COURSE DATA

Data Subject	
Code	34060
Name	General Chemistry
Cycle	Grade
ECTS Credits	6.0
Academic year	2019 - 2020

Study (s)

Degree	Center	Acad. year	Period
1201 - Degree in Pharmacy	Faculty of Pharmacy and Food Sciences	1	First term
1211 - D.D. in Pharmacy-Human Nutrition and Dietetics	Faculty of Pharmacy and Food Sciences	1	First term

Subject-matter

Degree	Subject-matter	Character
1201 - Degree in Pharmacy	1 - Chemistry	Basic Training
1211 - D.D. in Pharmacy-Human Nutrition and Dietetics	1 - Asignaturas obligatorias del PDG Farmacia-Nutrición Humana y Dietética	Obligatory

Coordination

Name	Department
ROS LIS, JOSE VICENTE	320 - Inorganic Chemistry

SUMMARY

General Chemistry is a basic course taught turing the first semestre of first year Grade in Pharmacy. In the current curriculum (study plan) the course consists of 4.5 theory credits and 1.5 laboratory credits.

The theoretical part seeks to provide the students with the basic and fundamental concepts of Chemistry in general, especially those concerning the chemical elements and their compunds, while showing at the same time the importance of the scientific knowledge (scientific perspective) of reality (of life), a fundamental aspect of the university education. The student must achieve solid bases to interpret and to build the potential applications and uses of the inorganic compounds, not only to undertake the study of other subjects, with significant chemical content, but also in the different areas of the performance of those professional activities related to its professional degree, in research, teaching, pharmacies and

industry.

With respect to the theory lectures, the objective is that the students consolidate and extend their knowledge on atomic structure, chemical bonding (both, in discrete molecules as well as in the solid state), and chemical reactivity.

As for the laboratory sessions, the student must achieve the necessary skill in the basic laboratory techniques and perform experimental studies of some of the concepts covered during the theory lectures.

PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

There are no specified enrollment restrictions with other subjects of the curriculum.

Other requirements

OUTCOMES

1201 - Degree in Pharmacy

- Skills for oral and written presentations.
- To develop in students an understanding of the risks associated with the use of chemical substances and laboratory procedures.
- To provide students with the knowledge of chemical reactions in solution, the different states of matter, the thermodynamic principles, and their application to pharmaceutical sciences.
- To be able to name and formulate inorganic and organic compounds.
- To achieve the skills to solve basic problems related to the determination of empirical and molecular formulae of chemical compounds.
- To be able to solve simple quantitative problems related to chemical processes in equilibrium, as well as from a kinetic point of view.
- To achieve the capacity to explain in understandable terms those phenomena and processes related to basic chemical issues.
- To know the characteristic properties of the elements and their compounds, as well as their applications in the pharmaceutical field.
- To assign and predict the structure of inorganic chemical compounds.
- To achieve the capacity to explain in understandable terms those phenomena and processes related to Inorganic Chemistry.

LEARNING OUTCOMES

Students must consolidate and extend the General Chemistry knowledge achieved along the baccalaureate (high school), related to atomic structure, periodicity, chemical bonding, molecular structure, states of matter and chemical reaction.

They must achieve solid bases on the facts, concepts and fundamental principles of Chemistry, so that they are able to adequately apply them in different situations as well as to the study of other subjects having chemical content.

The course will seek to underline basic aspects, as well as current applications, such as new pharmaceutical drugs, manufacturing of new materials with specific properties, new energy resources, pollution, etc.

The student must develop the capacity to outline and solve numerical problems, properly handling units and giving an interpretation of the results with analytical and critical thinking.

The objectives of laboratory sessions are to train the student in:

Handling of chemical reagents, residue treatment and compliance with safety measurements.

Basic laboratory techniques, such as: mass and volume measurements, preparation of solutions, filtration, separation, centrifugation, etc.

The use of measuring instruments of chemical interest.

The study of different kinds of chemical reactions, such as redox reactions and acid-base reactions.

The interpretation of experimental facts, by the synthesis and reactivity of inorganic compounds with pharmaceutical interest.

DESCRIPTION OF CONTENTS

1. ATOMIC STRUCTURE

Composition of the atoms. The Schrodinger equation for hydrogen. Atomic orbitals. Polyelectronic atoms. Electronic configuration. Periodic Table.

2. CHEMICAL BONDING

Basic Concepts of bonding and types of bonding. Electronegativity and bond polarity. Lewis structures. Resonance. Molecular shapes. VSEPR theory.

3. COVALENT BONDING

Molecular orbital diagrams. Homo- and heteronuclear diatomic molecules. Polyatomic molecules. Hybridization. Multiple Bonds.

4. INTERMOLECULAR FORCES

Van der Waals forces. The hydrogen bond.

5. Solid state I

Metallic solids. Structures. Band theory: conductors, Semiconductors and insulators.

6. SOLID STATE II

Covalent network solids. Molecular solids.

7. SOLID STATE III

Ionic solids. Structure considerations. Bond energy in ionic solids: lattice energy and the born-haber cycle. Polarization of ions.

8. THE CHEMICAL REACTION

Principles on Chemicals reactivity. Free energy and Chemicals equilibrium. Enthalpy. Enthalpy of formation. Hesss law. Bond enthalpy. Entropy. Free energy and spontaneity. Equilibrium constant. Change of equilibrium constant with temperature.

