University Center of Mila

Institute of Science and Technology

Option: Electromechanics

Lab: 4

Bipolar Transistor

1. Objectives:

1. Plot the characteristics $I_E=f(V_{CE})$: $I_C=f(I_B)$ & $I_B=f(V_{BE})$ of the bipolar transistor;
2. Deduce the current amplifier function and calculate the current gain;
3. Understand the operation of the transistor.

11. Equipment Used: For this lab, the following equipment is used:

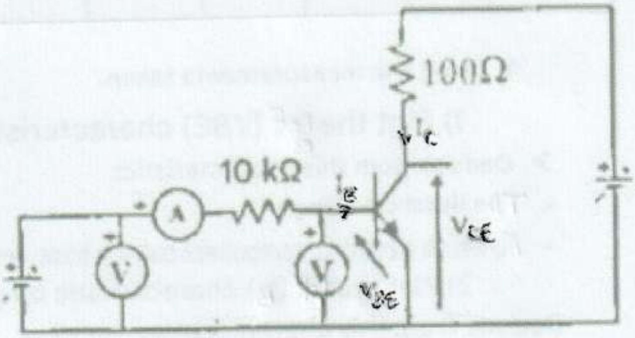
- ☐ Two regulated power supplies
- ☐ Three digital multimeters.
- ☐ Connecting cables.
- ☐ Two resistors of 10.2kΩ and 100. Ω.
- ☐ Two resistors of 43kΩ
- ☐ BC548B bipolar transistor.

III. Theoretical Study:

Must be done by the students in the group.

IV. Experimental Study

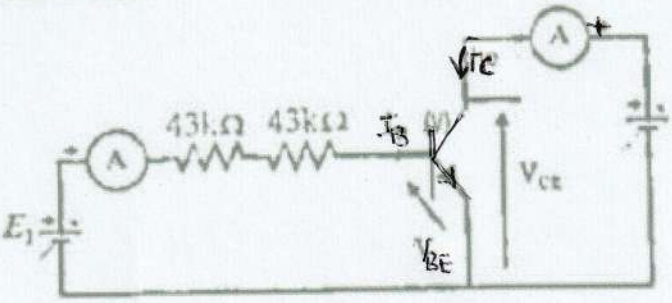
1. Input characteristic $I_B=F(V_{BE})$



- Set up the circuit shown in the following figure:
- Set the voltage E_2 to 10 V
- Fill in the following table:

E_1 (V)	0	0.7	0.8	1	2	3	4	5	6	7	8	9
V_{BE} (mV)												
I_B (μA)												

2. Current transfer characteristic $I_C=f(I_B)$ at constant V_{CO}.

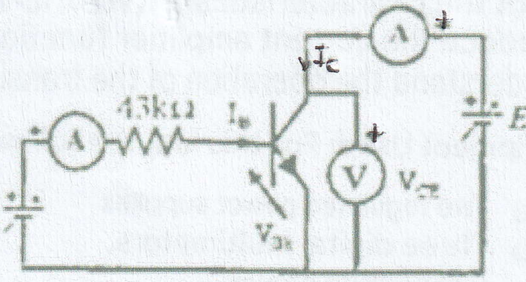


- Set up the circuit in the following figure:
- Set the voltage E_2 to 5 V
- By adjusting E_1, vary I_B
- Fill in the following table:

I_B (μA)	0	10	20	30	40	50	60	70	80	90	100	110
I_C (mA)												

3. Output Characteristic $I_C = F(V_{CE})$ at Constant I_B

- Set up the circuit in the following figure:



- Set the current to 200 µA
- Vary E_2 and fill in the following table:

V_{CE} (V)	0	0.1	0.2	0.3	0.4	0.5	0,6	1	1.5	2	2.5	3
I_C (mA)												

V. Using the measurements taken.

1) Plot the $I_E = F$ (VBE) characteristic on graph paper

➤ Deduce from this characteristic:

- The threshold voltage
- To which electronic component can the base-emitter junction of the transistor be compared? Justify your answer.

2) Plot the $I_C = F(I_B)$ characteristic on graph paper at constant VCE

Deduce from this characteristic:

The β = gain Ic/Ib. Compare this gain with that given by the constrictor: $200 \overset{\beta}{<<} 450$

3) Plot the $I_C = F(V_{CE})$ characteristic at constant voltage on graph paper.

➤ Deduce from this characteristic:

- The two operating regions of the transistor.

