

## EXPERIMENT-7

### ✦ AIM:

To study and plot the input and output characteristics of **common emitter** transistor.

### ✦ THEORY:

A Bipolar Junction Transistor (BJT) has three terminals connected to three doped semiconductor regions. The three parts of a BJT are collector, emitter, and base.

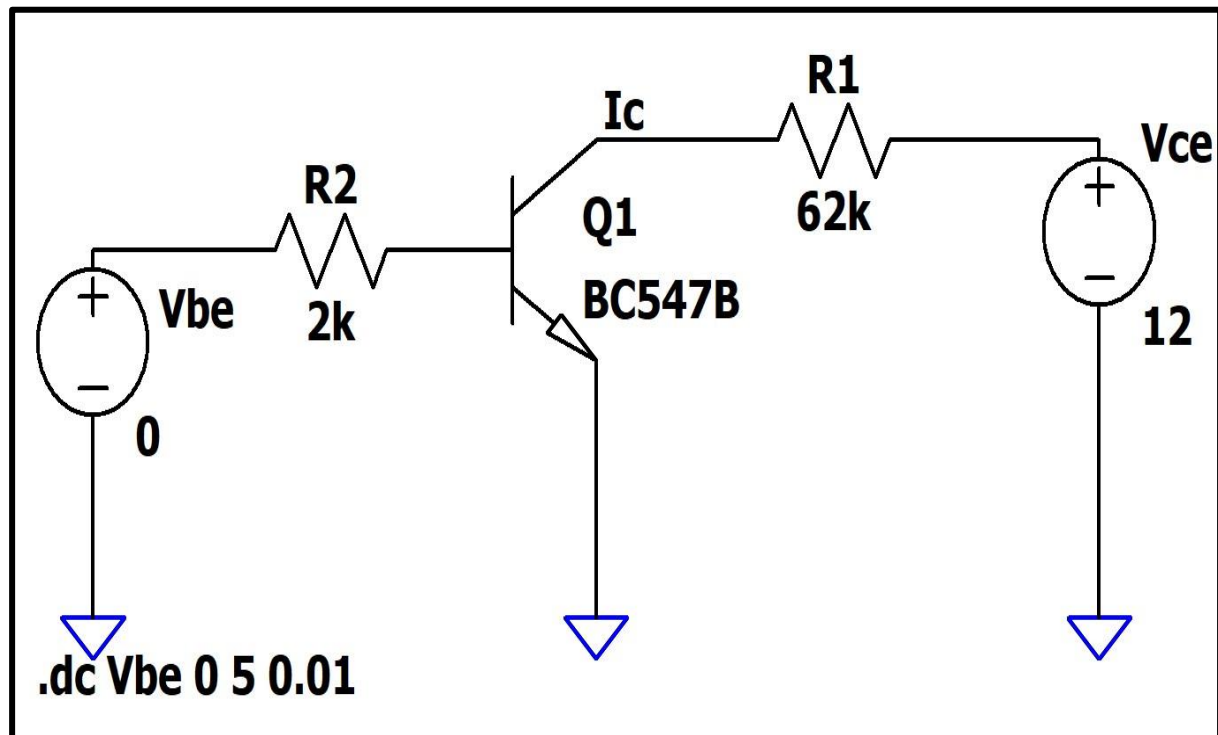
In CE configuration, we use emitter as common terminal for both input and output. This common emitter configuration is an inverting amplifier circuit. Here the input is applied between base-emitter region and the output is taken between collector and emitter terminals. In this configuration, the input parameters are  $V_{BE}$  and  $I_B$  and the output parameters are  $V_{CE}$  and  $I_C$ .

