

## Temperature On A Solar Scale

When we measure temperature in daily life we use the Celsius scale. On this scale, water freezes at  $0^{\circ}\text{C}$  and water boils at  $100^{\circ}\text{C}$  (at one atmosphere pressure, 101.3 kPa). The Celsius scale is sometimes referred to as the Centigrade scale.

Theoretically there is no upper limit for temperatures, but there is a lower limit, absolute zero. This is the lowest temperature possible. Absolute zero is when an object has the absolute minimum of heat energy. This temperature corresponds to  $-273.16^{\circ}\text{C}$ .

To avoid negative temperature values, another temperature scale is used. It is called the Kelvin scale or the Absolute scale. It is also sometimes named the thermodynamic temperature scale.



**To convert Celsius degrees to Kelvin units, add 273.  
To convert Kelvin units to Celsius degrees, subtract 273.**



The Kelvin scale starts at absolute zero, which is assigned a value of 0 K. One Kelvin unit is equal in size to one Celsius degree. So  $0^{\circ}\text{C} = 273\text{ K}$ , and  $100^{\circ}\text{C} = 373\text{ K}$ . (In most cases, to keep things simple, the 'extra' 0.16 is ignored.)

- 1 Study the information below, about temperatures in the Solar System. The temperatures are either given in Kelvin units or Celsius degrees. Provide each missing temperature. (The first one has been done for you.)

In our Solar System, a large range of temperatures can be found on the planets and their moons. On Mercury it can be as cold as  $-180^{\circ}\text{C}$  (93 K) at night and as hot as **a**  $430^{\circ}\text{C}$  ( \_\_\_\_\_ K) during the day.

Venus is believed to have a maximum temperature of **b** 750 K ( $^{\circ}\text{C}$ ) and an average temperature of **c**  $452^{\circ}\text{C}$  ( \_\_\_\_\_ K). The planet Earth has an average temperature of **d** 281 K ( \_\_\_\_\_  $^{\circ}\text{C}$ ).

The temperature on Earth's Moon ranges from **e** 400 K ( \_\_\_\_\_  $^{\circ}\text{C}$ ) during the day to **f**  $-170^{\circ}\text{C}$  ( \_\_\_\_\_ K) at night. On Mars, the average temperature is **g**  $-63^{\circ}\text{C}$  ( \_\_\_\_\_ K) with a minimum of

**h**  $-140^{\circ}\text{C}$  ( \_\_\_\_\_ K) and a maximum of **i** 300 K ( \_\_\_\_\_  $^{\circ}\text{C}$ ). The mean temperature of Jupiter is **j**  $-152^{\circ}\text{C}$  ( \_\_\_\_\_ K), while that of Uranus is **k** 59 K ( \_\_\_\_\_  $^{\circ}\text{C}$ ) and that of Pluto is **l**  $-236^{\circ}\text{C}$  ( \_\_\_\_\_ K).

- 2 What is the general trend of planetary temperatures? \_\_\_\_\_  
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- 3 What is the difference between maximum temperatures and minimum temperatures on Mercury?  
Give your answer in Kelvin units and degrees Celsius.  
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- 4 At what temperature in Kelvin units does water boil?

### Research

Three main temperature scales are in use: Kelvin, Celsius and Fahrenheit. All were named after the person who devised them.

- 5 Write a brief report about one of the following: William Thomson (Lord Kelvin), Anders Celsius, or Gabriel Fahrenheit. Focus on their work involving the measurement of temperature.
- 6 What is involved in the science of cryogenics? \_\_\_\_\_