**Using non-ohmic devices as sensors**

**Introduction**

This practical activity is intended to allow you to demonstrate your investigative skills and involves designing an appropriate circuit as well as carrying out an investigation.

You should be aware of the characteristics of the light dependent resistor (LDR) and thermistor. You should also have previously carried out experiments using a potential divider.

**Aim**

* To design a circuit which gives an output potential difference which:
1. increases as light level decreases
2. increases as temperature decreases
* To optimise your circuit to give the maximum range of potential difference on the output

**Intended class time**

* 60 to 90 minutes

**Equipment (per group)**

* metre rule
* variable Power Supply or Power Supply with Potential Divider
* voltmeter
* ammeter
* digital multimeter to measure resistance
* resistance decade box
* LDR
* thermistor
* leads
* crocodile clips (if using unmounted components)
* 12V lamp and separate supply
* ice (for thermistor)
* Bunsen tripod and beaker (for thermistor)
* thermometer (for thermistor)

**Health and safety**

* Safe use of electrical circuits

**Procedure**

**A) Using an LDR**

You are to design a circuit to give a variable voltage output, measured on a voltmeter, which increases as the light level on an LDR decreases. Such a circuit could be used to increase the intensity of artificial light as the sunlight gets less bright.

Having achieved the required outcome, it is also important to have as wide a range of voltage output as possible. Taking measurements, making calculations and by practical trialling optimise your circuit to give the maximum range.

Questions

1. What would you do differently to construct a light-meter for photography, where the voltage output increases as the light intensity increases?
2. Using one of these circuits, investigate if it is a useful means of determining the distance from a bright light source.

**B) Using a thermistor**

You are to design a circuit to give a variable voltage output, measured on a voltmeter, which increases as the temperature decreases. Such a circuit could be used to increase the output of an electric fire as the temperature decreases.

Having achieved the required outcome, it is also important to have as wide a range of voltage output as possible. Taking measurements, making calculations and by practical trialling optimise your circuit to give the maximum range.

Questions

1. Calibrate your sensor for temperatures of 00 C and 1000 C.
2. Use your sensor to determine ambient room temperature. Compare this with the reading from a liquid in glass thermometer.
3. Research any practical applications of such a sensor and give a short review of its use, including appropriate references to the sources of information.

**Recording**

Appropriate evidence for the Practical Endorsement comprises of your initial circuit design and its subsequent improvement presented in a scientific way. You should also have demonstrated how your circuit meets the design brief. All work should be clearly dated.

Additionally drawing conclusions from the measurements taken will support your preparation for the written examination.