

## Topic Page: [Expansion \(Heat\)](#)

Definition: **expansion** from *Philip's Encyclopedia*

Change in the size of an object with change in temperature. Most substances expand on heating, although there are exceptions (ice expands on cooling). The expansivity (coefficient of expansion) of a substance is its increase in length, area or volume per unit temperature rise. For a gas, the coefficient of expansion is the ratio of the rates of change of volume to temperature (at constant pressure), or of volume to pressure (at constant temperature).

Summary Article: **expansion**

From *The Columbia Encyclopedia*

in physics, increase in volume resulting from an increase in temperature. Contraction is the reverse process. When heat is applied to a body, the rate of vibration and the distances between the molecules composing it are increased and, hence, the space occupied by the body, i.e., its volume, increases. This increase in volume is not constant for all substances for any given rise in temperature, but is a specific property of each kind of matter. For example, zinc and lead undergo greater expansion in a one-degree rise in temperature than do silver or brass. Since solids have a definite shape, each linear dimension of the solid increases by a proportional amount for a given temperature increase. The amount that a unit length along any direction of a substance increases for a temperature increase of one degree is called the coefficient of linear expansion of the substance. Most liquids also expand when heated. However, since liquids do not have a definite shape, it is the expansion of their volume as a whole that is relevant rather than the increase in a linear dimension. The amount of expansion that a unit volume (e.g., a cubic centimeter or a cubic foot) of any substance undergoes per one-degree rise in temperature is called its volume coefficient or coefficient of cubical expansion and is listed as a property of that substance. The coefficient of linear expansion can be calculated by dividing the coefficient of cubical expansion of the substance by three. When the amount of expansion of a given length of a substance has been determined experimentally, the linear coefficient is calculated by dividing the total amount of expansion by the product of the original number of length units and the number of degrees of rise in temperature. Gases also exhibit thermal expansion. The coefficient of expansion is about the same for all the common gases at ordinary temperatures; it is  $1/273$  of the volume at 0 degrees Celsius per degree rise in temperature. The Kelvin, or absolute, scale is based upon this behavior (see Kelvin temperature scale). Charles's law concerning the expansion of gases states that the volume of a gas is directly proportional to its absolute temperature (see gas laws). Liquids differ from each other as do solids in their expansion coefficients. Water, unlike most substances, contracts rather than expands as its temperature is increased from 0 degrees Celsius to 4 degrees Celsius; above 4 degrees Celsius it exhibits normal behavior, expanding as the temperature increases.

**APA**

Chicago

Harvard

MLA

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expansion. (2018). In P. Lagasse, & Columbia University, *The Columbia encyclopedia* (8th ed.). New York, NY: Columbia University Press. Retrieved from <https://search.credoreference.com/content/topic/expansion>

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## APA

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## Harvard

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## MLA

"expansion." *The Columbia Encyclopedia*, Paul Lagasse, and Columbia University, Columbia University Press, 8th edition, 2018. *Credo Reference*, <https://search.credoreference.com/content/topic/expansion>. Accessed 16 Oct. 2019.