

COURSE: Analytical Chemistry II			
ACADEMIC YEAR: 2016 2017			
TYPE OF EDUCATIONAL ACTIVITY: (Basic, Characterizing, Affine, Free choice, Other): B			
TEACHER: Casella Innocenzo			
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Language: Italian			
ECTS: (lessons e tutorials/practice): 6	n. of hours: (lessons e tutorials/practice) 48	Campus: Potenza/Matera Dept./School: Potenza Program:	Semester: II

EDUCATIONAL GOALS AND EXPECTED LEARNING OUTCOMES

The objectives of this course regards the acquisition of the basic knowledge of the acid-base equilibria and all its implications for both theoretical and practical approach.

Similarly, were considered the redox equilibria and their implications in the different analytical contexts. The objectives concern the formal acquisition of the basic knowledge regarding the treatment of redox equilibria in terms of theoretical level and practical applications.

The graphics treatment, has the purpose to facilitate the approach to the numerical evaluation in different contexts and predict the evolution of the equilibria.

The treatment of the most common techniques of analysis: potentiometric, polarographic, spectrophotometric in absorption and emission has the aim to provide the basic knowledge of these techniques and to define and rationalize the most common approaches to the chemical analysis operative conditions.

The study of the gaseous and liquid chromatography has finally the purpose of providing their basic knowledge and technical information in order to obtain the necessary background of these separative techniques.

The main objectives of this teaching will be:

- Acquisition of knowledge related to the equilibria treatment;
- Approach to the numerical and graphical analysis of the species related to the equilibrium conditions;
- Management and proposition of instrumental analytical methods for the speciation of molecules of interest.

PRE-REQUIREMENTS

The optimal approach of the Course in Analytical Chemistry II implies the minimal knowledge of:

Basic Mathematics and Physics.

In addition, are necessary the cultural acquisition of the basic knowledge of General Chemistry, Analytical Chemistry I and Physics-Chemistry I.

SYLLABUS

- 1- Acid-base Equilibria: the systematic calculation of species at equilibrium. Protoliths and their properties; strong, weak, and their relevant mixtures. Calculation of buffer capacity.
 - 2- Graphical approach to the equilibria treatment: distribution and logarithmic diagrams. Buffer capacity representation vs pH.
 - 3- Redox equilibria: Galvanic cells with and without transports. Standard potentials. Graphical representation E vs pH. Permanganometry and Iodimetry. Applications.
 - 4- Potentiometry: General considerations. indicators and reference electrodes. Electrodes. Ion-selective membranes: solid crystalline, non-crystalline, liquid membranes. Calculation of selectivity coefficients. pH measurements. Calculation of equilibrium constants by potentiometric titrations. Instrumental titrations, E vs Titrant, Gran representation.
 - 5- Voltammetry: General considerations. Cells and electrodes. Diffusion layer; Cottrell equation. Voltammetry, equation of Randles-Sevcik. Polarography: advantages and limitations. Ilkovic equation. Faradic and capacitive currents. Amperometric titrations. Analytical applications of trace analysis.
 - 6- Molecular spectrophotometry UV-Vis in absorption: General considerations. Electromagnetic spectra. Radiation and molecules. Energy diagram. Beer-Lambert law: potential use and limitations. Spectrophotometer scheme: sources, monochromators and analyzers. Spectrophotometric titrations and instrumental analytical applications.
 - 7- Molecular spectrophotometry UV-Vis in emission (fluorescence): General Considerations; fluorescence emissions and relevant parameters. Fluorophore groups. Instrumental solutions.
 - 8- Chromatographic methods of separation: General principles and concepts. Factors of capacity, resolution and efficiency. Van Deemter equation. Gas chromatography: Gas-solid and gas-liquid. Capillary columns and instrumentation. Liquid chromatography: direct and reverse phase, ion exchange, size exclusion. Columns and instrumentation. uses and limits potential.
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TEACHING METHODS

At the beginning of the lecture series is presented the teaching program and through a phase of direct relation with students:

- Brief description of each topic to be treated and its available bibliography;
- Presentation of the program and approach at the study; modality of reception of students.

EVALUATION METHODS

The evaluation procedures provide a direct comparison phase with students during the cycle of lessons through numerical exercises and questions of topics of interest.

The final and definitive evaluation concerning the verification of the learning state, is based on oral examination with numerical approach to the subject of study.

TEXTBOOKS AND ON-LINE EDUCATIONAL MATERIAL

- **FONDAMENTI DI CHIMICA ANALITICA.** Skoog, West, Holler. EdiSES, Napoli.
- **ANALYTICAL CHEMISTRY,** G.D. Christian, 5th Ed. Wiley

INTERACTION WITH STUDENTS

EXAMINATION SESSIONS (FORECAST)¹

24/03/2017; 12/05/2017; 23/06/2017; 27/07/2017; 20/10/2017; 15/12/2017; 26/01/2018

SEMINARS BY EXTERNAL EXPERTS YES NO x

FURTHER INFORMATION

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