Week #5 Homework

1. Verify that an 8ºC rise in ambient temperature will cause a base-voltage biased common-emitter amplifier to saturate, assuming that it was initially biased for V_C=0.5 V_{CC}. Draw this out using only the r_E inherent in the transistor (don't add an extra R_E or R'). "Saturate" means that so much current flows that V_{CE} gets to only about 0.1V.
2. Design a tuned common-emitter amplifier to operate at 100 kHz: a bandpass filter built into the stuff stuck onto the transistor's emitter such that one frequency gets amplified by the amp, others do not. Use a bypassed emitter resistor, and set the quiescent current at 1.0 mA. Assume V_{CC}=+15 V and L=1.0 mH, and put a 6.2k resistor across the LC to set Q=10 (to get a 10% bandpass: look in your notes from when we first put up a passive LRC filter). Use capacitive input coupling.
3. Design a common-emitter npn amplifier with a voltage gain of 15, V_{CC} of +15 V, and an I_C of 0.5 mA. Bias the collector at 0.5 V_{CC}, and put the low-frequency 3dB point at 100 Hz.