

Exercise L2: Introduction to stoichiometric calculations

ETH Zurich Course 701-0426-00L: Modelling Aquatic Ecosystems (Schuwirth)

13.03.2024

Goals:

- Understand the concepts of stoichiometric calculations introduced in section 4.3.
- Be able to do simple stoichiometric calculations based on the chemical substance notation (with specified elemental mass fractions; section 4.3.1) and with parameterized elemental mass fractions (section 4.3.2).

Task 1: Stoichiometric calculations with given elemental composition

Derive the stoichiometry of the process “growth of algae with ammonium as the nitrogen source” assuming Redfield elemental composition of algae (see equation 4.33 for the Redfield composition). Do this by redoing the calculation leading to equation 4.35 (“growth of algae with nitrate as the nitrogen source”) with replacing NO_3^- by NH_4^+ .

Task 2: Stoichiometric calculations with parameterized elemental mass fractions

Derive the stoichiometry of the process “growth of algae with ammonium as the nitrogen source” assuming an arbitrary composition of algal biomass considering the mass fractions α_C , α_H , α_O , α_N , and α_P of the elements C, H, O, N and P.