# BJT (BC-547) *I-V* Characteristics

**(Note: Use Aplab (white) Multimeter for current measurement and the other to measure voltages)**

**Objectives:** To obtain the *I-V* characteristics of bipolar transistors and computer transistor parameters.

**Background:** The Bipolar Junction Transistor (BJT) is the heart of most analog ICs. In this experiment, you will measure the DC *I-V* characteristics of a BJT and compute some of the device parameters. As the BJT is three-terminal device, the *I-V* characteristics can be plotted in different ways. Depending on the amplifier circuit that we want to make up with the BJT, one of these plots may be more convenient than the others. The purpose of the first part of the experiment is to obtain two such plots. In the second part of the experiment, you will plot the current gain *(β)* as a function of the collector current $I_C$.

**Experiment:** You will be given two multimeters. It is convenient to use one of them to measure a current directly (i.e., as an ammeter) and the other to measure various voltages in the circuit. The ammeter connections should not be disturbed during the measurements. You will have to choose 100Ω values for the resistances $R_E$, $R_B$, $R_C$ in the figures below, so that the measurements can be made reasonably accurately.

**Part I: $I_E$-$V_{EB}$ characteristics**

(a) Connect the circuit as shown in Fig. 1(a). Measure $I_E$ versus $V_{BE}$ for $V_{CB}$=1V and 2V. Limit $I_E$ to about 10 mA. Measure $V_{CB}$ for each reading (while you are adjusting $V_{EB}$). You may have to adjust both $V_1$ and $V_2$ to ensure that $V_{CB}$ has not changed.

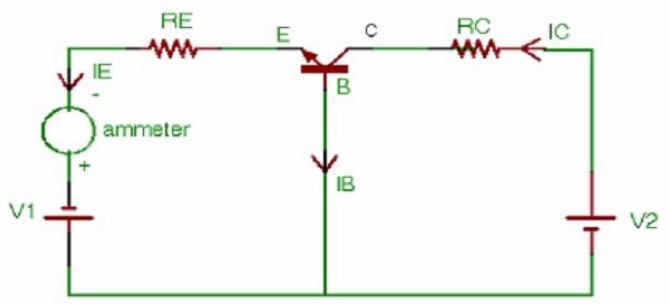
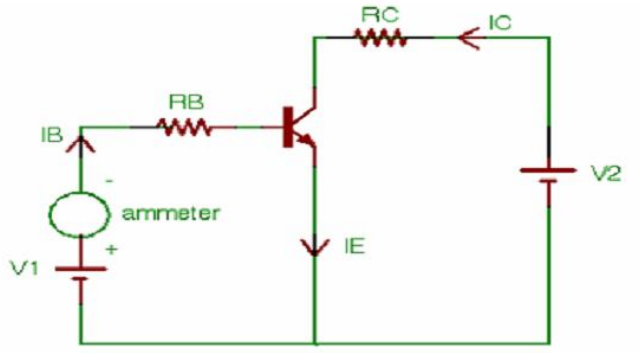



**Figure 1(a)**

(b) Connect the circuit as shown in Fig. 1(b). Our purpose is to keep $I_B$ constant, and measure $I_C$ versus $V_{CE}$; then repeat for another value of $I_B$ and so on. Again, you may have to adjust both $V_1$ and $V_2$ to ensure that $I_B$ remains constant as you try to vary $V_{CE}$ upto 8 volts. (For measuring the current $I_C$ measure the voltage across $R_C$. Set the current $I_B$ to 150μA and 200μA)




## Part II: β versus $I_C$

Connect the circuit as shown in Fig. 2. We want to keep $V_{CE}$ constant (say, 2V), measure $I_C$ for various values of $I_B$, and then plot the DC $\beta$ ($=I_C/I_B$) versus $I_C$ (with $I_C$ on a log scale). You need to get data for 3 or 4 decades of $I_C$, say, from few tens of μA to 50 mA.

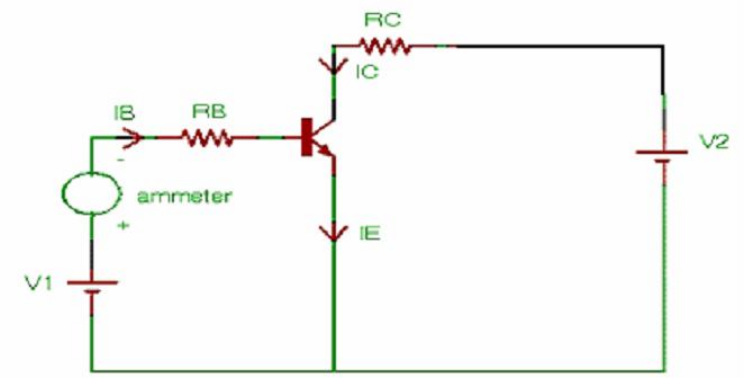



**Figure 2**