

COURSE: **Analytical Chemistry I**

ACADEMIC YEAR: **2019-2020**

TYPE OF EDUCATIONAL ACTIVITY: **Basic Related and Integrative**

TEACHER: **Anna Maria Salvi**

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Language:

ECTS: 6 (lessons e tutorials/practice)

n. of hours: 48 (lessons e tutorials/practice)

Campus: **Potenza**
Dept./School: Program: **Science Department**
CdS: Chemistry (L27)

Semester: **2nd from**
(date) **02.03.2020 to**
31 May- 20 June
2020

EDUCATIONAL GOALS AND EXPECTED LEARNING OUTCOMES

The purpose of this course is to provide the following basic knowledges of Analytical Chemistry:

- Fundamentals of qualitative and quantitative chemical analysis.
- Activity versus Concentration and systematic treatments of equilibrium.
- Experimental errors and their evaluation.
- Principles of volumetric and gravimetric analyses.
- Basic-acid, precipitation and dissolution, complex and redox reactions.
- Theory and classification of volumetric and gravimetric titrations.

Expected learning outcomes:

The student should comprehend the theoretical principles of analytical chemistry and gain an understanding of the basic analytical techniques and correct formulation *of the results*.

PRE-REQUIREMENTS

The course of General and Inorganic Chemistry is a preparatory course for the Analytical Chemistry I.

It is necessary to have acquired the basic knowledge of chemistry and in particular:

Unit of measurement and IUPAC nomenclature of the main inorganic compounds

Concepts of mole, stoichiometry and balancing of chemical reactions

Types of solutions, concentration units, liquid solutions preparation

Chemical equilibrium constants and their meaning, the principle of Le Chatelier

It is also advisable to know how to calculate the partial derivatives of a function in order to properly apply the error propagation formulas.

SYLLABUS

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BASICS OF QUALITATIVE AND QUANTITATIVE ANALYSIS

Qualitative analysis and periodic tables of elements. Unities and concentrations. Chemical equilibria in aqueous solutions. Ionic Strength. Activity and activity coefficients.

EVALUATION OF ANALYTICAL DATA

Systematic errors. Measurement errors and their propagation. Random errors and Normal distribution. Significance test-Q, F, t essays and introduction to sampling statistic.

GRAVIMETRIC ANALYSIS:

Solubility, solubility constants and factors affecting solubility. The process of precipitation in water. Colloids.

VOLUMETRIC ANALYSIS – STANDARD SOLUTIONS- TITRATIONS WITH CHEMICAL

INDICATORS AND ASSOCIATED ERRORS:

A) ARGENTOMETRY:

Mohr, Volhard and Fajans methods. Construction of titrations curves for silver halides precipitations.

B) ACID-BASE: An overview of acid-base equilibria in water. Definition of pH. Dissociation constants and distribution functions. Henderson-Hasselbach equation and buffer systems. Acid-base titrations.

C) COMPLEXOMETRY Consecutive and Global formation constants of Complexes. Use of Chelate complexes in analytical chemistry. Amphoteric hydroxides. Titrations with EDTA and metallochromic indicators.

D) REDOX Redox reaction and equilibrium constants. Nernst equation. Standard and Formal Redox potentials- Redox reagents and their applications. Redox titrations. Indicators and self-indicators.

NUMERICAL EXERCISES**TEACHING METHODS**

The course provides 48 hours of frontal lessons and numerical exercises on the topics.

EVALUATION METHODS

The exam consists of a single oral test comprising the two modules of 'Analytical Chemistry I' and 'Analytical Chemistry Laboratory I'. In order to verify the level of achievement of the indicated course objectives, during the examination the student will have to answer the theoretical questions and demonstrate how to apply the acquired knowledge by numeric examples.

The oral examination also includes the discussion of laboratory reports that will be delivered to the lecturer of the 'Laboratory of Analytical Chemistry I' at least one week before the examination date.

TEXTBOOKS AND ON-LINE EDUCATIONAL MATERIAL

- 1. A. ARANEO, "CHIMICA ANALITICA QUALITATIVA", Ambrosiana (Mi)
- 2. D.C. HARRIS "CHIMICA ANALITICA QUANTITATIVA", 2^a edizione, Zanichelli, Bologna
- 3. SAINI-LIBERTI, "CHIMICA ANALITICA", UTET
- 4. SKOOG, WEST, HOLLER, "FONDAMENTI DI CHIMICA ANALITICA" EDISES, NAPOLI
- LESSON NOTES FOR EACH REQUIRED TOPIC

INTERACTION WITH STUDENTS

At the beginning of the course, the goals, detailed program and verification methods will be described.

Students will be able to contact the teacher for further details (Study 4th floor MR-Building 2DA) and agree a reception time by email anna.salvi@unibas.it or mobile (3204238516).

EXAMINATION SESSIONS (FORECAST)¹

12 Febbraio; 16 Marzo; 12 Giugno; 24 Luglio; 24 Settembre; 15 Ottobre; 22 Dicembre

SEMINARS BY EXTERNAL EXPERTS YES NO

FURTHER INFORMATION

EXAMINATION BOARD: **President:** Anna Maria Salvi **Component:** teacher of 'AC Laboratory I' course

Adjunctive components: Giuliana Bianco; Rosanna Ciriello; Antonio Guerrieri

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