



UNIVERSITÀ  
DEGLI STUDI DI MILANO-BICOCCA

## COURSE SYLLABUS

### Aquatic Chemistry

2122-3-E3201Q087

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#### Aims

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Study of the processes that regulate the chemical composition of a water body.

The student acquires knowledge of the chemical parameters useful for assessing water quality.

#### Knowledge and understanding

At the end of the course the student knows:

The main chemical reactions in the water: the hydrolysis reactions, the ox-red reactions, the precipitation reactions of the salts applied to closed and open systems.

Water purification processes.

#### Applied knowledge and understanding

At the end of the course the student is able to:

Calculate the chemical composition of a water as a function of pH in an open and closed system

Calculate the total alkalinity of a water

Calculate the electronic activity of a water

#### Autonomy of judgment

At the end of the course the student is able to:

Identify the main chemical species of water in open and closed systems  
Identify water purification processes.

### **Communication skills**

Exposing, in a clear and concise manner, the main chemical reactions in the water compartment.

### **Learning skills**

Apply the acquired knowledge of water chemistry to the different types of water. Understanding the topics of environmental chemistry in past and present scientific literature.

### **Contents**

The overall aim of the AQUATIC CHEMISTRY course is to provide an understanding of equilibria in aqueous solution. Applications for the water quality characterization and water treatments.

### **Detailed program**

pH and buffer intensity,  $\text{CO}_2$ ,  $\text{HCO}_3^-$ ,  $\text{CO}_3^{2-}$  equilibria in natural waters;

Acidity and alkalinity of water:

Coordination compounds; metal ions speciation;

Redox reactions, redox conditions in aqueous solution;

redox potentials; standard redox potentials and Nerst equation; water composition as a function of the redox potential;

Solubility product; common ion effect; solubility of metal hydroxides; solubility of carbonates; solubility-pH diagrams; the control of alkalinity and metal ion concentration;

Adsorption of ions and organic compounds; ionic exchange; colloids, coagulation and flocculation processes;

Water quality characterization; chemical processes in

wastewater treatments.

## **Prerequisites**

Fundamentals of general and organic chemistry.

## **Teaching form**

Lessons, 6 credit, 48 hours

The course includes 6 credits by presenting slides and topics. The teaching method develops the topics through a historical time.

## **Textbook and teaching resource**

[Teaching material can be available on the e-learning platform: http://elearning.unimib.it/course](http://elearning.unimib.it/course)

Suggested reading:

W. Stumm, J. J. Morgan Aquatic Chemistry, Wiley, 1996

## **Semester**

Second semester

## **Assessment method**

Oral examination

Mark range 18-30/30

The exam consists in the assessment of the knowledge acquired by the student in the field of water chemistry, with particular attention to logC-pH charts, alkalinity, salt dissolution and Ox-Red reactions.

In the oral examination the student will be assessed on the basis of the following criteria: 1) knowledge and understanding; 2) connection of the different concepts; 3) reasoning autonomy.

## **Office hours**

The professor. Ezio Giovanni Bolzacchini receives the students by appointment by email:  
ezio.bolzacchini@unimib.it

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