

CHEMISTRY OF SEA WATER

Distribution of [phosphorus](#)

Nutrients in Sea water

Near surface nutrient concentration in seawater is as follows

Nutrient	Concentration (ppm)
Phosphorus (P)	0.07
Nitrogen(N)	0.5
Silicon(Si)	3

Nutrients are essential for plant growth. All plants, including those that live in the ocean, convert nutrients into food(organic compounds such as sugar) by photosynthesis. Nutrients in seawater are compounds that consist primarily of nitrogen (N), Phosphorous (P), and silicon (Si). Representative concentrations of these nutrients in the ocean are listed in the above Table 1. The concentrations are specified in parts per million (ppm). Most plants cannot use elemental nitrogen and [phosphorus](#) and satisfy their nutrient needs by absorbing phosphate (PO_4^{3-}) and nitrate (NO_3^-). Silicon is used by important groups of microscopic plants (diatoms) and animals (radiolarian 8).Because of biological uptake and release, the concentrations of nutrients in seawater, as on land, vary from place to place and over time at any one place. Hence,Oceanographers refer to these substances as non-conservative ions of seawater, signifying that levels of these substances are not constant in water, but vary over time and from place to place. Limiting nutrient is a missing nutriend among three nutrients needed. For seawater it is nitrogen and for freshwater it is phosphorous.

Phosphorus

Phosphorus is an essential element to all life forms. It is a structural and functional component of all orngisms. It provides phosphate ester backbone of DNA andRNA.Marine organisms contain phosphorus in the form of orthophosphoric acid in complex organic compounds such as phosphoproteins, nucleo proteins, nucleic acids, and phospholipids. The turnover rate of phosphorus in the surface layers is quite rapid. In the upper layers of the oceans chemical decomposition of simple excretory products may occur, by bacterial decomposition of simple excretory products .Bacterial decomposition of organic debris and organic compounds is the most important regenerative process. The phosphorus regeneration rate is thus a function of water temperature and the phytoplankton population. Laboratory experiments have shown that 35 to 55 percent reduction of plankton to phosphate can occur in 17 to 35 days, very little organic phosphate is found in the oceans below 300m.

The above figure shows the vertical distribution of phosphate in the various oceans. The four layers described previously are clearly visible. In [the Atlantic Ocean](#), water below about 1000m exhibits a decrease in phosphate as one move from south to north. The maximum phosphate concentrations are found at about 1000m depth in [the Atlantic Ocean](#). In the Pacific Ocean maximum phosphate concentrations (0.33ppm) are found north of the equator. The Antarctic areas contain about 0.19ppm phosphate at all depths.

The phosphate in the phototrophic regions of the oceans is normally depleted somewhat

during spring and summer because of phytoplankton growth. Death of the organisms, with subsequent phosphorus regeneration, increases the concentration later in this season.

Seasonal variation of phosphate

It is observed that phosphate is found in high values during winter and lowest during summer season due to phytoplankton growth. Phosphorous is present in sea only in inorganic form i.e. phosphate. About 50% of the total phosphorous in sea occurs in upper 60m of sea. Phosphorous are found in organisms in particulate and dissolved organic compounds and as phosphate forms phosphorous is utilized by plants and they are released in to the atmosphere during decomposition of the organic matter.

It is also found that

1. All utilization of phosphate takes place in upper 60m of Ocean.
2. That all downward transport of phosphorous is due to settling of organisms
3. That the upward transport of phosphorous is all due to eddy diffusion.
4. Phosphorous availability have impact on primary production rates.