

Ohm's law and component characteristics

Physics grades 9-10 (GCSE · IGCSE · O Level · Class 9-10) · Lab

Name: _____ Date: _____ Class: _____

How does the resistance of a thermistor change as it warms up? In this lab you heat a thermistor in a water bath, measure its resistance with a multimeter, and decide what type of thermistor it is.

Level: Physics grades 9-10 (GCSE · IGCSE · O Level · Class 9-10) · **Curriculum:** GCSE P2, IGCSE 4.3

Aim

To investigate how the resistance of a thermistor changes with temperature and to decide what type of thermistor it is.

Equipment

- 10 k Ω NTC thermistor sealed in a waterproof probe, or a bare thermistor in a thin test tube
- Digital multimeter with an ohm range
- Beaker of at least 250 mL
- Kettle or hot water and some cold water or ice
- Thermometer reading to 1 °C
- Stirrer and a stopwatch

Safety

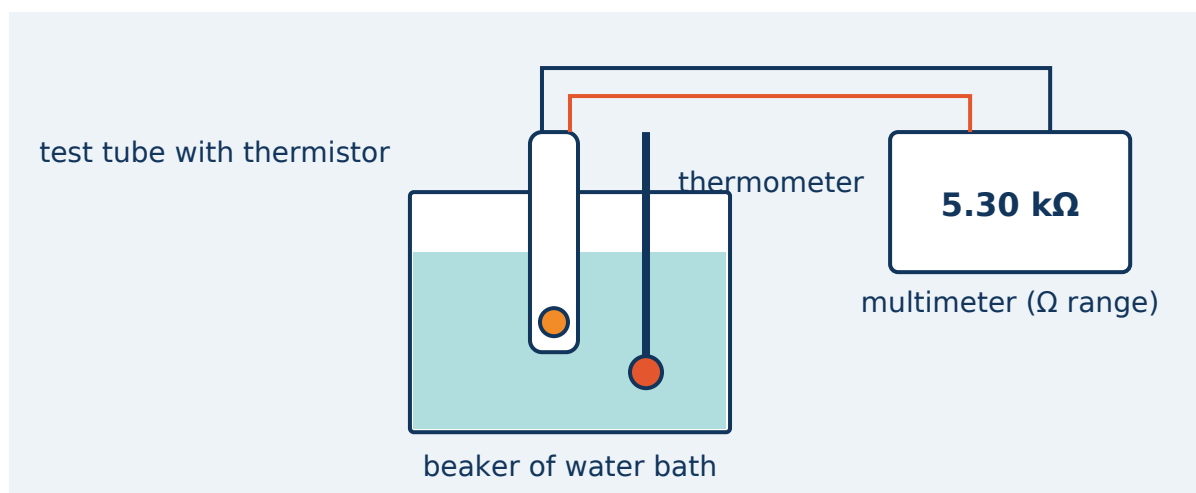
Safety

Hot water can scald. Pour it carefully and let an adult handle a kettle. Keep the multimeter and its leads dry and never use it on mains electricity. Wipe up spills at once.

Method

1. Place the thermistor in a test tube and stand the tube in a beaker of water at about 20 °C.
2. Connect the multimeter leads to the thermistor leads and set it to the ohm range.
3. Stir, wait 60 seconds, then record the temperature and the resistance.
4. Add a little hot water and stir. Wait until the temperature is steady and record again.
5. Repeat in steps of about 10 °C up to about 70 °C.

6. Let the water cool and record again on the way down to check the readings.



Heat or cool the water, stir, and record the thermistor resistance at each temperature.

Results

Sample measurements:

Temperature (°C)	Resistance (kΩ)
20	12.54
30	8.04
40	5.30
50	3.59
60	2.49
70	1.76

Analysis questions

Question 1 Plot the graph

Plot resistance (y-axis) against temperature (x-axis) and draw a smooth curve through the points.

Question 2 Describe the pattern

Describe how the resistance changes with temperature, and state the type of thermistor.

Question 3 Percentage change

Calculate the percentage fall in resistance from 20 °C to 70 °C.

Question 4 Interpolate

Estimate the temperature at which the resistance is 5.0 k Ω .

Question 5 Current in a circuit

The thermistor is joined to a 6.0 V supply. Calculate the current at 20 °C and at 70 °C.

Question 6 Sources of error

Suggest two reasons the readings might differ from the true values.

Question 7 Improvement

Suggest two improvements to the method.