

## 16.2: Density

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There is little to be said about density other than to define it as mass per unit volume. However, this expression does not literally mean the mass of a cubic metre, for after all a cubic metre is a large volume, and the density may well vary from point to point throughout the volume. Density is an intensive quantity in the thermodynamical sense, and is defined at every *point*. A more exact definition of density, for which I shall usually use the symbol  $\rho$ , is

$$\rho = \lim_{\delta V \rightarrow 0} \frac{\delta m}{\delta V}. \quad (16.2.1)$$

The awful term “specific gravity” was formerly used, and is still regrettably often heard, as either a synonym for density, or the dimensionless ratio of the density of a substance to the density of water. It should be avoided. The only concession I shall make is that I shall use the symbol  $s$  to mean the ratio of the density of a body to the density of a fluid in which it may be immersed or on which it may be floating,

The density of water varies with temperature, but at 4 °C is 1 g cm<sup>-3</sup> or 1000 kg m<sup>-3</sup>, or 10 lb gal<sup>-1</sup>. The original gallon was the volume of 10 pounds (lb) of water. These are Imperial (UK) gallons, and avoirdupois pounds - not the gallons (wet or dry) used in the U.S., and not the pounds (troy) used in the jewellery trade.

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