VI. *Conclusion*

Draw a suitable conclusion regarding this lab

Centre Universitaire de Mila

Institut des sciences et technologie **Option :** ***Electromécanique***

Nom et Prénoms			***Groupe***	***Note***
Nom et Prénoms				
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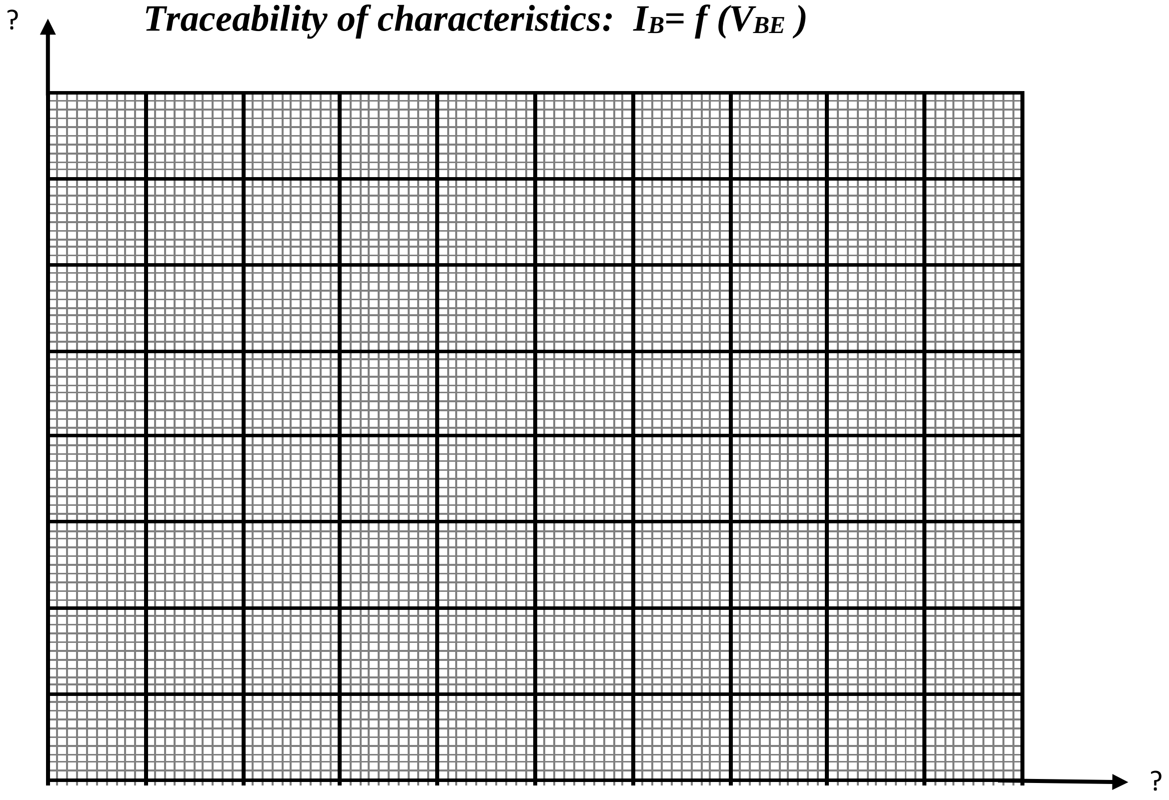
Traceability of characteristics: $I_B = f(V_{BE})$



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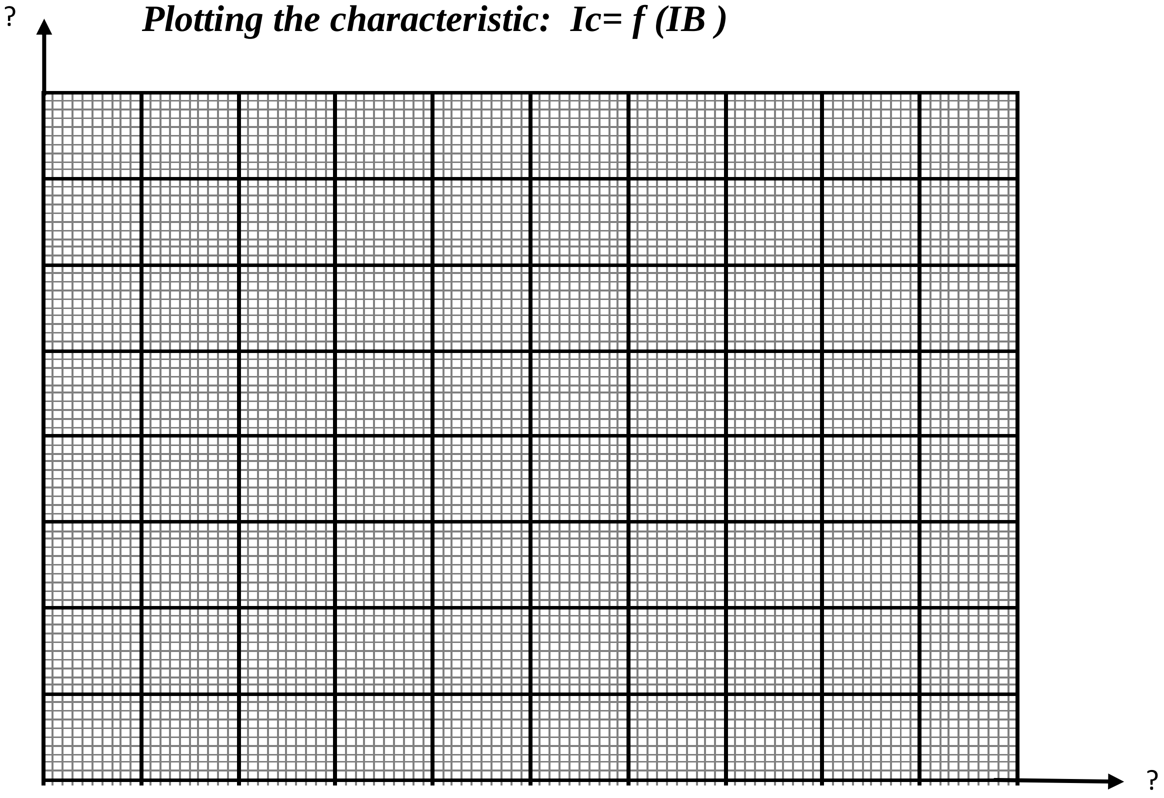
Plotting the characteristic: Ic= f (IB)



