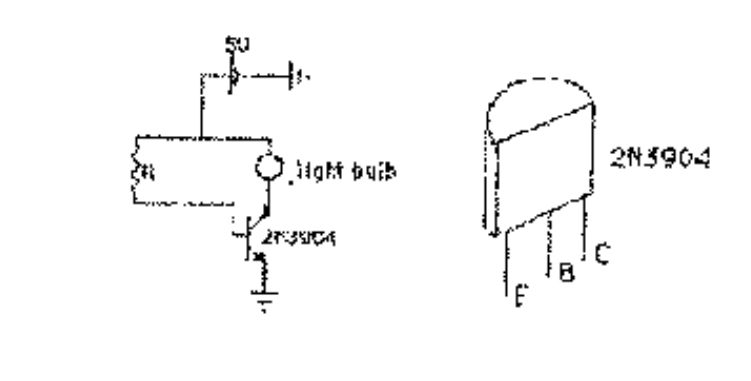


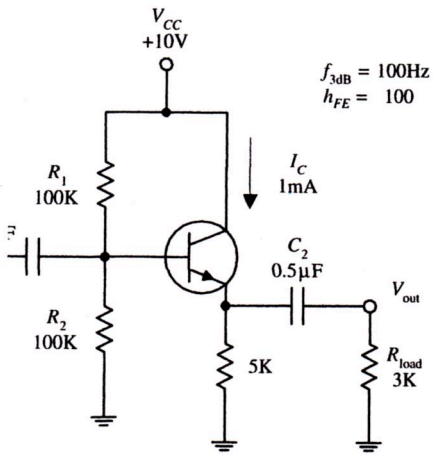
Physics 517/617 Experiment 4

Basic Experiment - Physics 517/617

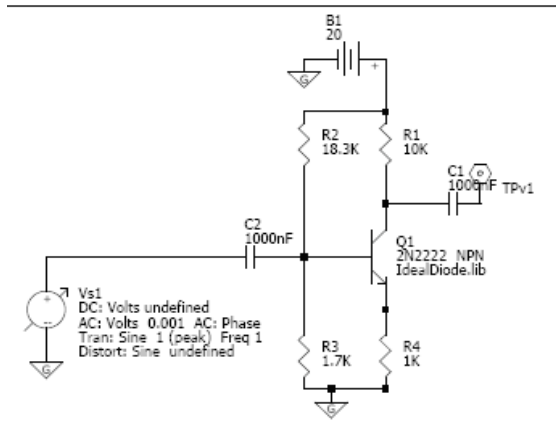
1) Build the following circuit. Vary R_1 between $500\ \Omega$ and $50\ \text{K}\Omega$ (using a resistor box if possible). Use a $100\ \Omega$ resistor instead of the light bulb. Measure V_{BE} and I_C . Determine β (h_{fe}) for each of your measurements. Plot I_B vs I_C . What is the saturation current and voltage (V_{CE})? For what values of R would this circuit make a good switch?



2) Build an emitter follower similar to that shown below (Fig. 4.57 of *Practical Electronics for Inventors*). Measure its gain and output impedance for frequencies for 100 Hz to 1 MHz. Compare the latter to what you measured for the function generator in Lab 1. In your write up, explain the purpose of this circuit.



3) Build the following single stage common emitter amplifier (with emitter degeneration).



- First build the circuit without the capacitors or sinusoidal source.
- Check the V_{BE} is .7 volts
- Add the capacitor and sinusoidal generator to your circuit.

Measure the following properties of your amplifier and compare them to what you expect theoretically:

- operating point (V_{CE} , I_C with no input signal).
- gain: make a bode plot for frequencies 100 Hz – 1 MHz
- response to large signals

In your write-up explain the biasing of the transistor and the requirements on the resistors connected to the transistor's base.

4) Add a bypass capacitor across the emitter resistor such that $RC < 1$ kHz and make bode plots of the gain and phase shift of output of the transistor. Explain the function of the bypass capacitor.

No additional work is required for Physics 617