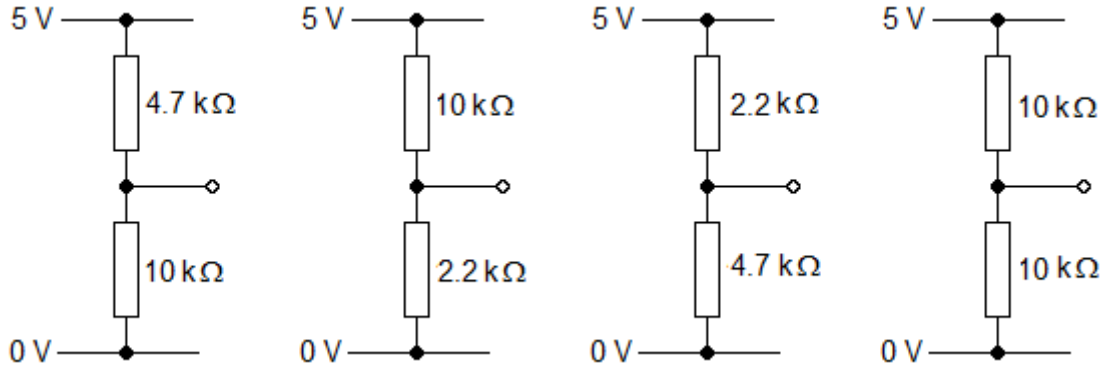


Voltage dividers

You are going to measure the output signal of these four voltage divider circuits and compare it with the calculated value.



- 1 For the first voltage divider, calculate
 - the total resistance R_{total}
 - the current in the resistors I
 - the voltage V_{calc} across the bottom resistor.

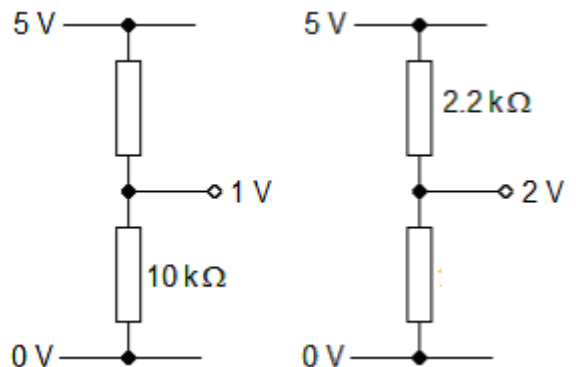
- 2 Assemble the circuit on breadboard. Use a voltmeter to measure the voltage V_{meter} at the output. If all is well, it should agree closely with the value of V_{calc} calculated in step 1.

- 3 Complete the table below for the four voltage dividers.

R_t	R_b	R_{total}	I	V_{calc}	V_{meter}
4.7 kΩ	10 kΩ				

- 4 Calculate suitable values for the unmarked resistors in these voltage dividers.

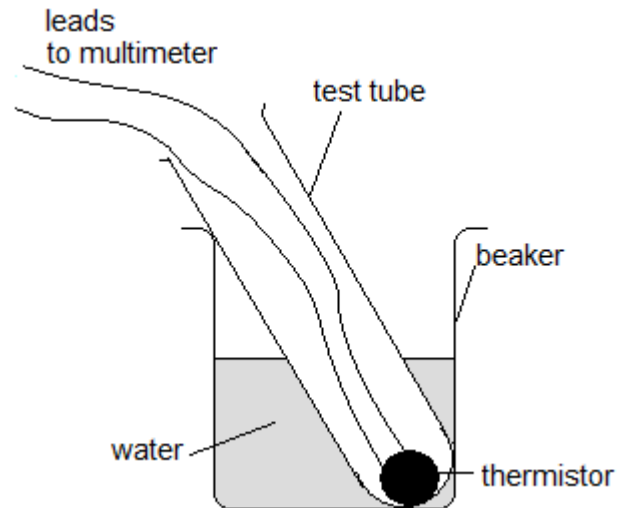
- 5 Assemble each voltage divider and use a voltmeter to verify that their output is at the stated voltage. Use pairs of resistors in series, as necessary, to obtain the required resistance value.



Environmental sensors

You are going to find the transfer characteristic of a thermistor, use it to make a simple temperature sensor and then evaluate the use of an LDR to measure light intensity.

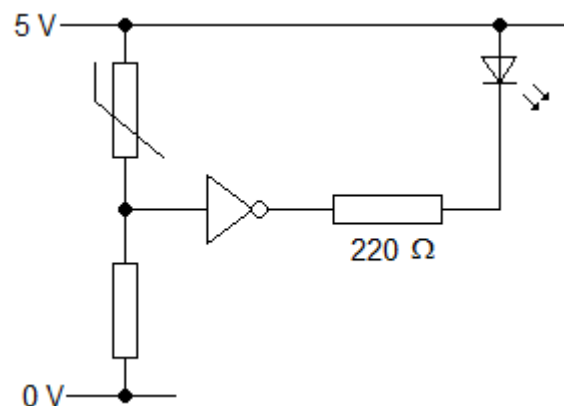
- 1 Set up the circuit shown opposite.
The thermistor needs to be connected to a multimeter set up as an ohm-meter. A thermometer will be needed to measure the temperature inside the test tube.



- 2 Use hot and cold water to hold the thermistor at several temperatures between 0 °C and 100 °C. Record the resistance of the thermistor each time.

- 3 Use your measurements to plot a resistance-temperature graph for the thermistor.

- 4 The circuit shown opposite uses an LED to indicate when the thermistor is above 20 °C. Use the graph to select a suitable value for the pull-down resistor.



- 5 Assemble the circuit. If all is well, the LED should start to glow when you heat the thermistor in your hand.

- 6 Replace the thermistor with an LDR. By trial-and-error, select a value for the pull-down resistor which allows the LED to stop glowing when you cover the LDR with your hand.

- 7 What do your observations of the circuit on your breadboard tell you about the relationship between the resistance of an LDR and its illumination?