DIPARTIMENTO DI SCIENZE

COURSE: **General and Inorganic Chemistry II**			
ACADEMIC YEAR: **2018-2019**			
TYPE OF EDUCATIONAL ACTIVITY: **Characterizing**			
TEACHER: **Mario Amati**			
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phone: 0971/205935		mobile (optional):	
Language: **ITALIANO**			
ECTS:**6** (**3** Theory + **2** Numerical Applications + **1** Laboratory Activity)	n. of hours: **60** (**24** T + **24** NA + **12** LA)	Campus: **Potenza** Dept.: **Dipartimento di Scienze** Program: **Chemistry (L27)**	Semester: **II** start: 05/03/2018 end: 15-30/06/2018

EDUCATIONAL GOALS AND EXPECTED LEARNING OUTCOMES

Skills

- qualitative and quantitative aspects of the chemical equilibrium
- qualitative and quantitative aspects of the reaction equlibria involving gases
- qualitative and quantitative aspects of the most important classes of ionic equilibria in aqueous solution;
- elements of Electrochemistry: redox reactions, galvanic cells and electrolitic processes;
- elements of Kinetics: reaction rates; rate laws; reaction mechanisms; transition state theory and reaction profiles; temperature dependence of the reaction rates;
- elementary laboratory techniques: precipitation and filtration of precipitates;

Learning outcomes

- ability to treat numerically the homogeneous and eterogeneous equilibria involving gases;
- ability to treat numerically the acid-base equilibria in aqueous solution;
- ability to treat numerically solubility equilibria;
- ability to treat numerically redox processes occurring in galvanic and electrolitic cells;
- ability to write the kinetic law of a reaction and calculate the decay time of a substance using experimental kinetic data;
- Ability to report accurately and concisely the data of the laboratory experiments.

PRE-REQUIREMENTS

General and Inorganic Chemistry I

SYLLABUS

Chemical equilibrium. (2h T + 4h NA)

Nature and properties of the chemical equilibrium. Equilibrium constants. Effect of concentration, pressure, volume, temperature on the equilibrium composition. Le Chatelier Principle. Reaction ratio. Qualitative and quantitative aspects of equilibria involving gases.

Acid-base equilibria in aqueous solution. (6h T + 8h NA)

Definition of acid and base by Arrhenius, Lowry-Bronsted, Lewis. Water equilibrium and the pH scale. Aqueous solutions of strong acids, strong bases and mixtures of both. Weak monoprotic acids and bases. Acid-base equilibria in salt solutions. Buffer solutions. Polyprotic acids and salts of polyprotic acids.

Solubility equilibria. (4h T + 4h NA)

Low-solubility salts and solubility product constants. Effect of the shared ion and pH on the solubility of a salt. Precipitation reactions. Selective precipitation reactions.

Electrochemistry. (6h T + 4h NA) Redox reactions and oxidation numbers. Standard reduction potentials. Galvanic cells and redox reactions. Nernst equation. Classification of the half cells. Equilibrium constants of redox reactions. Concentration cells. Qualitative and quantitative aspects of the electrolitic processes.

Kinetics. (6h T + 4h NA)

Reaction rates and rate laws. Determination of reaction rate laws using experimental data. Integrated rate low for first and second order reactions involving only one reagent and determination of the halving time. Reaction mechanisms and elementary processes. Temperature dependence of the reaction rates. Arrhenius equation and its applications. Activated complex theory. Transition state and activation energy. Reaction profiles of stepwise reactions. Homogeneous and eterogeneous catalysis.

Laboratory Applications . (12h)

Lab experiences: **1.** Elementary techniques of a chemical laboratory. Acid-base, precipitation, complexation

reactions of the copper(II) ion in a copper sulfate pentahydrate solution.

2. Electrochemistry Experiments: **(A)** Redox reaction betwee metallic zinc and the copper(II) ion and determination of the quantum yield**. (B)** Construction of the Daniell's galvanic cell.

(C) Electrolysis of a solution of sodium sulfate.

TEACHING METHODS

The lectures will be comprised of PowerPoint slides provided by the teacher and supplemented with chalkboard presentations. Numerical application will be comprised of chalkboard problem solving and discussions. Laboratory activities will be introduced by PowerPoint and chalckboard presentations. The students will also be provided with supplementary worksheets.

EVALUATION METHODS

The final exam will comprise a written examination consisting of six numerical problems and an oral examination. A score of at least 18/30 in the written examination is mandatory to access the oral examination. The evaluation of the laboratory written reports will contribute to the final score of the exam.

TEXTBOOKS AND ON-LINE EDUCATIONAL MATERIAL

The students will be provided with PowerPoint slides of the lectures.

Required textbooks:

- P. Atkins e L. Jones , Principi di Chimica, Casa Editrice Zanichell, Terza edizione italiana condotta sulla quinta edizione americana
- Mahan B. H. e Myers R. J., Chimica, Casa Editrice Ambrosiana
- Bertini I. e Mani F., Stechiometria: un avvio allo studio della Chimica, Casa Editrice Ambrosiana

INTERACTION WITH STUDENTS

Office Hours: 9:00–11:0 Monday and Wednesday and by e-mail appointment.

EXAMINATION SESSIONS (FORECAST)[1]

29/06/2019; 26/07/2019; 25/09/2019; 25/10/2019; 06/12/2019.

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.