9. ACID-BASE EQUILIBRIA

Acid-base reactions. Auto-ionization of water. The pH concept. Strength of acids and bases. Acid-base titrations. Buffer Solutions.

10. REDOX EQUILIBRIA

Oxidation states. Redox Potentials. Spontaneity of reactions. Nernst equation.

11. INTRODUCTION TO COORDINATION COMPOUNDS

Coordination compounds. Nomenclature. Geometry and introduction to bonding.

12. LABORATORY SESSIONS

USE OF LABORATORY EQUIPMENT. PREPARATION OF SOLUTIONS.

SEPARATION OF MIXTURES. REDOX EQUILIBRIA. BATTERIES.

ACID-BASE EQUILIBRIA. BUFFER SOLUTIONS.

SYNTHESIS OF SODIUM BICARBONATE.

WORKLOAD

ACTIVITY	Hours	% To be attended
Theory classes	38,00	100
Laboratory practices	15,00	100
Seminars	2,00	100
Tutorials	2,00	100
Development of group work	4,00	0
Development of individual work	4,00	0
Study and independent work	15,00	0
Readings supplementary material	6,00	0
Preparation of evaluation activities	10,00	0
Preparing lectures	30,00	0
Preparation of practical classes and problem	15,00	0
Resolution of case studies	6,00	0
TOTAL	**147,00**	

TEACHING METHODOLOGY

This course is structured in four types of activities: theory lectures, seminars, laboratory experimental sessions, and tutorials (recitations).

Study of theory contents. Students should acquire the basic knowledge included in the syllabus by means of their individual study and assistance to the lectures. During such lectures, the professor will set and explain an overview of each subject, emphasizing those key concepts needed for its understanding, and will answer questions from the students. To help in their individual study and in depth preparation of each subject, students will be provided with basic and complementary bibliography, internet addresses and supporting computer equipment, as well as the instructions and advice for handling information sources.

Laboratory work. Laboratory sessions are structured around four main components. In the first place, students must undertake a preparatory work before going to the laboratory, consisting in an effort to understand the laboratory guide provided for each experiment, review of the theoretical concepts involved, answering a set of previous questions, and preparing an outline of work process. At the beginning of each laboratory session, the students will be asked to answer a set of questions to evaluate the preparation of the work to be performed. The student should go to each session with a laboratory notebook in which to register the previous work done, as well as all the observations and relevant facts taking place during the each experiment and the results of all the measurements performed. The student should analyze the observed facts and will answer some post-laboratory questions. By the end of the course all students will take a written exam on some questions directly related with the carried-out experiments.

Tutorials. Tutorials are meant to solve any doubt raised during theory lectures and to orient students about the most effective study methodology to improve their learning performance. In addition, during the tutorials the students will be provided with a list of questions to be solved at home, either individually or in group.

Seminars. Practical seminars and workshops are programmed during the course on monographic specific aspects of the course in order to help in their learning.

Attendance to seminars and tutorials are mandatory to at least an 80% of them. Unjustified absence to any of the laboratory sessions will prevent passing the course.

EVALUATION

Learning evaluation of students will take into account all aspects exposed in the methodology section of this teaching guide and will be carried out by the professor in a continuous way.

First Examaation Sitting.

Student will be taking a final written exam that will represent a 75% of the final grade obtained in the course. It will consist of conceptual or reasoning questions to evaluate student's understanding of the fundamentals concepts. The exam may include a topic to be developed to evaluate the synthesis and descriptive ability.

The score obtained in the laboratory work, with mandatory attendance to all sessions, will represent 15% of the final grade. The evaluation of the laboratory work will take into account all components described in the methodology section, according to the following criteria:

Previous work to each session: 45%

Laboratory notebook: 10%

Final exam: 45%

A 10% of the final grade will come from all the activities carried out during the learning process: attendance to tutorials and seminars, sound participation in the discussions raised, preparation and presentation of the proposed activities, adequate progress in the usage of chemical language, raising doubts, and the capacity for team work.

In order to pass the course, a minimum score of 5 over 10 will be required in both, the final exam and in the laboratory work, separately.

Second Examination Sitting.

The same criteria will be applied for the second exam sitting.

Note.

In the case of failing the course in both sittings, the score obtained in the laboratory work (15%) will be maintained for the next two academic courses.

REFERENCES

Basic

- QUÍMICA GENERAL Enlace Químico y Estructura de la Materia. Petrucci R.H., Harwood, W.S. y Herring F.G. Prentice Hall. Octava edición, 2003.(Vol.I)
  QUÍMICA. La Ciencia Central. Brown T.L., Lemay H.E., Bursten B. E. y Murphy C. J. Editorial Pearson. Décimoprimera edición. 2009.
  QUÍMICA. Chang R. Ediciones McGraw-Hill. Décima edición, 2010.

Additional

- QUÍMICA GENERAL Reactividad química. Compuestos inorgánicos y orgánicos. Petrucci R.H., Harwood, W.S. y Herring F.G. Prentice Hall. Octava edición, 2003.(Vol.II)
  PRINCIPIOS DE QUÍMICA. Los caminos del descubrimiento. Atkins P.W. y Jones L. Editorial Panamericana. Quinta edición, 2012.
  FUNDAMENTOS DE ENLACE Y ESTRUCTURA DE LA MATERIA. E. Colacio Rodríguez. Base Universitaria, Anaya, 2004.

ADDENDUM COVID-19

This addendum will only be activated if the health situation requires so and with the prior agreement of the Governing Council

English version is not available