

# Chemical composition [ edit ]

Seawater contains more dissolved ions than all types of freshwater.<sup>[11]</sup> However, the ratios of solutes differ dramatically. For instance, although seawater contains about 2.8 times more bicarbonate than river water, the percentage of bicarbonate in seawater as a ratio of *all* dissolved ions is far lower than in river water. Bicarbonate ions constitute 48% of river water solutes but only 0.14% for seawater.<sup>[11][12]</sup> Differences like these are due to the varying residence times of seawater solutes; sodium and chloride have very long residence times, while calcium (vital for carbonate formation) tends to precipitate much more quickly.<sup>[12]</sup> The most abundant dissolved ions in seawater are sodium, chloride, magnesium, sulfate and calcium.<sup>[13]</sup> Its osmolarity is about 1000 mOsm/l.<sup>[14]</sup>

Small amounts of other substances are found, including amino acids at concentrations of up to 2 micrograms of nitrogen atoms per liter,<sup>[15]</sup> which are thought to have played a key role in the origin of life.

## Total molar composition of seawater (salinity = 35)<sup>[16]</sup>

Component	Concentration (mol/kg)
H <sub>2</sub> O	53.6
Cl <sup>-</sup>	0.546
Na <sup>+</sup>	0.469
Mg <sup>2+</sup>	0.0528
SO <sub>4</sub> <sup>2-</sup>	0.0282
Ca <sup>2+</sup>	0.0103
K <sup>+</sup>	0.0102
C <sub>T</sub>	0.00206
Br <sup>-</sup>	0.000844
B <sub>T</sub>	0.000416
Sr <sup>2+</sup>	0.000091
F <sup>-</sup>	0.000068

$$\text{pure water } 100 \text{ gm}/100 \text{ gm} = 1000 \text{ gm}/\text{L} / 18.01 = 55.525\text{M}$$

MW gm/M

18.01

24.30

$$16 \times 4 + 32.1 = 96.1$$

39.1

$$\text{gm}/\text{M} * \text{M}/\text{kg} = \text{gm}/\text{kg}; /10 = \text{gm}/100 \text{ gm} = \%$$

$$\text{sulfate} = .0282 * 96.1 / 10 = .287\% = 2870 \text{ ppm}$$

## Seawater elemental composition (salinity = 3.5%)<sup>[citation needed]</sup>

Element ↕	Percent by mass ↕
Oxygen	85.84
Hydrogen	10.82
Chlorine	1.94
Sodium	1.08
Magnesium	0.1292
Sulfur	0.091
Calcium	0.04
Potassium	0.04
Bromine	0.0067
Carbon	0.0028
Vanadium	$1.5 \times 10^{-11} - 3.3 \times 10^{-11}$

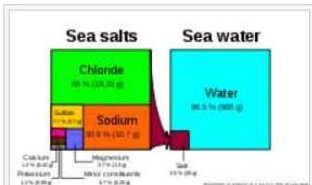


Diagram showing concentrations of various salt ions in seawater. The composition of the total salt component is: Cl<sup>-</sup> 55%, Na<sup>+</sup> 30.6%, SO<sub>4</sub><sup>2-</sup> 7.7%, Mg<sup>2+</sup> 3.7%, Ca<sup>2+</sup> 1.2%, K<sup>+</sup> 1.1%, Other 0.7%. Note that the diagram is only correct when in units of wt/wt, not wt/vol or vol/vol.

$$\text{Mg in seawater ppm is } 0.0528 * 24.3 / 10 = 0.128\% = 1280 \text{ ppm}$$