In this configuration, the emitter current is equal to the sum of small base current and the large collector current. i.e.,

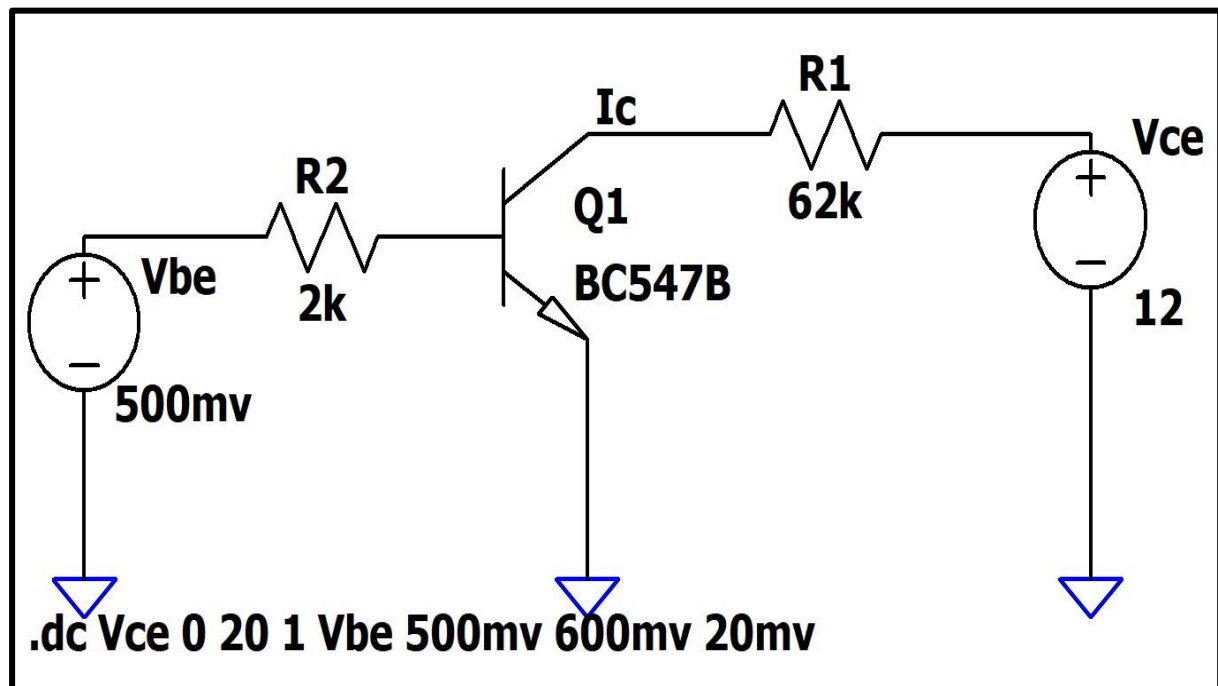
$$I_E = I_C + I_B.$$

### ✦ CIRCUIT DIAGRAM:

• For Input:



• For Output:



✦OBSERVATION TABLE:

## ○ Input Characteristics:

### • Observations (Input characteristics :)

Collector emitter voltage  $V_{CE} = 1V$

S.No.	Base-Emitter Voltage $V_{BE}(V)$	Base Current ( $I_B$ ) ( $\mu A$ )
1.	0.1	2.307
2.	0.22	2.739
3.	0.3	3.070
4.	0.4	3.542
5.	0.5	4.085
6.	0.6	4.713
7.	0.7	5.437
8.	0.8	6.271

Collector emitter voltage  $V_{CE} = 2V$

S.No.	Base-Emitter Voltage $V_{BE}(V)$	Base Current ( $I_B$ ) ( $\mu A$ )
1.	0.2	2.661
2.	0.4	3.542
3.	0.6	4.713
4.	0.8	6.271
5.	1	8.345
6.	1.2	11.11
7.	1.4	14.87
8.	1.6	19.67

Collector emitter voltage  $V_{CE} = 3.1V$

S.No.	Base-Emitter Voltage $V_{BE}(V)$	Base Current ( $I_B$ ) ( $\mu A$ )
1.	0.24	2.818
2.	0.48	3.970
3.	0.72	5.594
4.	0.96	7.882
5.	1.2	11.11
6.	1.44	15.65
7.	1.68	22.05
8.	1.9	30.19

## ○ Output Characteristics: $I_B$ $= 40 \mu A$

• Observations (Output characteristics)

