

COURSE: Analytical Chemistry			
ACADEMIC YEAR:2016-2017			
TYPE OF EDUCATIONAL ACTIVITY: (Basic, Characterizing, Affine, Free choice, Other): B			
TEACHER: CASELLA INNOCENZO			
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phone: 0971 206124		mobile (optional):	
Language:			
ECTS: (lessons e tutorials/practice) 7 + 1	n. of hours: (lessons e tutorials/practice) 68 56 + 12	Campus: Potenza Dept./School: Program:	Semester: I

EDUCATIONAL GOALS AND EXPECTED LEARNING OUTCOMES

The objectives of this course are the acquisition of basic knowledge about the thermodynamic of the equilibrium of the reactions. In particular the equilibria regards: the acid-base and Redox equilibria. The study focuses on and aims to understand the most important implications regarding the numerical and conceptual problems in different contexts of the Analytical Chemistry.

The approach on the common analytical techniques such as: potentiometric, spectrophotometric absorption and emission has the aim to provide a basic but exhaustive vision to the chemical analysis and relevant laboratory approaches.

The study of the gaseous and liquid chromatography has finally the purpose of providing the necessary information of these techniques for the purification and/or separation and subsequent analysis of several molecules of pharmaceutical interest.

The cycle of lectures, with numerous numerical approaches, will have the goal to provide the following capabilities:

- Ability to calculate acid-base and redox species under equilibrium conditions;
- Knowledge and critical capacity to the understanding the procedures in order to define the common methods of analysis.

PRE-REQUIREMENTS

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

Basic Mathematics and Physics.

SYLLABUS

- 1) CHEMICAL EQUILIBRIA: Thermodynamics and equilibrium constants.
- 2) ACID-BASE EQUILIBRIA: Protolysis strong and weak, pH calculation. Concept of buffer solutions and calculation of buffer capacity. pH indicators. Volumetric analysis, primary standards, titration curves,

Acid / base titration of protoliths.

3) REDOX REACTIONS: Galvanic and electrolysis cells. Equation of Nernst
Definition of potential standards and their experimental evaluation. Calculation of the
equilibrium constants.

Redox titrations; redox indicators.

Permanganometry; iodometry; Iodimetry.

4) POTENTIOMETRY: Galvanic Cells as of measuring instruments. Electrodes
and reference indicators.

Glass electrode and pH measurement. Ion selective electrodes.

5) UV-VIS: General definitions of Spectrophotometry . Lambert Beer law and its limitations.
Energy diagrams. Conditions of absorption.

Spectrophotometer schemes: single / dual beam.

Absorption analysis.

6) SPECTROPHOTOMETRY IN EMISSION: Fluorescence: Properties and general
definitions.

Molecular structure vs. quantum yield.

Fluorescence signal vs. concentration.

Instrumentation and general characteristics. Examples of analytical applications.

7) SEPARATION TECHNIQUES:

Definitions and general properties. Factors of capacity, resolution, efficiency.

Equation of Van Deemter. Chromatographic techniques: Gas-chromatography: packed and
capillary columns. stationary and mobile phases;

Liquid chromatography: stationary and mobile phases. Isocratic and
gradient conditions. Types of chromatography: partition, ionic, size exclusion.

TEACHING METHODS

The teaching method is based on the traditional approach: lecture with extensive use of numerical
presentation and exercises; in addition a large use of graphics is considered.

The course consists of 8 (7+1), 7 credits of frontal lessons.

An important part involves the use of the traditional approach and the use of software for
electronic presentation using Power Point, EXCELL, etc.

EVALUATION METHODS

The evaluation procedures provide a direct interaction phase with students during the cycle of
lessons through numerical exercises and questions of topics interest regarding the modern aspects
of the Analytical Chemistry.

The final and definitive evaluation concerning the verification of the learning state, is based on oral examination considering the quantitative 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
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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;

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.