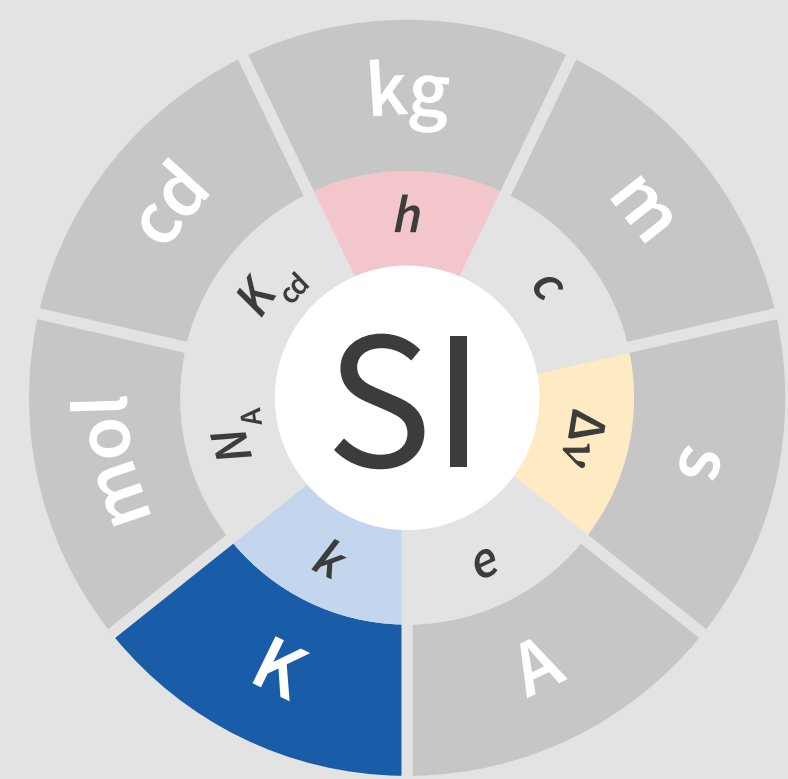


temperature measurement **K** kelvin



Temperature measurement matters

Reliable temperature measurements are important in lots of areas of science and engineering:

- Food preparation, from chilling to sterilisation and baking.
- Manufacturing, from the 200 °C at which plastics are extruded, to the 1 600 °C at which steel is made.
- Controlling processes such as jet engines, car engines and power stations, to make sure they operate safely, efficiently and effectively.
- Measuring the temperature and humidity of the air for weather forecasting and climate monitoring.



Temperature measurements

The many types of temperature measurement can be divided into contact and non-contact.

In contact measurements, a sensor is placed in contact with the object whose temperature is to be measured. Often, the sensor contains a material whose electrical resistance varies with temperature (a resistance thermometer), or two wires which generate a voltage which varies with temperature (a thermocouple).

In non-contact measurements, the intensity of infrared light (which transports heat) emitted by an object is measured to infer the temperature.

