

UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Scienze e Tecnologie Biologiche, Chimiche e Farmaceutiche
ACADEMIC YEAR	2018/2019
MASTER'S DEGREE (MSC)	PHARMACY
SUBJECT	ANALYTICAL CHEMISTRY
TYPE OF EDUCATIONAL ACTIVITY	A
АМВІТ	50324-Discipline Chimiche
CODE	01799
SCIENTIFIC SECTOR(S)	CHIM/01
HEAD PROFESSOR(S)	BONGIORNO DAVID Professore Associato Univ. di PALERMO
OTHER PROFESSOR(S)	
CREDITS	6
INDIVIDUAL STUDY (Hrs)	100
COURSE ACTIVITY (Hrs)	50
PROPAEDEUTICAL SUBJECTS	00133 - GENERAL AND INORGANIC CHEMISTRY
MUTUALIZATION	
YEAR	2
TERM (SEMESTER)	1° semester
ATTENDANCE	Not mandatory
EVALUATION	Out of 30
TEACHER OFFICE HOURS	BONGIORNO DAVID
	Monday 14:30 16:30 Via Archirafi n.32, primo piano Stanza 77

DOCENTE: Prof. DAVID BONGIORNO	
PREREQUISITES	Structure of the atom (general description and electronic structure); the chemical bonds; quali-quantitative aspects of chemical reactions: atomic and molecular weights, equations balance, nomenclature; mixtures and solutions: concentrations and their units, electrolytes, monoprotic and polyprotic acids and bases; definition of buffer solutions.
LEARNING OUTCOMES	KNOWLEDGE AND ABILITY OF COMPREHENSION The course aims at providing the basic concepts for the definition of the composition and chemical characteristics of the equilibrium systems in aqueous solution. The concepts will be developed in view of the interaction of equilibrium processes, in order to apply to chemical analysis. Particular attention will be paid to statistical applied to chemical analyses in detail to the concepts of precision, accuracy, reproducibility and sensitivity of a method in relation to the measurement uncertainties in an analytical procedure.
	CAPACITY TO APPLY KNOWLEDGE AND COMPREHENSION Ability to define the main chemical characteristics and the reactivity of the aqueous systems and to carry out the data analysis.
	MAKING JUDGMENTS Ability in identifying interactions between the basic concepts , in order to critically evaluate equilibrium processes and provide solutions in analytical procedures.
	ABILITY OF COMMUNICATION Being able to explain the basic concepts with appropriate scientific language.
	LEARNING CAPACITY Being able to apply the basic concepts in order to solve equilibrium calculations, highlighting different steps of calculation for obtaining a correct analytical result and an appropriate presentation of the final analytical data.
ASSESSMENT METHODS	The final examination consists of one written examination and in an oral examination. The written test consists in solving exercises on the chemical equilibrium, and on statistical calculation. The midterm tests consist in solving a set of questions and exercises. The oral examination allow us to verify the degree of knowledge of the teaching topics, the possession of the scientific language and the ability exposure. Different ranging of evaluation will be done based on the following considerations: 1) Basic knowledge of topics and ability in processing knowledge for application to Analytical Chemistry. Limited capacity of analysis and exposure of the proposed questions (rating 18-21) 2) Good knowledge of topics and ability in processing knowledge for application to Analytical Chemistry. Good capacity of analysis and exposure of the proposed questions (rating 22-24) 3) Very good knowledge of topics and ability in processing knowledge for application to Analytical Chemistry. Good capacity of analysis and exposure of the proposed questions (rating 25-27) 4) Excellent knowledge of the topics and prompt capacity of knowledge processing for application to Analytical Chemistry. Very good capacity of analysis and exposure of the proposed questions (rating 25-27) 4) Excellent knowledge of the topics, excellent and very smart capacity of analysis and exposure of the proposed question to Analytical Chemistry. Very good capacity of analysis and exposure of the proposed question to Analytical Chemistry. Very good capacity of analysis and exposure of the proposed questions (rating 28-30) 5) Excellent knowledge of the topics, excellent and very smart capacity of analysis and exposure of the proposed questions (rating 30 cum laude)
EDUCATIONAL OBJECTIVES	Applying basic concepts of Analytical Chemistry for the development of an analytical procedure
TEACHING METHODS	frontal lessons Numerical exercises
SUGGESTED BIBLIOGRAPHY	I seguenti testi sono consigliati in alternativa per tutti gli argomenti del corso: Skoog, West, Holler, Crouch. Fondamenti di Chimica Analitica – Edises – 3° ed. (2015) (cap. 5-11; 14, 15, 17-20)
	Harris – Fondamenti di Chimica Analitica – Zanichelli 1° ed. (2017)
	Per gii argomenti riguardanti la trattazione degli equilibri chimici in soluzione acquosa un testo alternativo e:
	Di Marco, Pastore, Bombi - Chimica Analitica – Edises

SYLLABUS

Hrs	Frontal teaching
10	Aims of the course Statistics for chemical data evaluation Statistical calculations: mean, median, variance and standard deviation Errors and measurement uncertainty - repeated measures data distribution - confidence interval and Student t distribution. Accuracy, precision, sensitivity, detection and quantification limits - Calibration methods - the method of least squares in ordinary linear regression Tests of significance: Comparison of two precisions (F test), comparison of two experimental averages and of an average value with a known value (T test), identification of outliers (Q test). Principal spectrophotometers and spectrometers analytical tecniques.
2	Chemical equilibrium and calculation of the equilibrium concentrations The mass action law, equilibrium constants - mass and charge balance equations - Definition of activity and ionic strength - analytical applications of equilibrium: titrations.
10	Acid-base equilibrium Water autoprotolysis equilibrium- monoprotic and polyprotic weak acids and bases - distribution diagrams - ampholytes, acids or bases mixtures, buffer systems. Acid-base titration and titration curves
8	Complex formation Equilibrium Lewis acids and bases, metal / binders complexes, chelating effect and equilibrium constants. Competitive complexation equilibrium: hydrolysis of metals, acid-base reactions of complexes Complexometric titrations with ethylenediamine tetraacetic acid
6	Precipitation equilibrium Calculation of the equilibrium concentrations. Precipitation equilibrium in presence of competitive equilibrium Effect of the ionic strength effect of in common ions on the precipitation equilibrium
8	Redox equilibrium Galvanic cells and electrodes potentials. The equilibrium condition in the redox- reactions, Nernst equation - Solutions of two redox pairs in the presence of competitive equilibria Stability of the redox couples in water and pH diagrams / potential
Hrs	Practice
6	Numerical exercises summarizing the topics of frontal lessons