

The ideal gas law is the equation of state of a hypothetical ideal gas. It is a good approximation to the behavior of many gases under many conditions, although it has several limitations. It was first stated by Émile Clapeyron in 1834 as a combination of Boyle's law and Charles's law. The ideal gas law is often introduced in its common form:

$$PV = nRT$$

where P is the pressure of the gas, V is the volume of the gas, n is the amount of substance of gas (also known as number of moles), T is the temperature of the gas and R is the ideal, or universal, gas constant,

So if $n = \text{const}$ (it is the same quantity of gas), it is possible to write this law for two cases.

$$P_1V_1 = nRT_1$$

$$P_2V_2 = nRT_2$$

But when $n = \text{const}$ and $R = \text{const}$, and even $P_1 = P_2 = \text{const}$ it is possible to write these two equations together:

$$V_1/T_1 = nR/P_1$$

$$V_2/T_2 = nR/P_2 \text{ if } P_1 = P_2$$

$$V_1/T_1 = V_2/T_2$$

$$V_1 T_2 = V_2 T_1$$

$$T_2 = V_2 T_1 / V_1$$

Given:

$$V_1 = 0.097 \text{ L}$$

$$V_2 = 0.95 \text{ L}$$

$$T_1 = 298 \text{ K}$$

$$T_2 = 0.95 * 298 / 0.097 = 2919 \text{ K}$$

New temperature is 2919 K