

What controls ocean chemistry?

Ocean salinities

1000 g of seawater = 965 g water + 35 g salt

grams of salt per thousand grams of water
(parts per thousand ‰)

Salinity is the total quantity of salt dissolved in seawater. (avg. 35‰)

Dissolved salts (cations and anions)

- major constituents
- trace elements

Where did salts come from?

cations – brought by rivers from weathered rocks on continents

anions – from mantle (volcanoes)

Ocean water

CATIONS (+)	ANIONS (-)
Sodium Na^+	Chloride Cl^-
Magnesium Mg^{2+}	Sulfate SO_4^{2-}
Calcium Ca^{2+}	Bicarbonate HCO_3^-
Potassium K^+	

River water

CATIONS (+)	ANIONS (-)
Calcium Ca^{2+}	Bicarbonate HCO_3^-
Sodium Na^+	Sulfate SO_4^{2-}
Magnesium Mg^{2+}	Chloride Cl^-
Potassium K^+	Bromide Br^-

Why?

1. Biological activity
Ca and HCO₃ used for making up shells (reefs, oysters, clams....)
2. Adsorption to clays and ion exchange
3. Formation of evaporites
Large deposits of sodium chloride (Morton – salt mine near Erie)
4. SO₄²⁻ → crystallization of gypsum
→ reduction to sulfur by microbes
5. Supply and removal of chemicals at the mid-ocean ridges

CONSTANT PROPORTIONS of conservative salts regardless of total salinity (Forchhammer's principle)

Salinity vs. Chlorinity

The gases dissolved in ocean
depend on

- temperature
- salinity
- pressure

Sources of gases:

- **atmosphere,**
- **photosynthesis**
- **respiration and decomposition**

pH of the ocean

CO₂ buffers the ocean



Buffer prevents sudden changes in the
acidity of a solution.

Nature pH 1 to 14, ocean 7.5 – 8.5