

Experiment 7

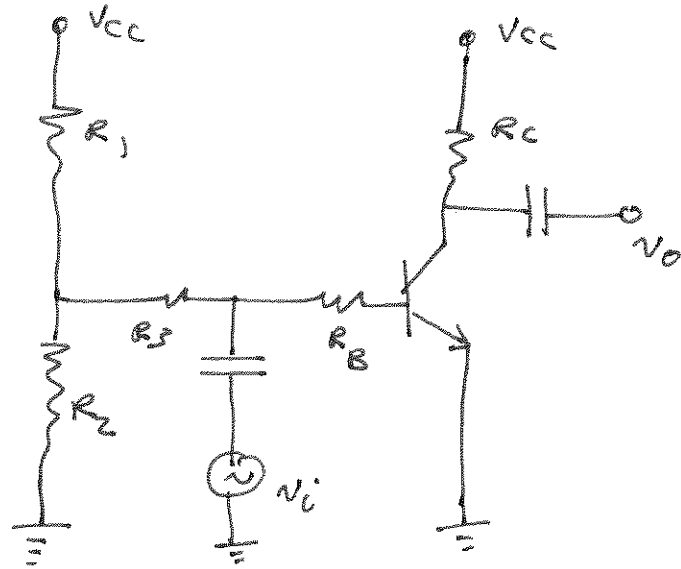
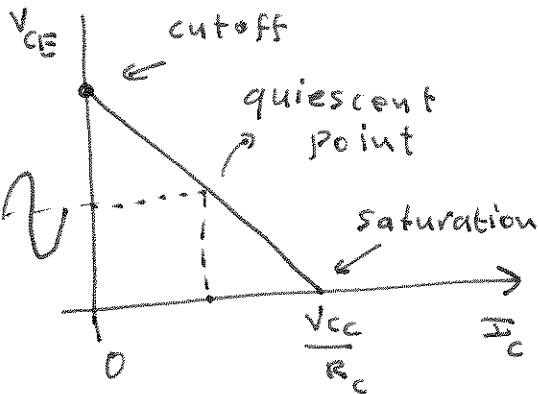
BJT Transistor as an Amplifier

①

DC Load Line

$$V_{CC} = I_C R_C + V_{CE}$$

$$V_{CE} = V_{CC} - I_C R_C$$



• Variation of ac signal should remain along the linear (active) curve to avoid clipping.

DC circuit

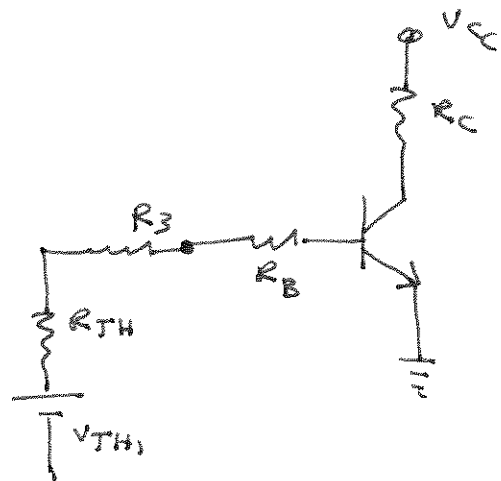
$$R_{TH} = R_1 \parallel R_2$$

$$V_{TH} = V_{CC} \frac{R_2}{R_1 + R_2}$$

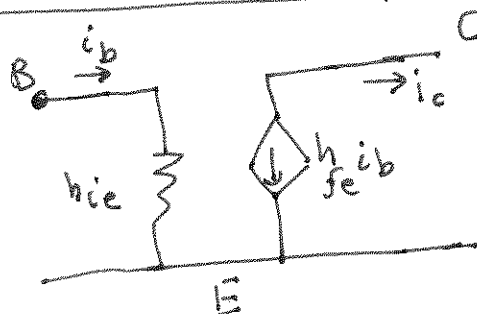
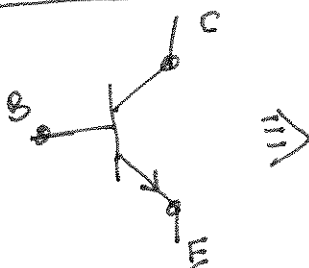
$$V_{TH} = I_B (R_{TH} + R_3 + R_B) + V_{BE}$$

$$I_B = \frac{V_{TH} - V_{BE}}{R_{TH} + R_3 + R_B}$$

$$I_C = \beta I_B, \quad I_E = (\beta + 1) I_B$$



Transistor ac equivalent circuit



$$h_{ie} = \frac{v_{be}}{i_b}$$

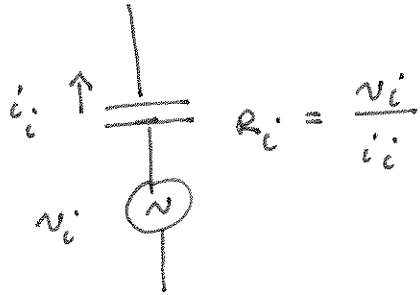
$$h_{fe} = \frac{i_c}{i_b}$$

all ac quantities

$$\text{Transistor gain} = \frac{v_c}{v_b} = \frac{v_o}{v_b} \quad (\text{output relative to base voltage})$$

$$\text{Amplifier gain} = \frac{v_o}{v_i} \quad (\text{output relative to input voltage}). \quad (2)$$

$$\text{input resistance as seen from source} = \frac{v_i}{i_i}$$



output resistance

$$R_o = \frac{v_o}{i_o}$$

remove v_i (short) and add a source at the output.

