Aim : To study the characteristics of a common emitter transistor and to find out the values of current and voltage gains.

Apparatus : An n-p-n transistor, dual power supply (battery) with 3V & 10V, two rheostats, two voltmeters (0 – 3V and 0 – 10V), milli-ammeter (0-100mA), micro-ammeter (0 – 100 µA) and connecting wires.

Theory : In a common emitter configuration, the emitter – base is the input and the collector – base is the output. The input is forward biased and the output is reverse biased. The emitter current dives itself into base current and collector current. The current gain of a transistor in common emitter configuration is given by

$$\beta = \frac{\Delta I_C}{\Delta I_B}$$

Procedure :
1. Make the circuit diagram as shown in the figure. Make all connections clean and tight.
2. Note the least count and zero error of all the meters used.
3. Move the rheostat R_1 and keep V_{CE} (V_2) a constant, say 4V.
4. Move the rheostat R_2 and increase the forward bias (V_{BE}) in steps of 0.1V till the voltmeter reads 0.7V. Note the corresponding base current (I_B) in each case.
5. Plot a graph between V_{BE} and I_B, taking V_{BE} long the x-axis and I_B along the y – axis.
6. Move both rheostats and bring both voltmeters back to zero. Move the rheostat R_2 and keep the input current (IB) a constant, say 50 uA.
7. Move the rheostat R_1 and increase the reverse bias (V_{CE}) in steps of 0.1V till to voltmeter reads 1V and note the collector current (I_C) in each case.
8. Plot a graph between V_{CE} and I_C, taking V_{CE} long the x-axis and I_C along the y – axis.

Result :
1. The input and output characteristics of an n – p – n transistor has been plotted.
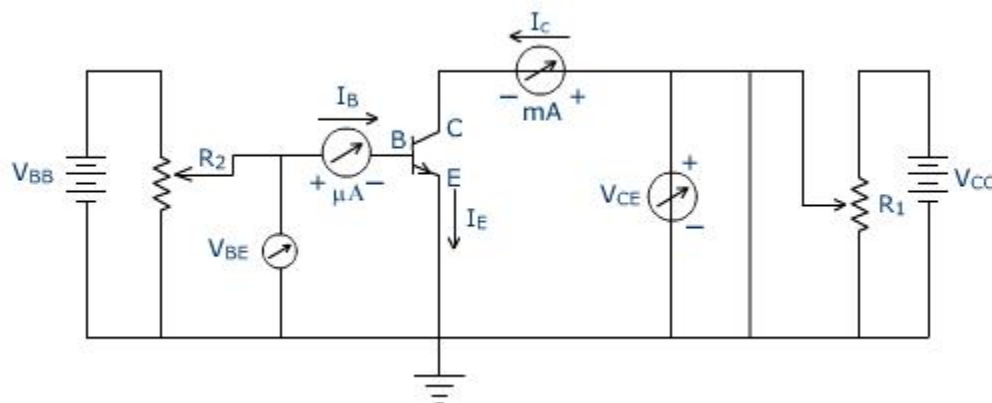2. For the given configuration, the current gain (β) = _____

Precautions :
1. All connections should be clean and tight.
2. Forward and reverse bias voltages beyond the specified value should not be supplied.

Sources of error :
1. The transistor may be faulty.
2. The connections are not clean or tight.

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Circuit Diagram

Observations
    a) Output characteristics
        i. L.C. of voltmeter   _____ V
        ii. L.C. of milli-ammeter   _____ mA
        iii. Zero error of voltmeter   _____ V
        iv. Zero error of milli-ammeter _____ mA
    b) Input characteristics
        i. L.C. of voltmeter   _____V
        ii. L.C. of micro-ammeter   _____ μA
        iii. Zero error of voltmeter   _____ V
        iv. Zero error of micro-ammeter _____ μA

Observation Table
For input characteristics V_{CE} = _____ V

Sr. No.	Base-Emitter voltage (V_{BE})	Base Current (μA)
1	0	
2	0.1	
3	0.2	
4	0.3	
5	0.4	
6	0.5	
7	0.6	
8	0.7	

For output characteristics I_B = _____ μA

Sr. No.	Collector-Emitter voltage (V_{CE})	Collector Current (mA)
1	0	
2	0.1	
3	0.2	
4	0.3	
5	0.4	
6	0.5	
7	0.6	

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