Exp.1: Diode Characteristics

1-*Objectives:*

- Diode as valve in a circuit
- Static recording of the current-voltage characteristic
- Dynamic representation of the current-voltage Characteristic.

2-*Circuit elements:*

1 Incandescent lamp 12V/3W 1 Lamp holder E10,

1 Resistor 10 Ω

1 Resistor 100Ω

1 Ge diode AA 118 1 Si Diode 1N4007

Meters:

1 Ammeter

1 Voltmeter

1 Two-channel oscilloscope

DC. Power supply unit

AC. Power supply (0-25V)
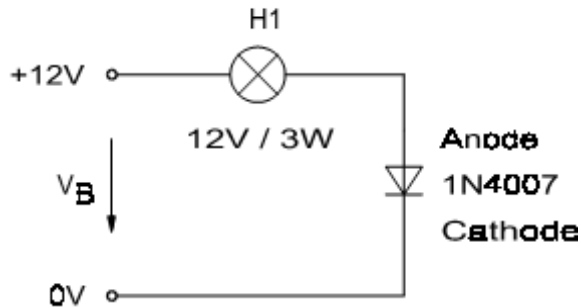
3-*Procedure:*

☒ Diode as valve in a circuit

Fig.1

1- Connect the circuit as shown in figure 1, and apply an operating voltage of V_B = 12 V to the input .
2- Comment on the result you obtained.
3- Interchange the connection to diode i.e., reverse bias.
4- Comment on the result you obtained.
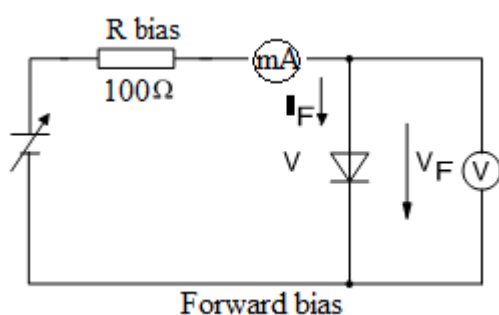
☒ Static recording of the current-voltage characteristics
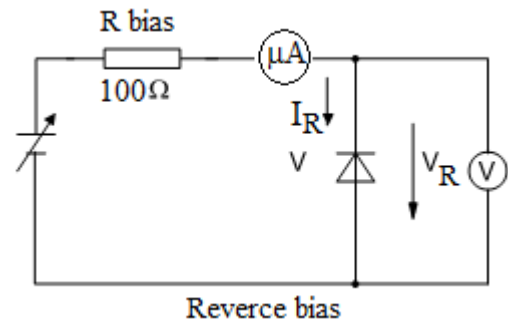

Fig. 2(a)   Fig. 2(b)

1- Connect the circuit as shown in figure 2(a).

2- Change the voltage from 0 V to 0.8 V in steps of 0.05, and record the corresponding current value <u>for Si and Ge</u>.

3- Connect the circuit as shown in figure 2(b).

4- Change the voltage from 0 V to 10 V in steps of 1V, and record the corresponding current value <u>for Si and Ge</u>.

V_F/V	Forward bias I_F/mA		V_r/V	Reverse bias I_r/µA	
	1N4007	AA 118		1N4007	AA 118
0.00			0.00		
0.20			0.50		
0.25			1.0		
0.30			2.0		
0.35			3.0		
0.40			4.0		
0.50			5.0		
0.55			6.0		
0.60			7.0		
0.65			8.0		
0.70			9.0		
0.75			10.0		
0.8			-		

Table 1

5- Plot a graph between v and I.

6- Determine the threshold voltage V_{th} of the Si and Ge diodes. (<u>compare the V_{th} of Si and Ge diodes</u>)

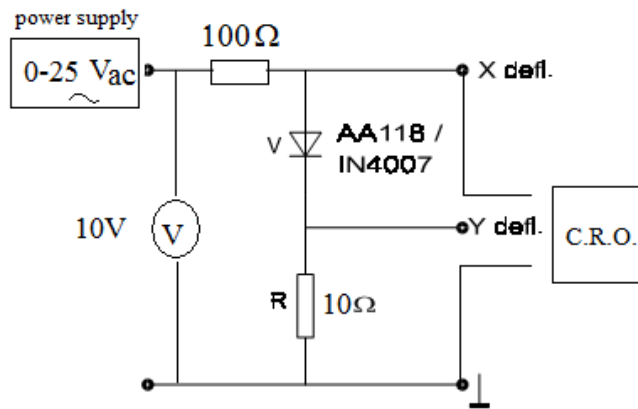# ☒ Dynamic representation of the current-voltage characteristic

Fig. 3

1. connect the circuit as shown in Fig.3 and apply an ac sinusoidal voltage V = 10 V, f = 50 Hz.

2. Record the settings of the oscilloscope:

   X-deflection: ----- V/div   &   Y-deflection: ---V/div

3. Use the oscilloscope (C.R.O.) to record the silicon and germanium diode characteristics and compare these with the statically recorded characteristics.

4. Draw the relation between the current I(y- axis) and the voltage V(x-axis)in case for in both: forward and reverse bias.

5. Calculate the diode resistance:

germanium diode	V (V)	I(A)	R_D Ω
	0.3		
	0.5		
	0.65		
silicon diode	0.5		
	0.65		

4- *Precautions:*

1- Read the ammeter and voltmeter at eye level.

2- Change the scale of ammeter scale from DC. To AC. When performing AC measurement.

3- Check the circuit before starting.

5-*Questions:*

1- What is a semiconductor diode?

2- Discuss the difference between a forward and reverse bias diode?

3- What is the value of the Energy gab. For silicon and germanium diodes?

4- Draw the energy band diagrams for the following:

(a)Insullator (b) Semiconductor   (c) conductor, materials.

5- Discuss the formation of N-type and p-type materials?

6- Discuss the difference between a silicon and germanium diode?