
COURSE: General and Inorganic Chemistry II

ACADEMIC YEAR: 2019-2020

TYPE OF EDUCATIONAL ACTIVITY: Characterizing

TEACHER: Annalisa Mariconda

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website:

phone:

mobile (optional):

Language: **Italiano**

ECTS: **6 (3 Theory + 2
Numerical Applications
+ 1 Laboratory Activity)**n. of hours: **60 (24 T + 24 NA + 12 LA)**Campus: **Potenza**
Dept./School: **Dipartimento
di Scienze**
Program: **Chemistry (L27)**Semester:
from 02/03/20
to 31/05/20
20/06/20

EDUCATIONAL GOALS AND EXPECTED LEARNING OUTCOMES**Skills**

- salient aspects of the to main two bonding models and of the intermolecular interactions;
- quantitative aspects of the chemical equilibrium;
- quantitative aspects of the reaction equilibria involving gases;
- quantitative aspects of the most important classes of ionic equilibria in aqueous solution;
- elements of Electrochemistry: redox reactions, galvanic cells and electrolytic processes;
- elementary laboratory techniques: precipitation and filtration of precipitates.

Learning outcomes

- ability to predict the geometry and the bond parameters of simple inorganic compounds;
 - ability to correlate the macroscopic properties of the compounds with the nature of the chemical bond;
 - ability to treat numerically solubility equilibria;
 - ability to treat numerically redox processes occurring in galvanic and electrolytic cells;
 - ability to report accurately and concisely the data of the laboratory experiments.
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PRE-REQUIREMENTSGeneral and Inorganic Chemistry I

SYLLABUS**The chemical bond.** (8h T + 4h NA)

Bond parameters (bond energy, bond length, bond angles), bond models. The Ionic bond in the ionic solids. Lattice energy and Born-Haber cycle. Covalent bond: the molecular orbital concept; molecular orbital as linear combination of atomic orbitals (LCAO-MO). Electronic configuration of omonuclear and eteronuclear diatomic molecules using the MO approach. Empirical methods to determine the number of bonds in polyatomic molecules: Lewis structures and evaluation of the relative stabilities of resonance structures using the formal charge concept.

Molecular geometry (6h T + 4h NA)

The Valence Shell Electron Pair Repulsion (VSEPR) model. Polarity of a chemical bond. Dipole moment of diatomic and polyatomic molecules. Hybrid orbitals and molecular geometry. Weak bonds: London's forces, dipole-dipole and ion-dipole interactions, hydrogen bonds.

Chemical equilibrium (2h T + 2h NA)

Quantitative aspects of equilibria involving gases.

Acid-base equilibria in aqueous solution (6h NA)

Stoichiometry exercises of: aqueous solutions of strong acids, strong bases and mixtures of both. Weak monoprotic acids and bases; acid-base equilibria in salt solutions; buffer solutions; polyprotic acids and salts of polyprotic acids.

Solubility equilibria (4h NA)

Numerical exercises of low-solubility salts; effect of the shared ion and pH on the solubility of a salt; precipitation reactions.

Electrochemistry (8h T + 4h NA)

Redox reactions and oxidation numbers. Standard reduction potentials. Galvanic cells and redox reactions. Nerst equation. Classification of the half cells. Equilibrium constants of redox reactions. Concentration cells. Qualitative and quantitative aspects of the electrolytic processes.

Laboratory Applications (12h)

Lab experiences:

1. Elementary techniques of a chemical laboratory. Acid-base, precipitation, complexation reactions of the copper(II) ion in a copper sulfate pentahydrate solution.
2. Electrochemistry Experiments:
 - (A) Redox reaction between metallic zinc and the copper(II) ion and determination of the quantum yield.
 - (B) Construction of the Daniell's galvanic cell.
 - (C) Electrolysis of a solution of sodium sulfate.

TEACHING METHODS

The lectures will be comprised of PowerPoint slides provided by the teacher and supplemented with chalkboard presentations. Numerical application will be comprised of chalkboard problem solving and discussions. Laboratory activities will be introduced by PowerPoint and chalkboard presentations. The students will also be provided with supplementary worksheets.

EVALUATION METHODS

The final exam will comprise a written examination consisting of six numerical problems and an oral examination. A score of at least 18/30 in the written examination is mandatory to access the oral examination. The evaluation of the laboratory written reports will contribute to the final score of the exam.

TEXTBOOKS AND ON-LINE EDUCATIONAL MATERIAL

The students will be provided with PowerPoint slides of the lectures.

Required textbooks:

- o P. Atkins e L. Jones, Principi di Chimica, Casa Editrice Zanichelli, Terza edizione italiana condotta sulla quinta edizione americana
- o Mahan B. H. e Myers R. J., Chimica, Casa Editrice Ambrosiana
- o Bertini I. e Mani F., Stechiometria: un avvio allo studio della Chimica, Casa Editrice Ambrosiana

INTERACTION WITH STUDENTS

Office Hours: 9:00–11:0 Wednesday and by e-mail appointment.

EXAMINATION SESSIONS (FORECAST)¹

27/02/2020; 26/03/2020; 30/06/2020; 29/07/2020; 11/09/2020; 23/10/2020; 17/12/2020

SEMINARS BY EXTERNAL EXPERTS YES NO

FURTHER INFORMATION

¹Subject to possible changes: check the web site of the Teacher or the Department/School for updates.