■Units of concentrations

% (Per cent)
Ratio of the volume of a substance to the volume of its medium expressed in percentage:

$$=\frac{\text{Volume of substance}}{\text{Volume of medium}}\times 100$$

ppm (parts per million)
Ratio of the volume of a substance to the volume of its medium expressed in parts per million:

$$=\frac{\text{Volume of substance}}{\text{Volume of medium}}\times 10^{6}$$

ppb (parts per billion)
Ratio of the volume of a substance to the volume of its medium expressed in parts per billion:

$$=\frac{\text{Volume of substance}}{\text{Volume of medium}}\times 10^{9}$$

mg/m³ (milligrams per cubic metre)
Ratio of the weight of a substance expressed in mg to the volume of its medium of 1m³ (1,000 l). This unit is mainly used for concentrations of particulate substances, but can also be applied to gases and vapours.

mg/l (milligrams per litre)
Ratio of the weight of a substance expressed in mg to the volume of its medium of 1 l. This unit is mainly used for concentrations of particulate substances, but can also be applied to gases and vapours.

• Relations between concentration units

$$\text{ppm}=\%\times 10{,}000$$

$$\%=\text{ppm}\times 0.0001$$

$$\text{ppb}=\%\times 10{,}000{,}000$$

$$\%=\text{ppb}\times 0.0000001$$

$$\text{mg/m}^3=\text{ppm}\times\frac{M}{22.4}\times\frac{273}{(273+t)}\times\frac{P}{1013}$$

$$\text{ppm}=\text{mg/m}^3\times\frac{22.4}{M}\times\frac{(273+t)}{273}\times\frac{1013}{P}$$

$$\%=\text{mg/l}\times\frac{22.4}{M}\times\frac{(273+t)}{273}\times\frac{1}{10}$$

$$\text{mg/l}=\%\times\frac{M}{22.4}\times\frac{273}{(273+t)}\times 10$$

Where:

M: Molecular weight

22.4 (l): Volume of 1 mol at 0°C (32°F) under 1 atmospheric pressure

273 (°K): °K represents an absolute temperature.
0°C≒273°K, t°C=(273+t)°K

1013 (hPa): 1 atmospheric pressure in hectopascal

P: Atmospheric pressure at the time of measurement in hectopascal