

1.6: Applicability of Equations

There seem to be lots and lots of equations in thermodynamics. Some of them are of very general applicability. For example the equation $dU = dQ + dW$, which is known as the First Law of Thermodynamics, tells us that the increase in the internal energy of a system is equal to the heat supplied to it plus the work done on it, and it is obviously of very general applicability and is true whatever the nature of the system. An equally well known equation is $PV = RT$. But this equation, which relates pressure, molar volume and temperature, applies *only to an ideal gas*. It doesn't apply to a vapour (which is a gas that is close to the temperature at which it will condense), and still less does it apply to a liquid or a solid. Although we often deal in thermodynamics with a gas held inside a cylinder, thermodynamics is by no means confined to gases, let alone ideal gases.

This section is just an advance warning to be conscious, whenever you see or use an equation, whether the equation is of great generality or whether it applies only to a particular substance or to some special thermodynamic process or to a narrow set of circumstances.

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