2. Frequency analysis of transistor amplifiers

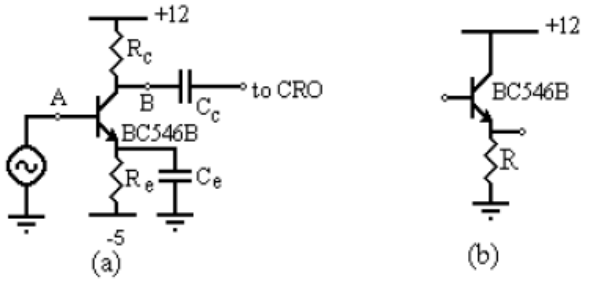
A. For circuit (a) below, calculate:

R_e and R_C to make $I_C \approx 0.2$ mA and $V_{CE} \approx 6$V.

C_e to give a pole frequency at about 400 Hz, and C_C to give a pole at about 50 Hz.

The oscilloscope input resistance is 1 MΩ. For initial calculations assume $C_\mu = 5$ pF and $C_{CRO+cable} = 110$ pF. (These will be measured in the lab.) The generator resistance is 50 Ω, which may be taken as a good approximation to zero for this experiment. Moreover, the input will be monitored across the generator and its voltage kept constant, so it may be treated as an ideal voltage source.

Estimate the voltage gain, the frequency of the zero introduced by C_e, and the upper 3-dB frequency f_h. What is the voltage gain if C_e is omitted?



B. Circuit (b) is to be inserted in series at point B to buffer the load capacitance. Calculate R to give a collector current of about 1.2 mA. Assuming a 'typical' value for h_{fe}, recalculate f_h. Is the pole frequency introduced by C_C significantly affected?

C. Leaving circuit (b) in place, a 10 kΩ resistor is inserted at point A (simulating a higher source resistance than that of the generator). Recalculate f_h. Is the pole frequency introduced by C_e affected?
