

This document includes:

Chemistry/Nutrients/Nitrate concentration parameters in the water column
Chemistry/Nutrients/Nitrite concentration parameters in the water column
Chemistry/Nutrients/Silicate concentration parameters in the water column
Chemistry/Nutrients/Phosphate concentration parameters in the water column
Chemistry/Nutrients/Ammonium concentration parameters in the water column

at both L4 and E1.

Sample collection

- 1) Take a water sample from the surface, this should be from a clean pumped supply, or from the sampling CTD Rosette bottle;
- 2) Put on gloves (ensure these are Duratouch);
- 3) Take some surface water sample direct from the rosette bottle or the pump supply straight into one of the sample bottles (labelled), and fill with about 20-30 mls of seawater, swill the bottle and discard, do this three times to clean the bottle. Then fill the sample bottle and screw the lid on. Label as to where it was sampled, depth etc. Ensure this is kept clean at all times. Put the sample bottle into the cool box;
- 4) If another sample is taken from 10 metres or elsewhere then carry out the same protocol for taking the first sample;
- 5) Return the water samples back to land in the cool box provided;
- 6) Return all the equipment and samples to PML as soon as possible.

Calculations and analysis

1. Phosphate

The analytical method is based upon the production of the phospho-molybdenum-blue complex by reaction with molybdate and ascorbic acid, and the catalyst of potassium antimony tartrate. The pH needs to be kept <1 in order to avoid a competitive reaction from silicate.

Reference: J-Z Zhang and J. Chi (2002), Automated analysis of nanomolar concentrations of phosphate in natural waters with liquid waveguides, *Env. Sci. and Tech.*, 36(5).

2. Silicate

The analytical method here involves the reaction of inorganic silicate with the ammonium molybdate to form mainly silicomolybdic acid. This is reduced by the ascorbic acid to form a silico-molybdenum blue complex. The oxalic acid ensures that there is no competitive reaction from phosphates.

Reference: D.S. KIRKWOOD, ICES CM 1989/ C: 29 Simultaneous determination of selected nutrients in sea water.

3. Nitrate

The analysis is for the total of nitrate and nitrite ions. The reaction is for the reduction of nitrate to nitrite, using a copper/cadmium column, in an ammonium chloride solution (pH = 8.5). The nitrite ions react with an acidic sulphanilamide solution to form a diazo compound. This is then reacted with the N-1-naphthylethylenediamine dihydrochloride (NEDD), to form a reddish purple azo dye. The concentration of nitrate is obtained by subtracting the nitrite concentration from the combined concentration obtained here for the total of nitrate plus nitrite.

Reference: BREWER and RILEY, 1965, Deep Sea Research, 12: 765 - 772. The automatic determination of nitrate in sea water. (modified to increase sensitivity, by decreasing the ammonium chloride concentration in the reaction.)

4. Nitrite

The chemistry is the same as the nitrate channel for nitrite analysis.

Reference: A modified GRASSHOFF, K, (1976). Methods of seawater analysis, Verlag chemie, Weinheim: pp. 317.

5. Ammonia

The analysis technique is based upon the production of the indophenol-blue complex. This method is very dependent upon the reaction pH, which is optimum at 10.6.

Temperature optimisation for sensitivity is at 55 degrees C. The reaction must then be cooled prior to detection.

Reference: MANTOURA, R.F.C, and WOODWARD, E.M.S., (1983). Estuarine, Coastal and Shelf Science, (1983), 17, 219-224. Optimization of the indophenol blue method for the automated determination of ammonia in estuarine waters.

Data stored

In WCO database – new data delivered every three months.