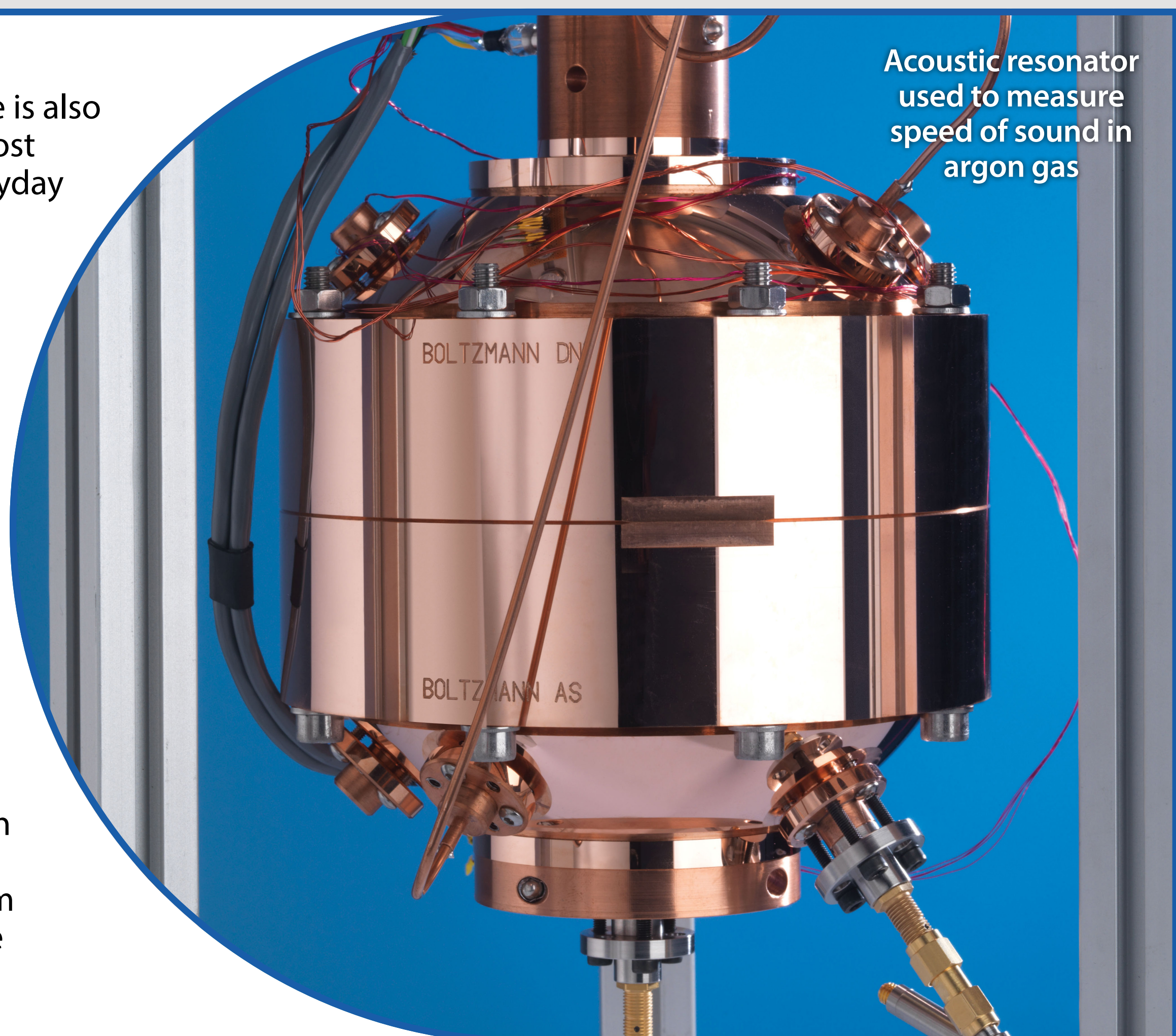
Definition

The base unit for temperature is the kelvin (K). But there is also a second SI unit, the degree Celsius (°C), which is the most commonly used way of expressing temperature in everyday life. The kelvin is defined by taking the fixed numerical value of the Boltzmann constant to be $1.380\,649 \times 10^{-23}$ when expressed in the units J K⁻¹.

$$T(K) = t(^{\circ}\text{C}) + 273.15$$

Most people use a conventional thermometer such as a resistance thermometer or thermocouple, which can measure temperature indirectly; that is, once it has been calibrated by comparing its indication with known temperatures. On the other hand, measuring temperature directly is difficult. It may be done with a thermometer which measures something that can be related to temperature through well-understood physics.

The most accurate method of measuring temperature directly is to measure the speed of sound in an atomic gas such as argon or helium. The speed of sound in such a gas is, under certain conditions, directly proportional to the average atomic speed. If the mass of the gas atom is known, then the kinetic energy and thus the absolute temperature can be found.



Did you know?

It is thought that the lowest temperature possible is 0 K or -273.15 °C. This is called 'absolute zero', and it can never actually be reached in practice.