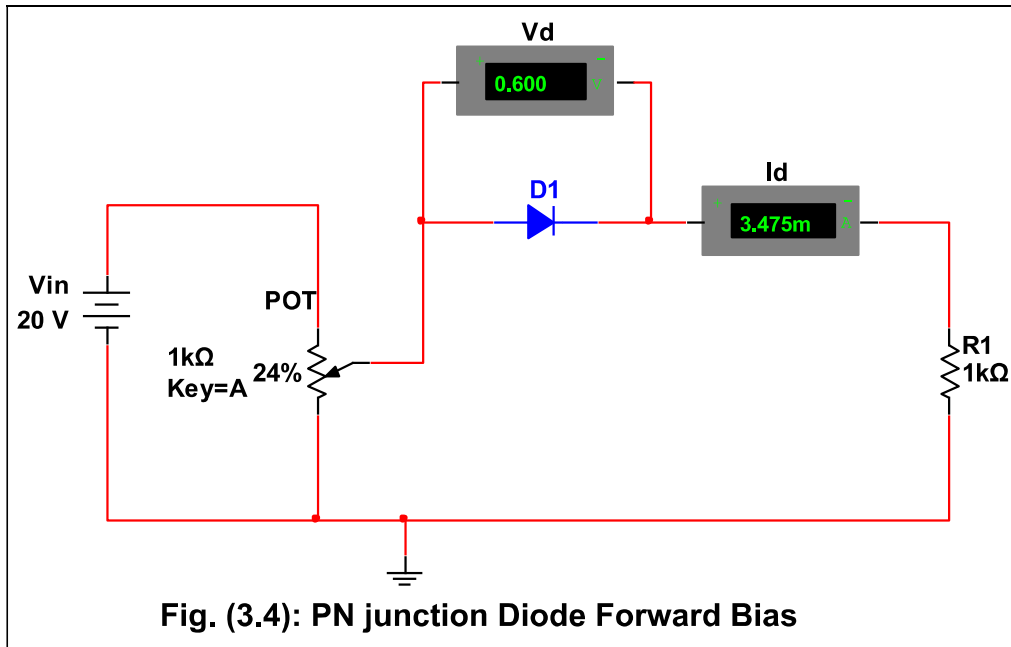


Fig. (3.4): PN junction Diode Forward Bias

Table 3.1a: Forward Bias

S.NO	VOLTAGE ACROSS DIODE [V_D](volts)	CURRENT THROUGH DIODE [I_D](mA)
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		

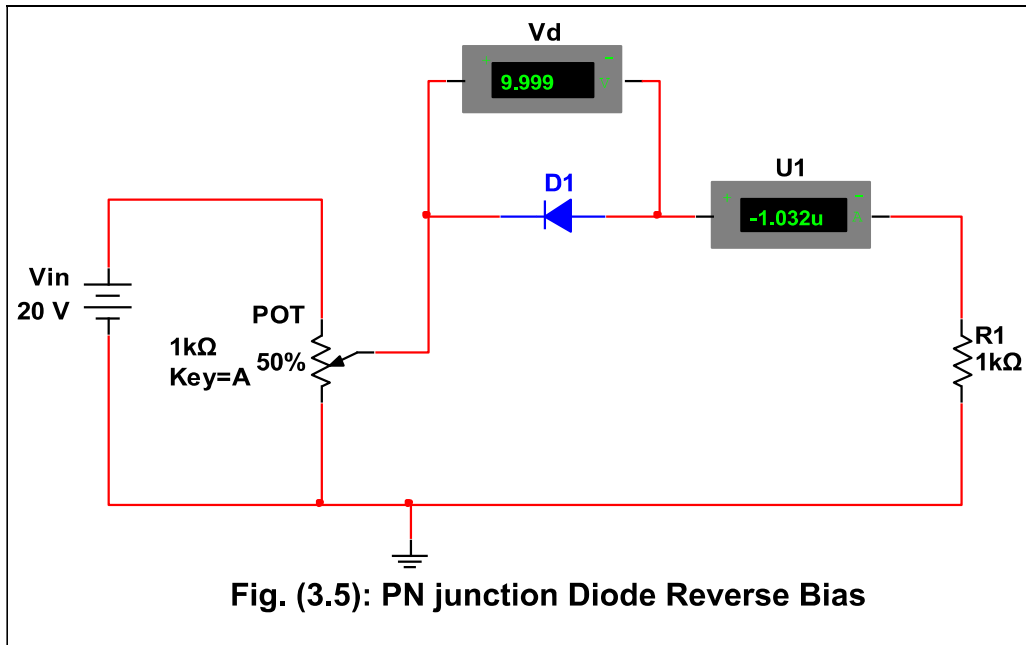


Table 3.2a: Reverse Bias

S.NO	VOLTAGE ACROSS DIODE [V_D](volts)	CURRENT THROUGH DIODE [I_D](μA)
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		