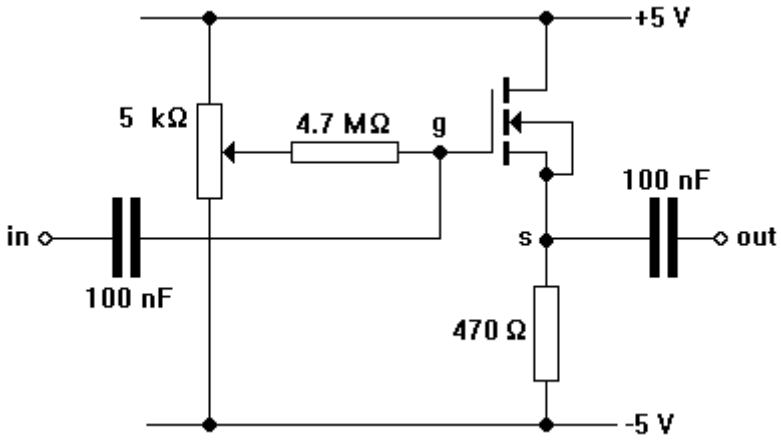
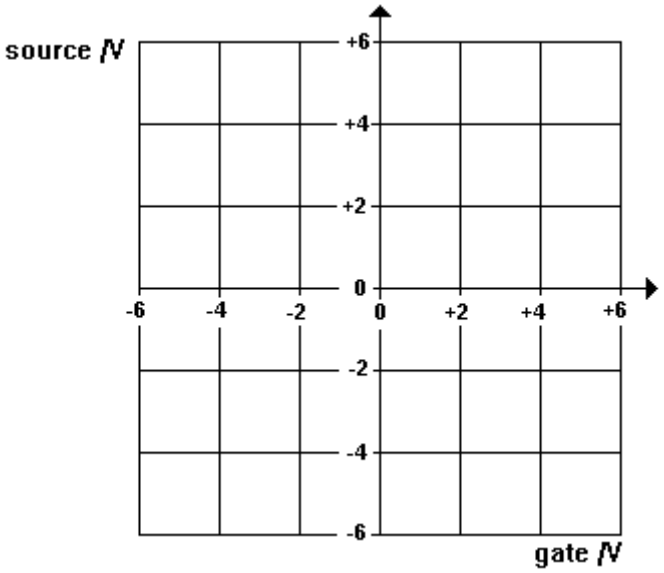
A MOSFET follower

1 Assemble the voltage follower circuit shown below.



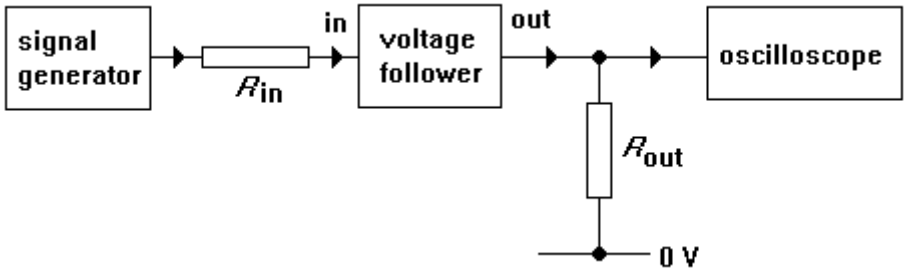
2 Use a double beam oscilloscope to monitor the voltages at the wiper and source. Use the potentiometer to vary the voltage at the gate. If all is well, the voltage at the source should rise from -5 V to about +3 V as the gate is raised from -5 V to +5 V. (The voltage at the gate should equal the voltage at the wiper.)

3 Set the wiper/gate voltage to -5.0 V. Measure the source voltage. Increase the gate voltage in steps of 1.0 V, measuring the source voltage each time. Plot the results on a grid like the one shown below.



4 Use the graph to state the voltage gain of the circuit when a.c. signals are placed at **in**. Suggest an optimum value for the d.c. voltage at the gate. Use the potentiometer to set the gate to this optimum voltage. Do not change it from now on.

5 The block diagram below shows how you can measure the input and output impedance of the circuit. R_{in} is a resistor in series with the follower input, and R_{out} is a load resistor at the output.



6 Verify that the input impedance of the voltage follower is 4.7 M as follows.

Make R_{in} and R_{out} both 47 k .

Adjust the signal generator so that the oscilloscope displays a 1 kHz sine wave with an amplitude of 1.0 V.

Replace R_{in} with 470 k and 4.7 M in turn. The latter should halve the amplitude of the signal displayed on the screen. This means that the input impedance of the voltage follower is about 4.7 M .

7 Measure the output impedance of the voltage follower as follows.

Note the amplitude of the signal displayed on the oscilloscope screen when R_{in} is left at 4.7 M .

Replace R_{out} with 4.7 k , 2.2 k , 1.0 k , 470 , 220 and 100 in turn, noting the amplitude of the signal displayed on the screen each time.

Use the results to estimate the output impedance of the voltage follower.

8 The block diagram below shows one way of demonstrating the benefits of a large input impedance for a voltage follower. Try it out.