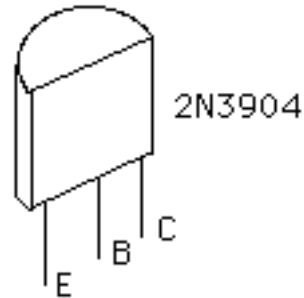
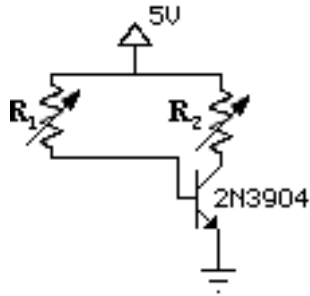


Physics 4700 Experiment 4

Transistors - 1

1) Build the following circuit, with $R_1 = 5\text{ M}\Omega$ and $R_2 = 10\text{ k}\Omega$. Vary I_B between 1 and $30\text{ }\mu\text{A}$ and measure V_{CE} and I_C . Plot I_{C1} , $\beta (= h_{fe} = I_C / I_B)$, V_{CE} , vs. I_B . Compare your results with Fig. 11 (this figure has V_{CE} fixed at 10 V) of the 2N3904 spec sheet. What is the saturation current and saturation voltage (V_{CE} at saturation)?



2) Design a single stage common emitter amplifier. The amplifier should have the following specs:

- flat frequency response from 30 to 10 kHz (i.e. -3 dB point at 30 Hz)
- voltage gain of ≈ 100
- input impedance $> 300\text{ }\Omega$

3) Measure the following properties of your amplifier and compare your results with expectations:

- DC voltages at operating point (V_E , V_B , V_C).
- plot voltage gain as a function of frequency (30-100 kHz).
- capture a picture of the amp's output response to a large input sine wave.

Suggested References:

Class notes of course.

Simpson Experiment 13 (P. 862) and 14 (P. 864).

Student Manual for Art of Electronics (most of Chapter 2).