Base current,  $I_B = 13.13 \mu A$

Base current,  $I_B = 15.35 \mu A$

S.No.	Collector-Emitter Voltage $V_{CE}(V)$	Collector Current $I_C (mA)$	S.No.	Collector-Emitter Voltage $V_{CE}(V)$	Collector Current $I_C (mA)$
1.	1.0	36.97	1.	1.0	45.81
2.	2.0	46.80	2.	2.0	57.98
3.	3.0	48.30	3.	3.0	59.85
4.	4.0	48.51	4.	4.0	60.10
5.	5.0	48.54	5.	5.0	60.14
6.	6.0	48.54	6.	6.0	60.14
7.	7.0	48.54	7.	7.0	60.14
8.	8.0	48.54	8.	8.0	60.14

Base current,  $I_B = 23.56 \mu A$

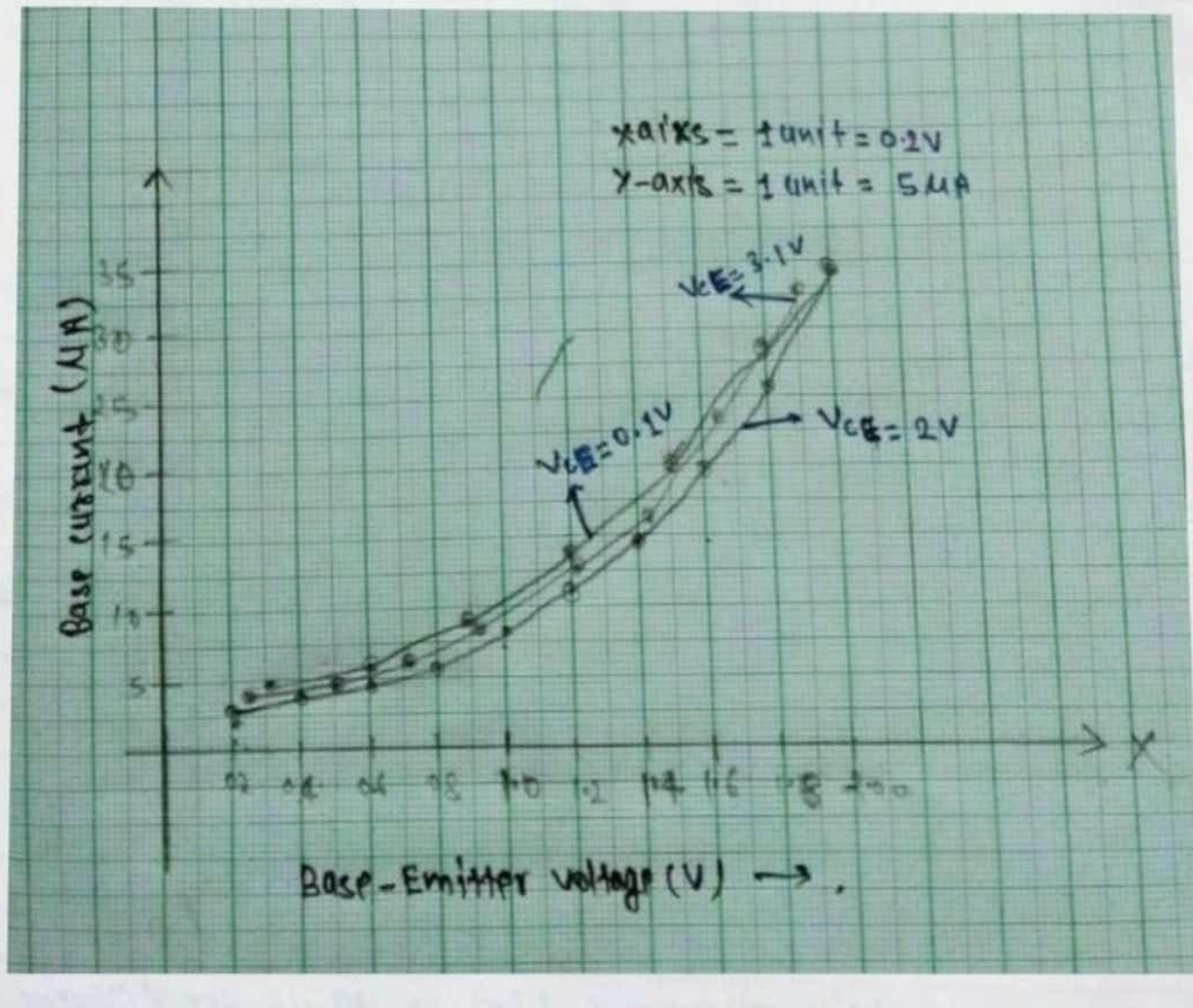
S.No.	Collector-Emitter Voltage $V_{CE}(V)$	Collector Current $I_C (mA)$
1.	1.0	87.12
2.	2.0	110.3
3.	3.0	113.9
4.	4.0	114.3
5.	5.0	114.4
6.	6.0	114.4
7.	7.0	114.4
8.	8.0	114.4

