

Absolute Zero Encyclopedia Article

Absolute Zero

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Absolute Zero

The absolute scale, also called the Kelvin scale, was invented in 1848 by William Thomson (Lord Kelvin). It has, as its low point, a mark called absolute zero, the point at which all matter stops moving and below which the temperature cannot be lowered. Modern calculations place this temperature at -273.18°C .

Thomson based his concept of an absolute scale on the theories of French physicist Jacques-Alexandre-César Charles. Charles' observations show that a gas at 0°C can be cooled; for every degree the temperature is lowered, the volume decreases by $1/273$. What Charles' law seems to indicate is that at -273°C the volume of the gas will be zero. This phenomenon puzzled scientists who could not understand why the volume would reach zero, or just what happened to the gas when it did.

After working with cooled gases with James Joule, Thomson proposed the following idea: the temperature of the gas was a reflection of the kinetic energy of its atoms. As the temperature decreased the atoms would be less active, moving less and taking up less room, and, thus, would drop in volume. At -273°C the energy of each of the atoms would reach zero; they would then stop moving and take up virtually no space. Thomson posited that this theory would hold true for all matter.

Using this as a springboard, Thomson devised a new temperature scale called the *absolute scale*; this was actually just a rearrangement of the centigrade scale, placing absolute zero as the zero mark. Thus, the absolute scale has no negative degrees. Temperatures are expressed in degrees Kelvin, the name given to the scale in honor of its inventor.