EXPPERIMENT#11

Bipolar Transistors

Objective:

Testing the layering and rectifying behavior of bipolar transistor.

Introduction:

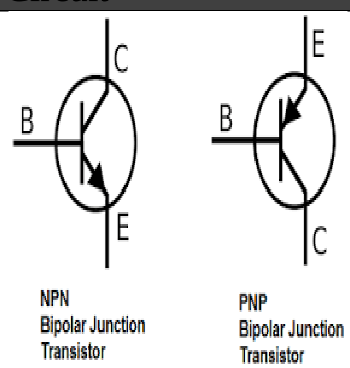
Transistors are three pole semiconductor components in which either a thin p-conductor layer is embedded two n-conducting layers (n-p-n transistor) or a thin n- conducting layer between two p-conducting layers(p-n-p transistor).

The p-n transitions between the middle layer(base and two outer layers emitter and collector) have a rectifier effect which can be investigated like every rectifier diod

Task: The effect of the p-n transition of an n-p-n transistor on the current flowing through it is to be investigated depend on the applied voltage polarity . then the experiment is to be repeated with n-p-n transistor are to be investigated

Experiment Part 1:

Connect the circuits shown on the tables. The measurements are the with digital multi meter DMM

	Circuit	Polarity	n-p-n	p-n-p
Base/emitter line		Base+, emitter-	0.7	2.9
		Base-, emitter+	2.9	0.68
Base /collector line		Collector-,base+	0.7	2.9
		Collector+,base-	2.9	0.6
Collector/emitter line		Collector+,emitter-	2.9	2.9
		Collector-,emitter+	2.9	2.9

Q1 :What basic properties do the two p-n transistor have?

(**bipolar transistor)**is a type of transistor that uses both electron and hole charge carriers. In contrast, unipolar transistors, such as field-effect transistors. only use one kind of charge carrier. For their operation, BJTs use two junctions between two semiconductor types, n-type and p-type.

BJTs are manufactured in two types, NPN and PNP, and are available as individual components, or fabricated in integrated circuits, often in large numbers.

The basic function of a BJT is to amplify current. This allows BJTs to be used as amplifiers or switches, giving them wide applicability in electronic equipment, including computers, televisions, mobile phones, audio amplifiers, industrial control, and radio transmitters.

Q2 :what must be considering when switching a circuit from p-n-p or n-p-n transistor?

N-p-n: when no voltage or zero voltage is applied at the input, transistor operates in cutoff region and acts as an open circuit. In this type of switching connection, load (here LED lamp) is connected to the switching output with a reference point. Thus, when the transistor is switched ON, current will flow from source to ground through the load.

P-n-p: In this connection, load is connected to the transistor switching output with a reference point. When the transistor is turned ON, current flows from the source through transistor to the load and finally to the ground.

Q3: if we measure a certain transistor on the ohmmeter and it give a reading does this transistor good or bad ?

The transistor is good and it's conducting .

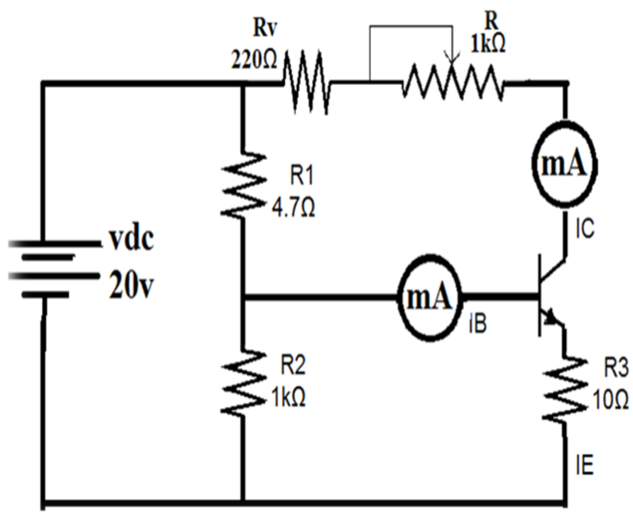
Q4 :how do you identify the base of transistor?

