UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

# COURSE SYLLABUS

## Laboratory of General Chemistry

**2627-1-E2703Q003-E2703Q00302**

### Aims

The course allows students to gain familiarity with laboratory techniques and apparatus, and to apply their knowledge of concepts from General Chemistry course in an actual laboratory situation. The course will also give the basic principles and procedures of laboratory safety.

**Knowledge and understanding**

At the end of the course the student is able :

- is able to perform the fundamentals in the inorganic chemistry laboratory;
- knows the techniques of volumetric analysis and is able to determine the composition of a mixture or the concentration of a solution;
- performs simple inorganic synthesis by applying the reported procedure, in compliance with safety standards;
- performs separations and purifications by using standard procedures.

**Applying knowledge and understanding**

At the end of the course the student is able:

- to collect scientific data through the use of fundamental chemical techniques and methodologies;
- to identify the most appropriate methods to carry out the basic experimental operations such as volumetric analysis, preparation of solutions, filtration, purification etc.

**Making judgements**

At the end of the course the student is able:

- to identify and calculate the most appropriate chemical quantities in order to address the proposed problem;
- is able to collect scientific data related to the observation and measurement in the laboratory;
- is able to reproduce the experiments and to evaluate and quantify the results by applying stoichiometry.

**Communication skills**

By writing the scientific reports, the student is able: i) to develop and discuss the experimental data in clear and concise way, ii) to describe and communicate the general topics in simple and critical way.

**Learning skills**

To be able to apply the acquired knowledge to contexts different from those presented during the course.

## Contents

The course is designed in order to recall the basic principles of general chemistry necessary for the understanding of the lab experiments. These practical experiments will be devoted to the learning of the main chemistry lab techniques and will be performed by the student individually or in small groups.

## Detailed program

*Stoichiometry*: Elements, atoms, ions, atomic mass, Periodic system, oxidation number. Molecules, Molecular Mass, Moles, Empirical Formulas and Molecular Formulas, Percent composition of compounds. Balance of chemical equations. Concentration of a solution, Mixing and dilution, Volumetric Analysis, Equilibrium and equilibrium constant. Dissociation and formation equilibria. Acid and bases, Ionic product of water, pH and pOH, strong and weak acid and bases. pH of the saline solutions. Buffer solutions. Solubility and solubility equilibria, solubility and pH.

*Laboratory experiments (in presence or in synchronous videoconference)*: Limiting agent, Synthesis and reactivity of inorganic compounds, solubility , introduction to volumetric analysis (acid-base titrations, barium phosphate, redox titrations), precipitation / separation and identification of cations (qualitative analysis).

## Prerequisites

Algebraic calculations, SI units, knowledge of logarithmic and exponential functions, numbers in decimal and scientific notation, are required. All students must complete mandatory safety training to participate in the course.

## Teaching form

The Laboratory of General Chemistry implies practical laboratory sessions, in person, Interactive Teaching. Attendance is compulsory.

## Textbook and teaching resource

Lab manual to be downloaded from e-learning.

## Semester

First semester.

## Assessment method

The evaluation of the Lab activity concur to assess the unique mark of the complete course.

The assessment, regarding the Lab activity, is composed by two aspects: the attendance to the Lab (75 % of the course), a final report including graphics, numerical results and comments (either in printed format or uploaded in the E-learning page).In detail:
1-2: not insufficient report, with incorrect graphics and numerical results or missing parts;
3: sufficient report, with some calculation errors and limited critical processing capacity;
4: good report, without calculation errors and good critical processing capacity;
5: excellent report, without calculation errors and significant critical processing capacity.

The final grade corresponds to a weighted sum of the results.

## Office hours

Any time, to be fixed by e-mail.

## Sustainable Development Goals

QUALITY EDUCATION