UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Complements of Inorganic Chemistry

2627-3-ESM01Q021

Aims

Aim of the course is to give a deep knowledge of the chemistry of the elements and the inorganic compounds, focusing on the relationships between their structure, properties and reactivity. At the end of the course the student will
possess the basic knowledge of inorganic chemistry and of the periodic properties of the elements and compounds, fundamental to deal with the preparation and structural/functional characterization of the inorganic materials.

Knowledge and understanding
The students will study the general topics of inorganic chemistry: athomic teory and periodicity of the elements; models of the chemical bond; molecolar symmetry; ionic and metallic solids; acid-base and donor-acceptor; oxidation and reduction; as well as the knowledge of the properties of the elements of the main groups and the transition metals and of their compounds.

Applying knowledge and understanding
The students will be able to describe the chemical behaviour of the element groups of the periodic table; to correctly understand the relationships between structure, properties and reactivity of the inorganic compounds by using the knowledge of the base and periodic properties of the elements and of their compounds.

Making judgements
The students will be able to identify the fundamental and periodic properties able to explain and predict the reactivity of the elements and their compounds.

Learning skills
The student will understand the fundamentals of the inorganic chemistry and of the periodic properties of the elements, correctly applying them to the problems to solve also in contexts different from those provided examining in depth the topics with different tools than those provided.

Communication skills

The students will describe orally, clearly and concisely and with correct use of language the fundamentals of inorganic chemistry; the properties, structures and reactivity of inorganic compounds.

Contents

The course is organized in three parts: a) fundamental topics of inorganic chemistry
(Atomic structure, molecular structure and chemical bond, structure of the solids, acid and base, oxidation and reduction, coordination compounds); b) chemistry and periodic properties of the elements of the
main groups and transition metals; c) inorganic materials and applications in material science

Detailed program

Atomic structure and periodicity of the elements. The models of the chemical bonds and the properties of the covalent, ionic and metallic compounds. Molecular symmetry (1 CFU)
Chemistry acid/base and donor/acceptor (0.5 CFU). Reactions of oxidation and reduction (0.5 CFU).
Periodic properties, chemistry and reactivity of s and p principal groups (2 CFU)
General characteristics and periodic properties and of the transition metals. Coordination compounds and coordinative bond (1 CFU).
Inorganic materials and applications in material science: the main synthetic methods; intercalation and porous compound; colloidal nanoparticles; inorganic molecular systems in hybrid materials and composites (1 CFU)

Prerequisites

Basic knowledge concerning the General Chemistry and the Laboratory of General Chemistry.

Teaching form

The course includes 6 CFU of lectures corresponding to 48 hours istribduted in 24 lectures of two hours are delivered as in-presence delivered lessons. The lessons are recorded and put at student’s disposal on the e-learning platform.
Introductive lessons for the laboratory activities, preliminary recorded and integrated with tutorial videos of the experimental operations of the laboratory experiences, are put at student’s disposal on the e-learning platform.
The lessons of Inorganic Chemistry are delivered in Italian language by the teacher which presents the topics of the course by slide presentation or on the blackboard. The slides of the lessons will be supplied to the students on the e-learning platform. The regular attendance of the lessons is recommended for an easier learning, although it is not more compulsory.

Textbook and teaching resource

Slides of the lessons of Complements of Inorganic Chemistry (e-learning)

Learning exercises of the main topics of Inorganic Chemistry (e-learning)
Recording of lectures (e-learning)

Textbook of Inorganic Chemistry suggested by the lecturer:
M.Weller, T.Overton, J.Rourke, F.Armstrong, La Chimica Inorganica di Atkins, Zanichelli

Semester

First semester of the third year of the Degree Course in Materials Science and Nanotechnology

Assessment method

The student acquires the CFU of the course passing an oral examination.
The oral examinations (grade from 18/30 to 30/30) consist in open questions on the topics of the Inorganic Chemistry course and the Laboratory activity treated at the lesson and on the textbooks.
The final grade corresponds to the evaluation of the oral exam following the graduation:
18-21: preparation on a limited part of the topics of the program, with scarce capacity of dissertation and independent analysis which, during oral test, have to be very often helped and demanded by the questions of the teacher; uncertain explanation capacity; lexicon often unclear and not accurate, sometimes not correct; with very low capacity of critical evaluation.
22-24: preparation on a good number of the topics of the program, even if not homogeneous, with sufficient capacity of dissertation and independent analysis, sometimes helped and demanded by the questions of the teacher; sufficiently clear explanation capacity; generally correct lexicon , even if sometimes not accurate; limited capacity of critical evaluation.
25-27: preparation on many topics of the program, good capacity of dissertation and critical analysis with good autonomy, capacity to apply the knowledge to real cases, correct lexicon, clear explanation capacity and good and correct use of the language.
28 – 30/30L: complete and exhaustive preparation on all topics of the program, independent capacity of dissertation and critical analysis, capacity to connect the topics to real cases, different contexts and branches of knowledge, full competence of the discipline lexicon; excellent, clear and precise explanation capacity and capacity of argumentation.

Office hours

From Monday to Friday by appointment.

Sustainable Development Goals

AFFORDABLE AND CLEAN ENERGY