**ACTIVITY: Investigating temperature**

**Activity idea**

In this activity, students view the interactive ‘Temperature – the hot and cold’ and participate in a class discussion.

By the end of this activity, students should be able to:

* explain the physical meaning of absolute zero
* state the similarities between heat and temperature
* describe how to convert between Celsius and Kelvin temperature scales
* appreciate the range of temperatures used in the production and functioning of certain types of ceramics
* recall several temperature ‘facts’ from the interactive.

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**Introduction/background**

Traditional ceramics require firing in a kiln. Advanced ceramics like O-Sialons need high temperature sintering to bind and fuse their constituent particles. Superconductor ceramics function only when cooled to extremely low temperatures.

Temperature plays a very important role not only in the production of ceramics but also in the way certain ceramics function.

In the world of science and engineering, temperatures are measured and reported using the Kelvin scale or the Celsius scale.

This student activity makes use of the interactive [Temperature – the hot and cold](https://www.sciencelearn.org.nz/image_maps/60-temperature-the-hot-and-the-cold) – each of the points on the scale relates to a temperature or temperature range of interest. It also complements the article [Temperature – the highs and lows](https://www.sciencelearn.org.nz/resources/1773-temperature-the-highs-and-lows).

**What you need**

* Access to interactive ‘Temperature – the hot and cold’
* Access to or copies of the article ‘Temperature – the highs and lows’

**What to do**

1. Have students read through the Science Ideas and Concepts article ‘Temperature – the highs and lows’.
2. Have students work through the interactive ‘Temperature – the hot and cold’.

**Discussion questions**

* Heat and temperature are related to each other, but are different concepts. When hot tap water is accidentally run over a person’s hand, a minor scald can result. However, when a white-hot spark from a Guy Fawkes sparkler falls on a person’s hand, no damage is done. What is the explanation behind this?
* The temperature range of human habitation is very small. Why is this?
* One possible application of superconductivity is in power transmission lines. If the conventional aluminium alloy cables were to be replaced with superconducting ceramics like BSCCO 2223, what are some of the difficulties that could be encountered?
* Household cups and saucers made of ‘fine china’ are more expensive to buy than earthenware ones. Why is this?
* Thermometers often used in school science laboratories are of the alcohol or spirit type. Older versions were based on mercury. How effective would these two types of thermometer be in measuring temperatures in the range absolute zero to 2,000°C?

**Extension ideas**

* The Kelvin temperature scale is named in honour of Lord Kelvin, also known as Baron Kelvin of Largs. Find out more about the contributions Lord Kelvin made to science and engineering.
* Liquid helium plays a very important role as a coolant in medical imaging devices like MRI and PET scanners. What is the source of helium used to cool these machines and how is it liquefied?
* Temperature plays a very important role in the firing of traditional ceramics. Contact a local potter and find out more about the firing process.
* In the production of advanced ceramics, a high-temperature process known as sintering is often used. What happens at the atomic/molecular level during sintering?
* O-Sialon is used in the manufacture of tubes, pipes, conduits and lining blocks in the metal production and molten metal handling industries. One of the reasons for this is because of its high thermal shock resistance. What is thermal shock resistance?