

2.2: The Ideal Gas Law

The **ideal gas law** combines the empirical laws into a single expression. It also predicts the existence of a single, universal gas constant, which turns out to be one of the most important fundamental constants in science.

$$pV = nRT$$

The ideal gas law constant is of fundamental importance and can be expressed in a number of different sets of units.

Value	Units
0.08206	atm L mol ⁻¹ K ⁻¹
8.314	J mol ⁻¹ K ⁻¹
1.987	cal mol ⁻¹ K ⁻¹

The ideal gas law, as derived here, is based entirely on empirical data. It represents “limiting ideal behavior.” As such, deviations from the behavior suggested by the ideal gas law can be understood in terms of what conditions are required for ideal behavior to be followed (or at least approached.) As such, it would be nice if there was a theory of gases that would suggest the form of the ideal gas law and also the value of the gas law constant. As it turns out, the kinetic molecular theory of gases does just that!

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