UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

General Chemistry

2324-1-E2702Q082-E2702Q083M

Aims

The lectures aim at providing a first rigorous alphabetization in chemistry to those students who have just started the study of this discipline. The exercises aim at providing the fundaments of stoichiometry, i.e. the numerical aspects of the simplest chemical concepts.

Contents

Matter. Atoms and atomic theory. Isotopes. Chemical compounds. Chemical reactions. Redox reactions. Gases. Thermochemistry. Electrons in atoms. Periodic Table. Chemical bond. Intermolecular forces. Liquids. Solids. Phase diagrams. Solutions. Chemical kinetics. Equilibrium. Acids and basis. Electrochemistry.

Detailed program

Matter: properties and measure, error, significant figures.

Atoms and atomic theory. Isotopes.

Chemical compounds: formulas, moles, oxidation states, nomenclature.

Chemical reactions: equations, types and balancing.

Redox reactions

Gases: gas laws, ideal gas, real gas, equations, kinetic-molecular theory, gas mixtures.

Thermochemistry: terminology, heat, enthalpy, enthalpy changes, Hess law, spontaneous processes, free energy.

Electrons in atoms: basic concepts in quantum chemistry, atomic spectra, orbitals, atomic configurations.

Periodic Table: groups, periods, periodicity of properties (IP, EA, electronegativity and atomic radius).

Chemical bond: covalent, polar covalent, ionic, metallic, Lewis formulas, VSEPR, hybridization.

Intermolecular forces.

Liquids: vapour pressure.

Solids; types of solids, crystalline systems, cubic lattices, coordination, x-ray diffraction.

Phase diagrams.

Solutions: solubility, concentration, mixing, diluition, colligative properties.

Chemical kinetics: collisions theory, kinetic constants, reaction order, Arrhenius, catalysis.

Equilibrium: homogeneous, heterogeneous, constant, quotient reaction, Le Chatelier principle.

Acids and basis: Arrhenius and Bronsted-Lowry theories, self-ionization of water, strong, weak, polyprotic, approximations, hydrolisis, buffer, titration curves.

Electrochemistry: batteries, standard potential, hydrogen reference electrode, Nernst equation, electrode potential, relation with equilibrium constant, electrolysis.

Prerequisites

Basic knowledge of mathematics.

Teaching form

Lectures in class and exercises.

Textbook and teaching resource

Suggested textbooks:

Chimica Generale Petrucci, Herring, Madura, Bissonnette (Piccin) + Soluzione degli esercizi.

Chimica Moderna, Oxtoby, Gillis, Butler (Edises).

Stechiometria, Caselli, Rizzato, Tessore (Edises).

Stechiometria, Bertini, Luchinat, Mani (Casa Editrice Ambrosiana).

Stechiometria per la chimica generale, Michelin Lausarot, Vaglio (Piccin).

Semester

First semester

Assessment method

The General Chemistry exam consists of a written test and an oral test or interview.

The written test can also be replaced by two partial written tests:

the first partial written test is carried out in the didactic break in November and consists of 3 stoichiometry exercises on the topics developed during the part of the course up to the teaching break and a chemical nomenclature exercise (compound name given the formula or formula given the name of the composed);

the second partial written test takes place immediately after the end of the course and consists of 3 exercises of stoichiometry on the topics developed in the second part of the course after the teaching break in November.

Only those who have passed the first partial written test with a grade higher than or equal to 18/30 are admitted to the second partial test.

As an alternative to the two partial tests or for those who have not passed them, we propose a total written test consisting of 5 exercises of stoichiometry on all the topics developed during the course. At every exam session, throughout the year, it is possible to carry out the total test.

Those who have passed the two partial tests with a grade greater than or equal to 18/30 and who are in compliance with the attendance of the laboratory course and the delivery of laboratory reports, are admitted to the oral examination.

The oral examination can be carried out in the same exam session in which the written test took place (or the first appeal for those who passed the partial tests) or in the next two appeals (the second o the third for those who passed the partial tests).

In the event that the candidate does not show up for the oral examination or does not pass on these three occasions, he will have to play and pass the written test again to be admitted again to the oral test.

The oral test consists of a first question of nomenclature, determination of atomic configuration or molecular geometry. Then, some open questions on the various topics in the General Chemistry course follow.

Office hours

The professor receives by appointment.

Sustainable Development Goals

AFFORDABLE AND CLEAN ENERGY | RESPONSIBLE CONSUMPTION AND PRODUCTION