✦ **GRAPH**

- **Input Characteristics:**

- Graph

(Input characteristics)

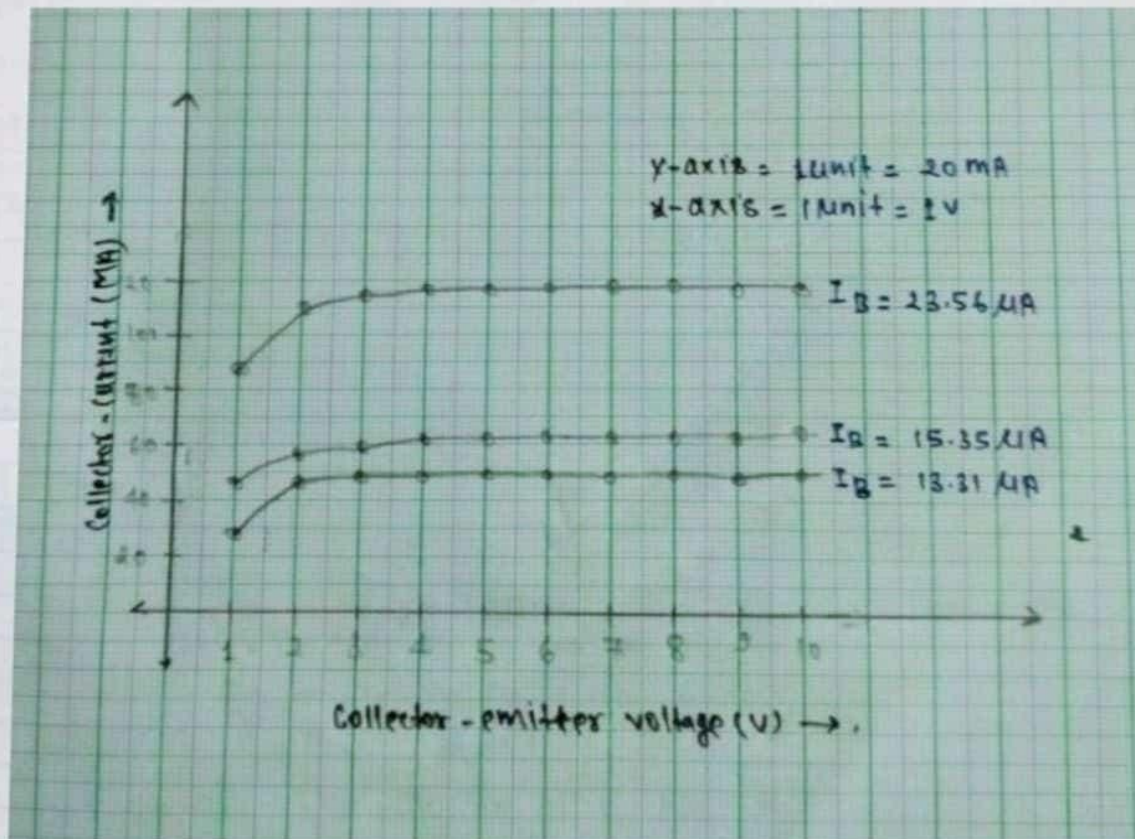


- **Output Characteristics:**



- Graph

(Output characteristics)



✦ **RESULT:** The input and output characteristics of CE transistor are observed.

