

COURSE: Analytical Chemistry I**ACADEMIC YEAR: 2017-2018****TYPE OF EDUCATIONAL ACTIVITY: BASIC****TEACHER: Anna Maria Salvi**

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Language: **Italian****ECTS: 6 (48 hours lessons and 0 tutorials/practice) 2nd Semester
Potenza, Chemistry Department CdS CHEMISTRY (L27)****EDUCATIONAL GOALS AND EXPECTED LEARNING OUTCOMES**

- **Fundamentals of Analytical Chemistry.**
- **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.**
- **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

Principles of stoichiometry, mole concept 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**1. 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.

2. 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.

3. GRAVIMETRIC ANALYSIS: Solubility, solubility constants and factors affecting solubility. The process of precipitation in water. Colloids.**4. VOLUMETRIC ANALYSIS – STANDARD SOLUTIONS- TITRATIONS WITH CHEMICAL**

INDICATORS AND ASSOCIATED ERRORS:

4A) ARGENTOMETRY

MOHR, VOLHARD AND FAJANS METHODS. CONSTRUCTION OF TITRATIONS CURVES FOR SILVER HALIDES PRECIPITATIONS.

4B) 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.

4C) COMPLEXOMETRY

Global and consecutive formation constants of Complexes. Chelate complexes and use in analytical chemistry.

Amphoteric hydroxides. Titrations with EDTA and metallochromic indicators.

4D) REDOX

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

5. 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. P. LANZA "CHIMICA ANALITICA GENERALE' PATRON EDITORE BOLOGNA

5. LESSONS NOTES

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INTERACTION WITH STUDENTS

At the beginning of the course, the teacher describes the goals, program and verification methods of the students. At the same time it collects the list of students who intend to attend the course, with their name, surname, enrollment and e-mail. As a compulsory course, the teacher will collect students' signatures in each lesson.

Students will be able to contact the teacher for further details on the following reception times:

Monday and Wednesday 11.30-12.30 (Studio 4th floor MR-Building 2DA) or at other times to be agreed by email anna.salvi@unibas.it or mobile (3204238516).

In addition to ensuring the availability of the suggested textbooks, the teacher will distribute a copy of the 'lesson notes' for each topic it is expected.

EXAMINATION SESSIONS (FORECAST)¹

21February; 21March; 20 June; 18 July; 26 September; 24 October; 19 December

SEMINARS BY EXTERNAL EXPERTS YES NO

FURTHER INFORMATION

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

Additional components: Giuliana Bianco; Rosanna Ciriello; Antonio Guerrieri

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