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The n-p-n Transistor

The n-p-n transistor is shown in fig. (a). With the emitter junction forward biased, the electrons in the emitter and the holes in the base move towards the emitter junction, the holes being repelled by the positive terminal and the electrons by the negative terminal of the battery V_{EE}. Obviously, the emitter junction will have low impedance. The collector-base circuit is reverse biased and as such the collector junction will have high impedance.

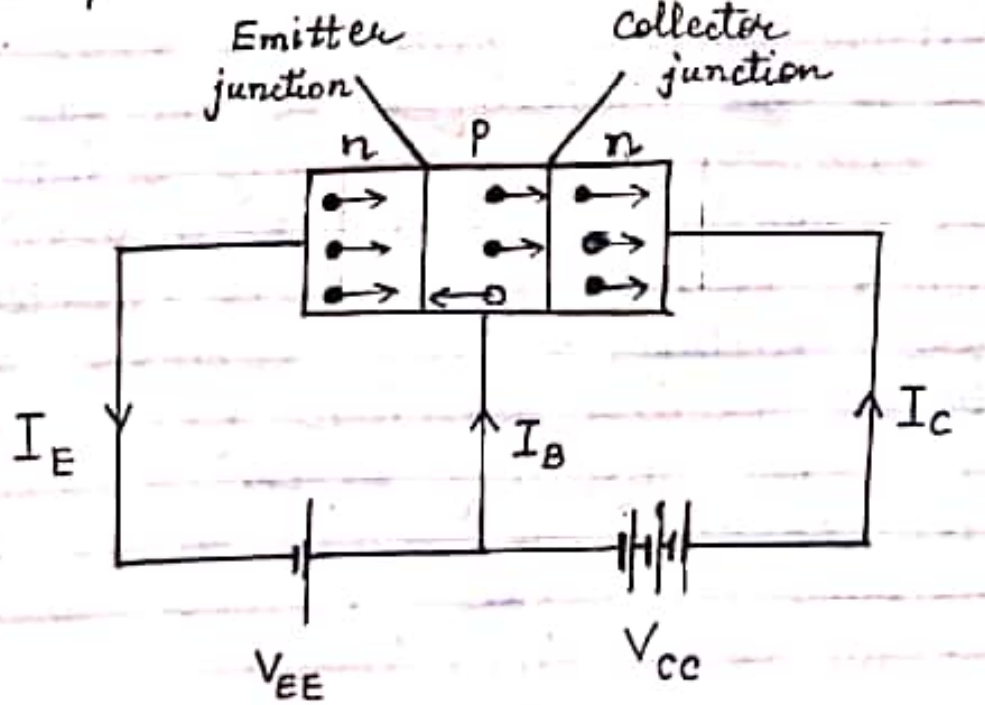

Fig. (a)

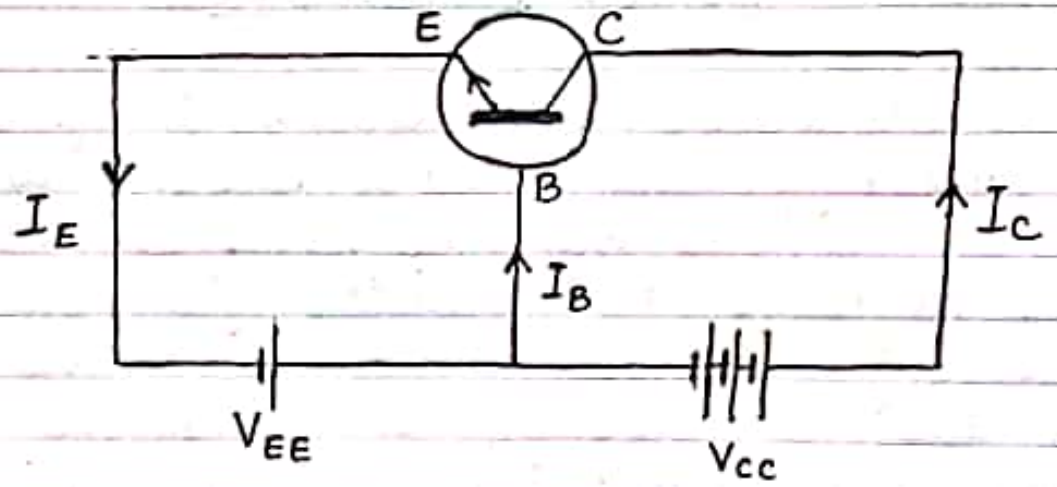

Fig. (b)

On reaching the emitter junction, a small fraction (about 5%) of the total no. of electrons combines with the holes in the base to get neutralized. As the base layer is extremely thin and only slightly doped, the collector, which is at a very high positive potential will collect almost all the electrons. These electrons will flow to the positive terminal of the battery V_{CC}. The deficiency of the electrons in the emitter is made up by the electrons from the negative terminal of the battery V_{EE}. Thus:

The current is carried in the crystal as well as in the external

circuit by the electrons.

Further,

$$I_E = I_C + I_B \quad \text{— (2.)}$$

where the letters have their usual meanings. Here, also I_E and I_C flow in the opposite directions in the base as shown in fig. (b).