## EXPERIMENT -8

### ✦ AIM:

To study and plot the input and output characteristics of **common base transistor**.

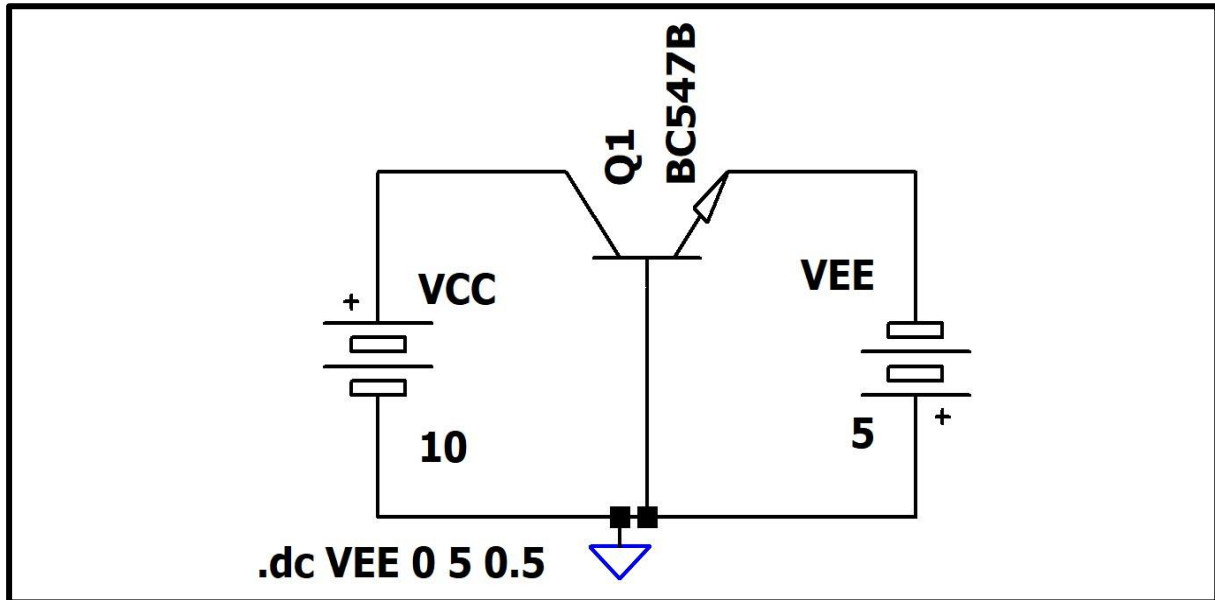
### ✦ THEORY:

A Bipolar Junction Transistor (BJT) has three terminals connected to three doped semiconductor regions.

