Thermistors and LDRs: measuring resistance changes

Student activity • investigation and reasoning

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The question

How do an NTC thermistor and an LDR respond to their surroundings?

Measure resistance with an ohmmeter only, using a waterproof temperature sensor and a cool light source.

Equipment

- Waterproof NTC thermistor, LDR, ohmmeter and leads
- Prepared water baths up to 45 °C, thermometer, tray
- Cool battery LED lamp, opaque card and ruler

Staff prepare water at 45 °C or below. Immerse only the rated waterproof sensor tip; keep meters and connections dry. No external supply is connected to the ohmmeter circuit. Use a cool LED lamp, not a hot filament lamp.

Course coverage: Shared Physics / Double Award: 2.10, 2.11. Temperature and light-dependent resistance.

Plan, model or apparatus sketch

Draw a labelled setup or force diagram; include the measured quantities.

Method and reasoning

Read the whole sequence before starting

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1. Work in five groups of six at two stations. Connect the disconnected NTC thermistor to an ohmmeter; no external power supply is connected.

2. Staff provide water baths near room temperature, 35 °C and 45 °C. Place only the approved waterproof thermistor tip and thermometer in each bath; keep connections dry and wait for readings to settle.

3. Record actual temperature and resistance for all three baths, then return to the first bath to check repeatability. Do not assume the labelled bath temperature is exact.

4. Connect the LDR to the ohmmeter. Keep a cool battery LED lamp at one fixed distance and orientation; compare uncovered, partly shaded and fully covered conditions using card.

5. Record resistance in each light condition, then repeat uncovered. Keep room lighting unchanged and avoid warming the sensor with hands.

6. Describe each trend separately. Explain that this NTC thermistor’s resistance falls with temperature and the LDR’s resistance usually falls with increasing illumination; do not assume a linear relationship.

Cleanup

- Switch off lamps and meters, allow water to cool and dry sensor tips before storage.

Record your evidence

Blank spaces are for your own work

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Reference and task data

NTC means negative temperature coefficient. Other thermistor types can behave differently. The LDR trial compares qualitative light conditions, not calibrated illuminance. Record the meter unit carefully: 1 kΩ = 1 000 Ω.

Condition	Actual temperature / °C	Resistance / unit
Bath 1		
Bath 2		
Bath 3		
LDR uncovered	—	
LDR part shade	—	
LDR covered	—	

Show your calculations, labelled model or correction here.

Explain and evaluate

Use evidence and show calculation steps where relevant

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1. What happens to NTC resistance as temperature rises?

2. What happens to LDR resistance as illumination rises?

3. Why disconnect external power when using an ohmmeter?

4. Why wait for the thermistor reading to settle?

5. Is partly shading the LDR a calibrated light measurement?

6. Why repeat the first condition?