XERCISE

5.40 The transistor in Fig. E5.40 is biased with a constant current source $I = 1$ mA and has $\beta = 100$ and $V_A = 100$ V. (a) Find the dc voltages at the base, emitter, and collector. (b) Find g_m, r_π, and r_o. (c) If terminal Z is connected to ground, X to a signal source v_{sig} with a source resistance $R_{sig} = 2$ kΩ, and Y to an 8-kΩ load resistance, use the hybrid-π model of Fig. 5.58(a), to draw the small-signal equivalent circuit of the amplifier. (Note that the current source I should be replaced with an open circuit.) Calculate the overall voltage gain v_y/v_{sig}. If r_o is neglected what is the error in estimating the gain magnitude? (*Note:* An infinite capacitance is used to indicate that the capacitance is sufficiently large that it acts as a short circuit at all signal frequencies of interest. However, the capacitor still blocks dc.)

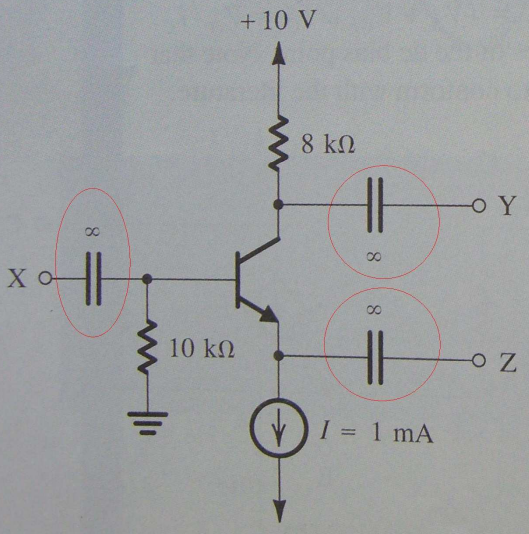

FIGURE E5.40

Ans. (a) −0.1 V, −0.8 V, +2 V; (b) 40 mA/V,