Physics 321: HW 8

Problems 8.7, 8.8, 8.9, 8.10, 8.12, and 8.17 in Sprott.

Notes:

Sprott calls r_E $r_{tr.}$ He also adds a resistance r_{ohmic} for the wire inside the transistor.

8.8: $r_{tr} = r_{ohmic} + (0.026 \text{ ohm-A})/I_E$

8.10: The circuit is as in fig. 8.6, but the problem as given is under-specified and doesn't determine all the circuit values. So choose the quiescent point to allow roughly equal positive and negative voltage excursions on the output. Choose bias resistor values so that the input impedance of your amplifier is as high as possible without having the quiescent point (V_C) shift by more than 0.5 volts if the beta were to go to infinity. To simplify the algebra, you can calculate R_2/R_1 to give you equal swings at infinite beta, then get $R_1//R_2$ such that it won't shift more than about 0.5 V going to beta of 100. After you have z_{in} , you can calculate a value for C_B that will make the gain fall off by 3 dB at 25 Hz (this would be called the "lower corner frequency" of the amplifier). Hint: start with the desired output impedance, then the desired gain. This will easily give you R_C and R_E. Then you can calculate your loadline and Q point. You can neglect r_{tr} here, since it's not shown in the equivalent circuit.

8.12: Note that the problem refers only to "lower-case" variables, so you can just use the small-signal equivalent circuit to get all the answers. Remember that capacitors are shorts and that you should combine resistors if possible to simplify the circuit. For an accurate answer, don't forget to put r_{tr} in your equivalent circuit.