

Edexcel Physics A-level

CP12 - Calibrate a Thermistor in a Potential Divider Circuit as a Thermostat

Practical Flashcards

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How does the resistance of a NTC thermistor vary with temperature?



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As temperature increases, the resistance of the NTC thermistor will decrease.



What formula is used to calculate the resistance of a thermistor as temperature varies?



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$$R = R_0 e^{\left(\frac{b}{T}\right)}$$



What is the advantage of taking logarithms before plotting the graph?



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Taking logarithms will result in a straight line graph that is easier to plot and take readings from than an exponential curve.



Why should you avoid heating the water too quickly?



Why should you avoid heating the water too quickly?

The thermistor and thermometer will have thermal inertia. If you try to heat the water too quickly, the temperature of the thermistor and thermometer won't be the same as that of the water.



What is the advantage of heating the water very slowly when carrying out this experiment?



What is the advantage of heating the water very slowly when carrying out this experiment?

By heating the water very slowly, you are allowing the thermistor and thermometer to become as close in temperature to the water as possible.



What safety precautions should be taken when using a bunsen burner?



What safety precautions should be taken when using a bunsen burner?

- Hair and loose clothing should be tied back.
- A heatproof mat should be used to protect the work bench.
- The safety flame should be used when not directly heating the water.
 - Avoid touching non-insulated regions during and immediately after use, as they will be very hot.



What is the added risk when using wires near a bunsen burner?



What is the added risk when using wires near a bunsen burner?

The plastic coating on wires could melt if caught in the bunsen burner flame. You must ensure that loose wires don't get close to the flame or touch any hot apparatus.



What does a potential divider do?



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A potential divider is an arrangement that allows a desired output voltage to be generated by producing the required ratio of resistances in the thermistor and the ordinary resistor.



How could you cool the thermistor down to zero degrees in this experiment?



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The experiment can start with the thermistor placed in a beaker of dominantly ice. This can then be heated using a bunsen burner to produce resistance measurements from 0°C right up to 100°C (melting and evaporating points of water).



When plotting a graph of $\ln(R)$ against $1/T$, what will the y-intercept be?



When plotting a graph of $\ln(R)$ against $1/T$, what will the y-intercept be?

The graph will be of the form:

$$\ln(R) = b/T + a$$

'a' is the y-intercept and will equal $\ln(R_0)$



What should you do to ensure the temperature of the water is constant throughout the beaker?



What should you do to ensure the temperature of the water is constant throughout the beaker?

You should use a stirrer to stir the water before taking temperature readings.



What equation can be used to calculate the output potential difference for a potential divider circuit?



What equation can be used to calculate the output potential difference for a potential divider circuit?

$$V_{out} = V_{in} \left(\frac{R_1}{R_1 + R_2} \right)$$



How should you take a reading from a thermometer?



How should you take a reading from a thermometer?

Thermometer readings should be taken at eye level to reduce parallax error.



Why is it important that the fixed resistor value isn't too high?



Why is it important that the fixed resistor value isn't too high?

If the fixed resistor is significantly larger than the thermistor resistance, changes in temperature won't result in a significant enough change in the output voltage. This makes it harder to measure how the output changes.



Why is it important that the fixed resistor value isn't too low?



Why is it important that the fixed resistor value isn't too low?

If the fixed resistor value is too low, it may result in the output voltage changing across too large a range of values. This range may exceed the range measurable using your voltmeter.