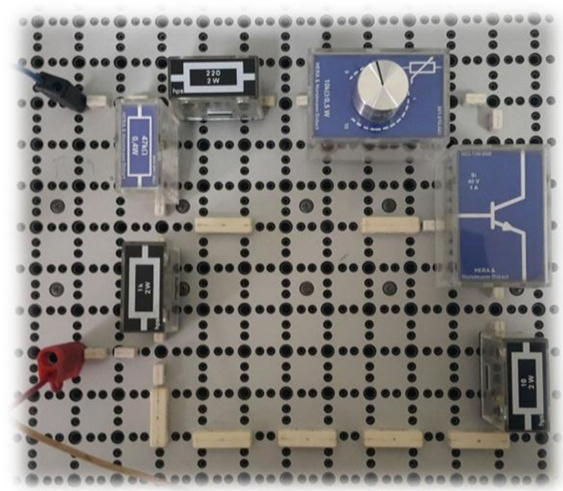
keep the front flat side facing you and count the pins as one, two etc. In most NPN **transistors** it will be 1 (Collector), 2 (**Base**) and 3 (Emitter). Thus CBE. But in PNP **transistors**, the condition will be just reversed

Part three(current distribution in the transistor and control effect of the base current):

Procedure:

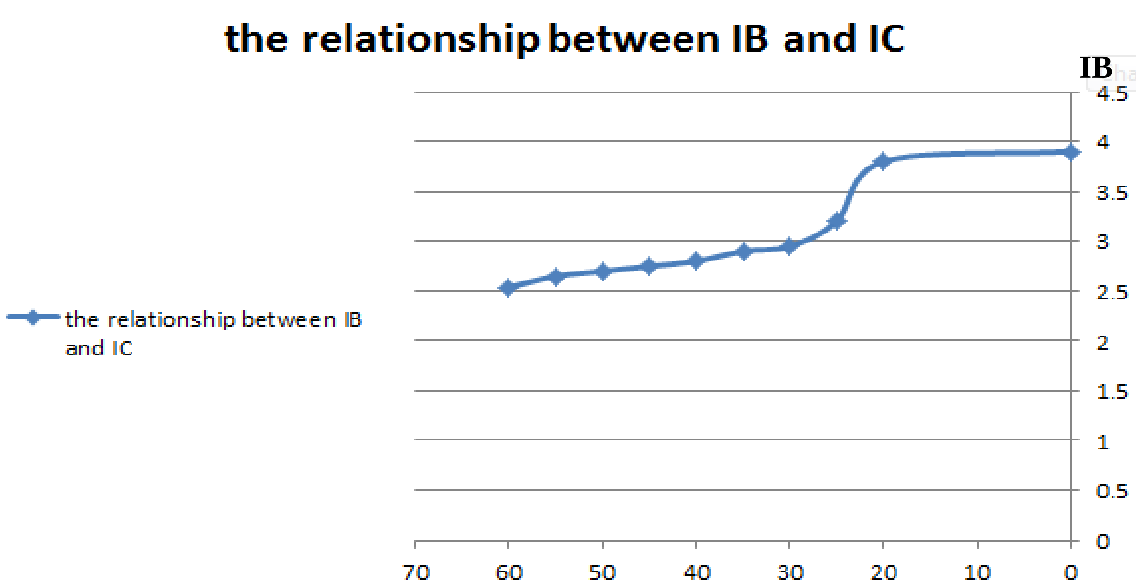
1. **Set up the circuit as shown.**



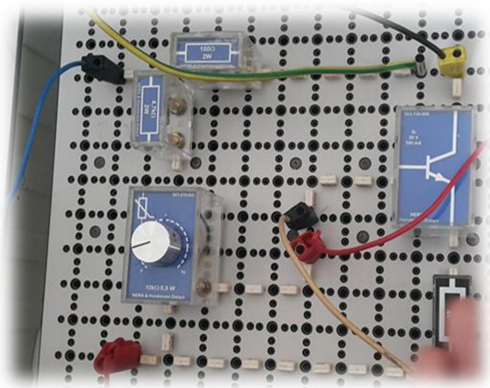


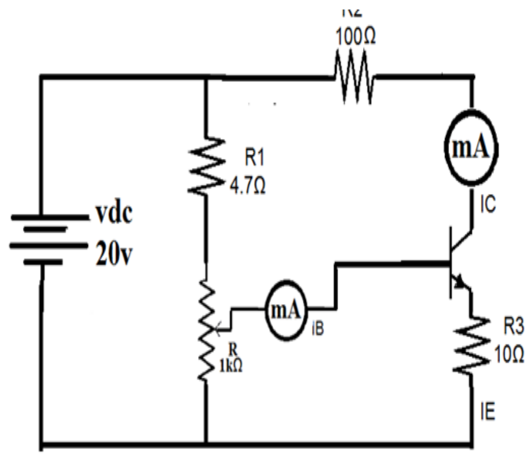
2. **We enter different value of Ic by changing the value of the variable resistance.**
3. **We measure the value of the base current.**

IC	0	20	25	30	35	40	45	50	55	60
IB	3.9	3.8	3.2	2.95	2.9	2.8	2.75	2.7	2.65	2.54



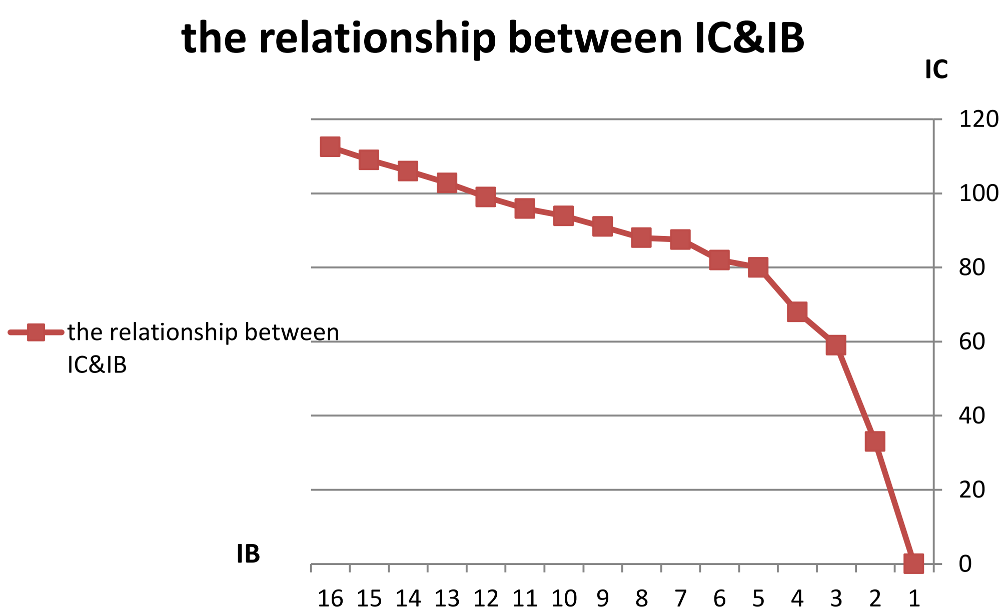
4. We set up the circuit as shown





5. We measure the collector current during we change the base current (see the attached table).

IB(mA)	0	0.05	0.1	0.15	0.2	0.25	0.3	0.35	0.4	0.45	0.5	0.6	0.7	0.8	0.9	1
IC(mA)	0	33	59	68	80	82	87.5	88	91	93.9	95.9	99	102.8	106	109	112.5



Q1 : What does the curve tell us :

When the current IB increases the current IC increases in linear relation then it becomes in saturation region on it reach to a specific point .

Q2 : The current amplification factor β at Ic =55 mA , β = (Ic / IB)

$when\ Ic = 55\ mA$ → IB = 0.3 mA

β = 183.42mA

Q3 – The small signal current amplification , **β** = (ΔI c / ΔIB)

For small signal β ΔIc = 20 mA -40 mA .

$$\beta = \frac{40 - 20}{0.2123 - 0.106} = 188.146\ mA$$

For larger β ΔIc = 70 mA - 80 mA .

$$\beta = \frac{80 - 70}{0.424 - 0.3715} = 190.476\ mA$$

Conclusion:

We learn current distribution in the transistor and control effect of the base current , Testing the layering and rectifying behavior of bipolar transistor. The sources of error :personal errors. ,calculation errors, wear wires , Don't take the accurate values from the signals &Errors in connection that may you have false values.