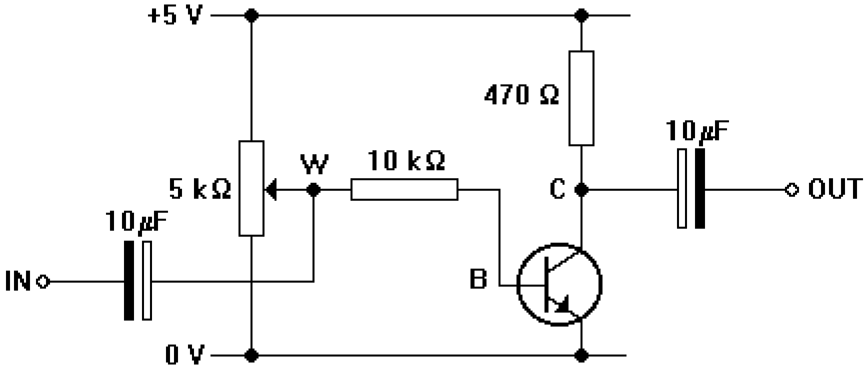
Investigating a common-emitter amplifier

1 Assemble the amplifier circuit shown below. Use a low power signal bipolar transistor.



2 Use a double-beam oscilloscope to monitor the voltages at W and C. If all is well, the voltage at C should fall as the voltage at W rises.

3 Set W to 0 V and slowly increase it until C starts to fall below +5 V. Note the value of the voltage at W. Then continue to increase the voltage at W until C hits 0 V and the transistor saturates. Note the new voltage at W.

4 Use the data from step 3 to calculate a value for the voltage gain of the circuit. Don't forget the sign.

5 Adjust the potentiometer so that C sits at +2.5 V. This should give the amplifier optimum bias.

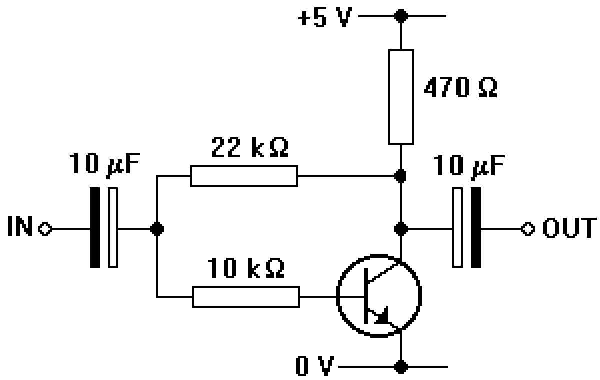
6 Use a signal generator to feed a 1 kHz sine wave with a peak value of 200 mV into the amplifier. Trigger the oscilloscope on the signal at the output. Sketch waveforms of the signals at IN, W, B, C and OUT. Don't forget to show the scales of the voltage and time axes.

7 Use the peak values of the input and output waveforms to calculate a value for the voltage gain. How does it compare with your value calculated in step 4?

8 Investigate the effect on the output waveform of altering the d.c. voltage at W.

9 Return the bias to its original optimum setting (step 5). Without altering anything else, note what happens when you replace your transistor with different ones.

10 Insert the original transistor. Remove the potentiometer. Use a 22 k resistor to provide bias from the collector, as shown below.



11 Measure the voltage gain of your new amplifier.

12 Note what happens now to the voltage gain and the bias if you replace the transistor with others.