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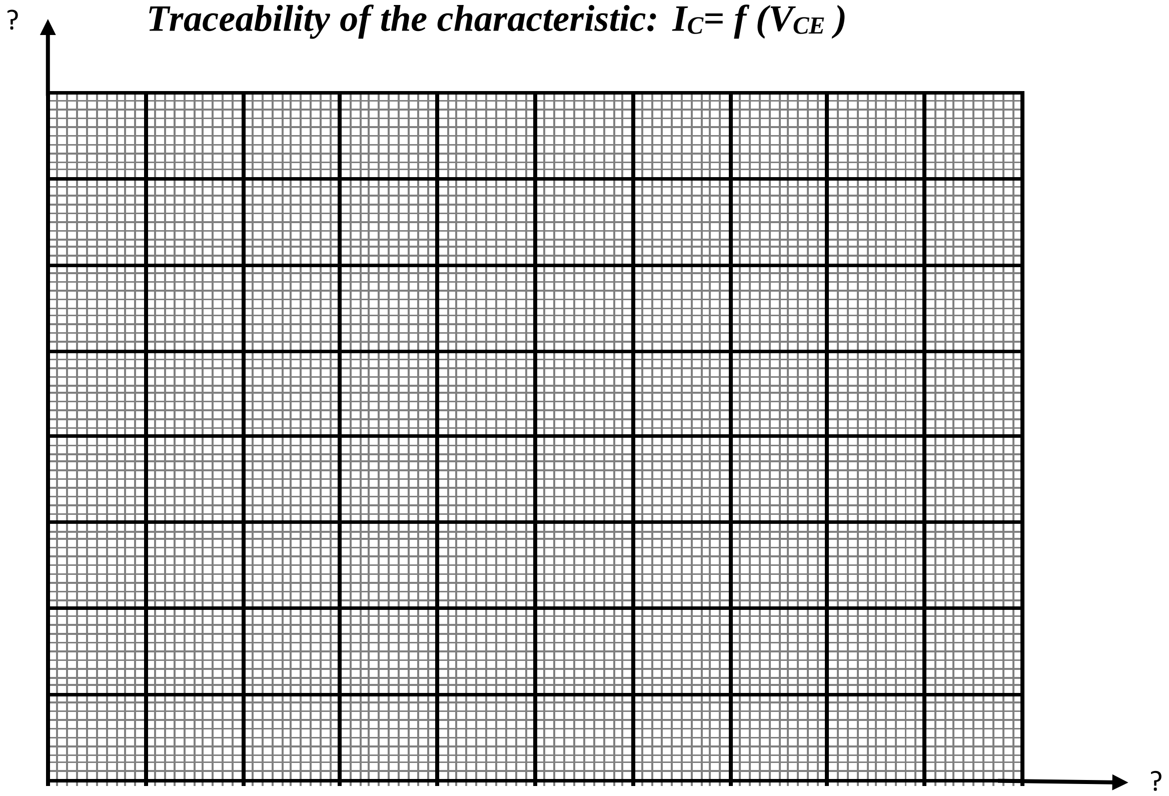
Traceability of the characteristic: $I_C = f\,(V_{CE})$



VII) Conclusion: draw an appropriate conclusion about this practical assignment.