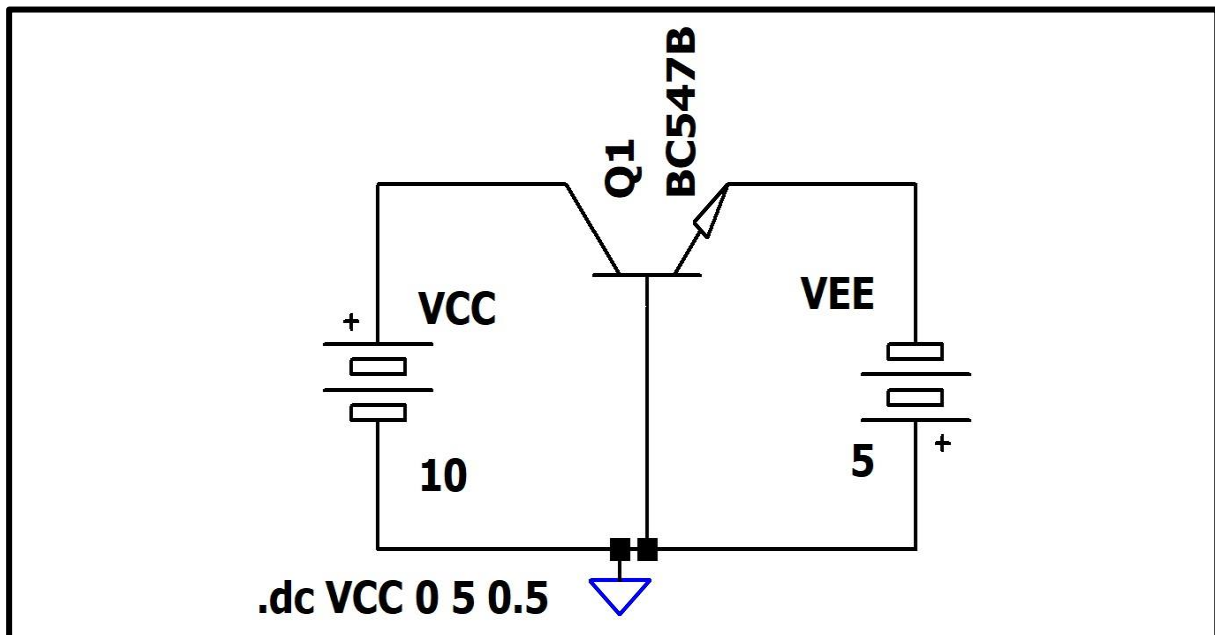
In this configuration, we use base as common terminal for both input and output signals. The common base circuit is mainly used in single stage amplifier circuits, such as microphone pre-amplifiers or radio frequency amplifiers. Here the input is applied between base and emitter terminals and the corresponding output signal is taken between the base and collector terminals with the base terminal grounded. Here the input parameters are  $V_{BE}$  and  $I_E$  and the output parameters are  $V_{CB}$  and  $I_C$ . The input current flowing into the emitter terminal must be higher than the base current and the collector current to operate the transistor, therefore the output collector current is less than the input emitter current.

## ✦ CIRCUIT DIAGRAM:

### • For Input:



### • For Output:





## ★ OBSERVATION TABLE:

### ○ Input Characteristics:

S.NO.		$V_{CB}=2V$	$V_{CB}=20V$
	$V_{EB} (V)$	$I_{B1} (mA)$	$I_{B2} (mA)$
1.	0.1	0.0	0.0
2.	0.2	0.0	0.0
3.	0.3	0.0	0.0
4.	0.4	0.0	0.0
5.	0.5	0.007	0.008
6.	0.6	0.3	0.5
7.	0.7	3.5	20
8.	0.72	3.9	21.4
9.	0.74	5.0	22.1
10.	0.76	7.0	23.5
11.	0.78	10.0	26.1
12.	0.8	15.0	30.4

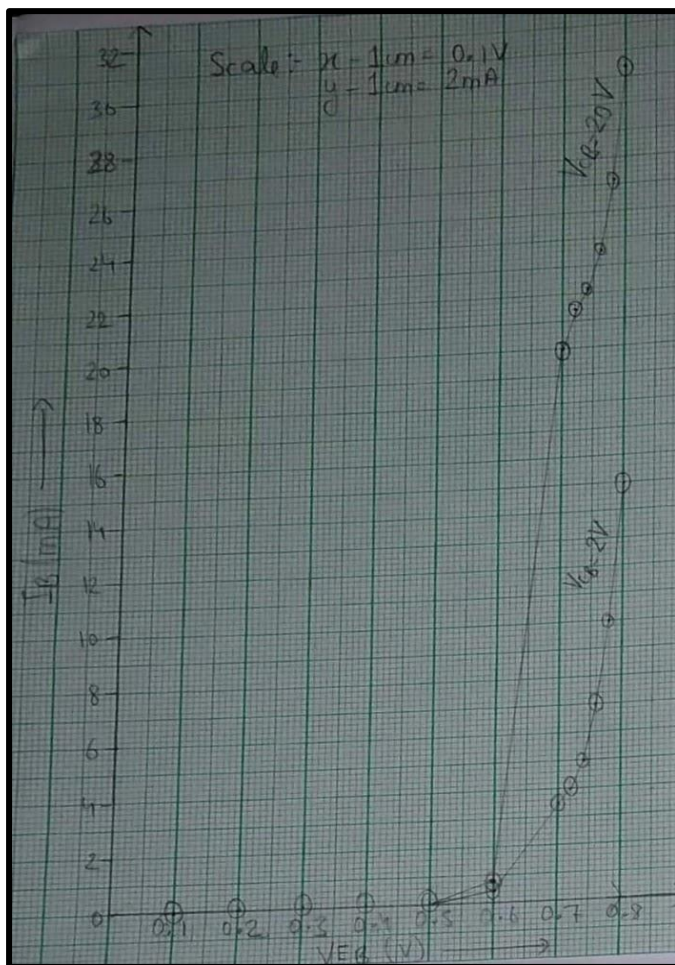
### ○ Output Characteristics:

