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Experiments of analog electronics laboratory

Lab(5)

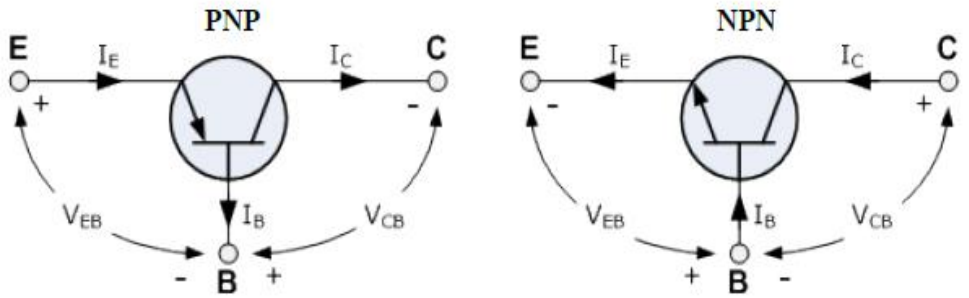
The Input characteristic of transistor

1. **Aim of the experiment :**

Determining the characteristic curve of the transistor and measurement of the basic current I_{BE} as a function of base voltage V_{CE} keeping the emitted-collector voltage V_{CE} constant.

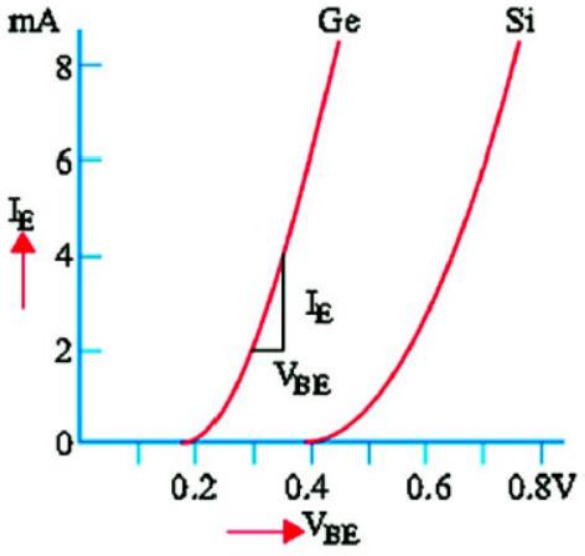
2. Theory:

A Bipolar Junction Transistor, or BJT is a three-terminal device having two PN junctions connected together in series. Each terminal is given a name to identify it and these are known as the Emitter (E), Base (B), and Collector (C). There are two basic types of bipolar transistor construction, NPN and PNP, which basically describe the physical arrangement of the P-type and N-type semiconductor materials from which they are made. Bipolar Transistors are"CURRENT" Amplifying or current regulating devices that control the amount of current flowing through them in proportion to the amount of biasing current applied to their base terminal. The principle of operation of the two transistor types NPN and PNP, is exactly the same the only difference being in the biasing (base current) and the polarity of the power supply for each type.



The symbols for both the NPN and PNP bipolar transistor are shown above along with the direction of conventional current flow. The direction of the arrow in the symbol shows current flow between the base and emitter terminal, pointing from the positive Ptype region to the negative N-type region, exactly the same as for the standard diode symbol. For normal operation, the emitter-base junction is forward-biased and the collector-base junction is reverse-biased. Transistor Configurations: There are three possible configurations possible when a transistor is connected in a circuit: (a) Common base, (b) Common emitter (c) Common collector. We will be focusing on the common emitter configurations in this experiment. The behaviour of a transistor can be represented by d.c. current-voltage (I-V) curves, called the static characteristic curves of the device. The tow important characteristics of a transistor are: (i) Input characteristics, (ii) Output characteristics. These characteristics give information about various transistor parameters, e.g. input and out dynamic resistance, current amplification factors, etc

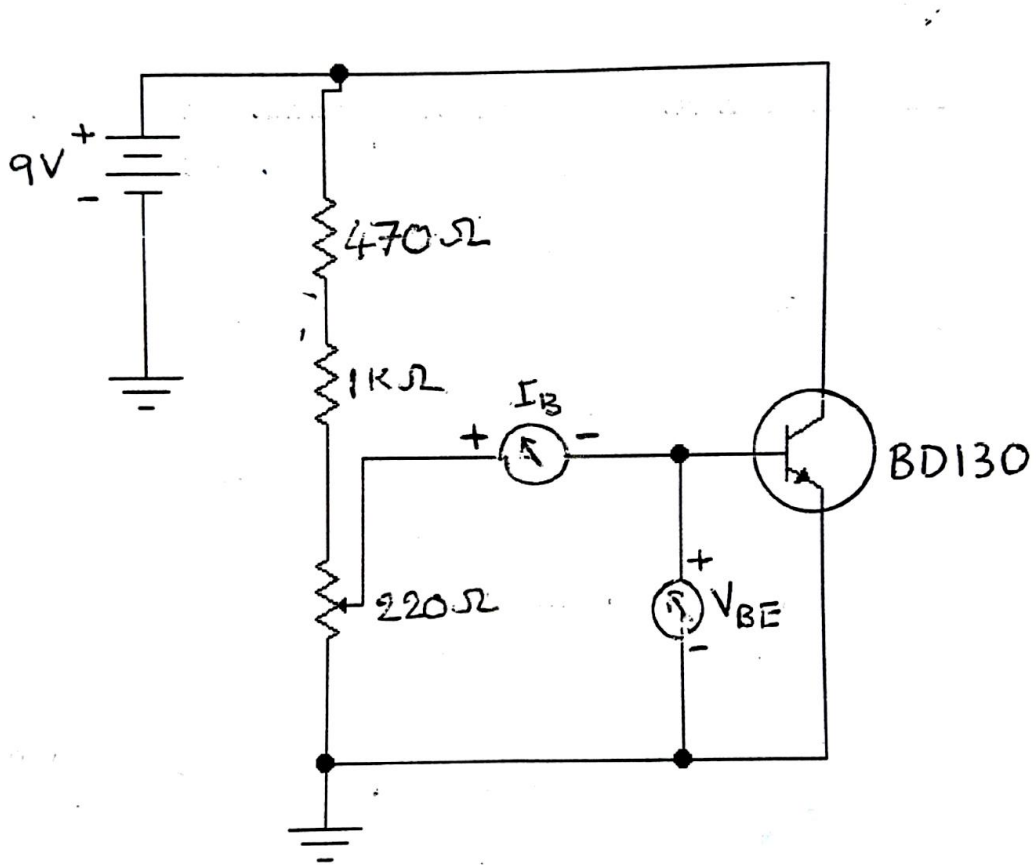
The input characteristics resemble that of a forward biased diode curve. This is expected since the Base-Emitter junction of the transistor is forward biased. As compared to CB arrangement IB increases less rapidly with VBE.Therefore input resistance of CE circuit is higher than that of CB circuit.



The Input characteristic of transistor

3. practical part:

a. Assemble the circuit as follows:



b. Adjust the voltage V_{CE} to 9 Volt.

c. increase the voltage V_{BE} from 0.1 to 0.6 with a potentiometer corresponding to the step given in the table below, and measure the corresponding base current I_B.

V_{BE}(volt)	0.1	0.2	0.4	0.5	0.55	0.6
I_B(mAmp)						

d. Draw the relationship between I_B vs V_{BE}.