		$I_E = 2mA$	$I_E = 4mA$	$I_E = 6mA$	$I_E = 8mA$
S.NO.	$V_{CB} (V)$	$I_{C1} (mA)$	$I_{C2} (mA)$	$I_{C3} (mA)$	$I_{C4} (mA)$
1.	2	2.07	4	5.9	7.9
2.	4	2.07	4	5.9	7.9
3.	6	2.07	4	5.9	7.9
4.	8	2.07	4	5.9	7.9

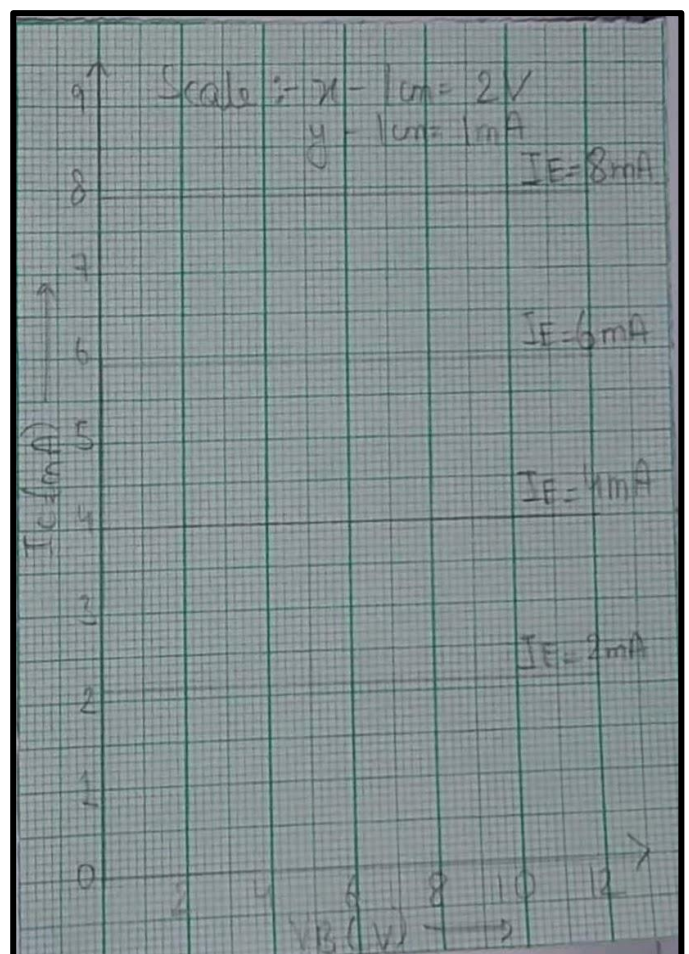
5.	10	2.07	4	5.9	7.9
6.	12	2.07	4	5.9	7.9

## ✦ GRAPH

### • Input Characteristics:



### • Output Characteristics:



## ✦ RESULT:

The input and output characteristics of CB transistor are observed.

