

**Información del Plan Docente**

<b>Academic Year</b>	2017/18
<b>Faculty / School</b>	175 - Escuela Universitaria Politécnica de La Almunia
<b>Degree</b>	423 - Bachelor's Degree in Civil Engineering
<b>ECTS</b>	6.0
<b>Year</b>	1
<b>Semester</b>	Second semester
<b>Subject Type</b>	Basic Education
<b>Module</b>	---

**1.General information****1.1.Introduction****1.2.Recommendations to take this course**

There are no formal pre-requisites but it is advisable for the student to have studied Chemistry at A-levels.

**1.3.Context and importance of this course in the degree****1.4.Activities and key dates****2.Learning goals****2.1.Learning goals****2.2.Importance of learning goals****3.Aims of the course and competences****3.1.Aims of the course****3.2.Competences****4.Assessment (1st and 2nd call)****4.1.Assessment tasks (description of tasks, marking system and assessment criteria)**

1: Continuous assessment

Students need to attend at least 80% of the in class/laboratory sessions. The assessment will include:

1. Assignments and laboratory practice: 10% of final mark.

2. 3 written tests: 90% of final mark. Each test must be passed with at least 5/10

2: Final global test

Students who cannot attend at least 80% of class or who fail to pass the subject by continuous assessment or wish to obtain a better mark.

It will include theory and applied theory: 100% of final mark.

## **5. Methodology, learning tasks, syllabus and resources**

### **5.1. Methodological overview**

**The learning process designed for this subject is based on the following :**

The organization of teaching will be carried out using the following steps:

- **Theory Classes** : Theoretical activities carried out mainly through exposition by the teacher, where the theoretical supports of the subject are displayed, highlighting the fundamental, structuring them in topics and or sections, interrelating them.

- **Practical Classes** : The teacher resolves practical problems or cases for demonstrative purposes. This type of teaching complements the theory shown in the lectures with practical aspects.

- **Laboratory Workshop** : The lecture group is divided up into various groups, according to the number of registered students, but never with more than 16 students, in order to make up smaller sized groups.

- **Individual Tutorials**: Those carried out giving individual, personalized attention with a teacher from the department. Said tutorials may be in person or online.

### **5.2. Learning tasks**

The subject has 6 ECTS credits, which represents 150 hours of student work in the subject during the trimester, in other words, 10 hours per week for 15 weeks of class.

A summary of a weekly timetable guide can be seen in the following table. These figures are obtained from the subject file in the Accreditation Report of the degree, taking into account the level of experimentation considered for the said subject is moderate.

<b>Activity</b>	<b>Weekly school hours</b>
Lectures	2
Laboratory Workshop	2
Other Activities	6

### 5.3.Syllabus

#### THEORETICAL CONTENTS

Module 1.- *THE ATOM AND THE PERIODIC SYSTEM*

Topic 1.- **The atom.**

Elemental particles. Atomic models. The Bohr atom. The quantum mechanical model. Atomic orbitals; quantum numbers. Principles for the electronic construction of atoms.

Topic 2.- **General overview of the periodic table**

Description of the current periodic table: groups and periods. Study of the electron shell and the periodic system. Periodic properties.

Module 2.- *THE CHEMICAL BOND*

Topic 3 .- **The ionic bond**

General characteristics of the ionic bond. Network energy. General properties of ionic compounds.

Topic 4 .- **The covalent bond**

Simplified model: the Lewis theory. Bond polarity and geometry. Valence bond theory. Orbital hybridization. Molecular orbital theory.

Topic 5 .- **The metallic bond**

General characteristics of metals. Theories of the metallic bond: the electron sea theory and valence bond theory. Alloys: classes.

Module 3.- *BONDS BETWEEN MOLECULES*

Topic 6 .- **Intermolecular bonds**

Van der Waal forces. Hydrogen bonds.

Module 4 .- *AGGREGATION STATES*

Topic 7 .- **The gas state**

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General characteristics of gases. Laws that govern the gas state. Equations of state. Kinetic theory. Gas mixtures: Dalton's Law. Gas diffusion and effusion: Graham's Law. Real gases: The Van der Waal equation.

### Topic 8 .- **The liquid state**

General characteristics of liquids. Vapour pressure. The effect of temperature on vapour pressure. Critical phenomena. Condensation of vapours and gases. Solidification.

### Topic 9 .- **The solid state**

Characteristics of solids. Classes of crystal network. Classes of solids based on bonding type. The phase rule and the triple point.

### Module 4 .- *INTRODUCTION TO THE STUDY OF SOLUTIONS*

#### Topic 10 .- **Introduction to the study of solutions**

Disperse systems. Types of solutions. Means of expressing concentration. Solid-in-liquid solutions. Liquid-in-liquid solutions. Gas-in-liquid solutions. Colligative properties of solutions. Colloidal solutions.

### Module 5 .- *INTRODUCTION TO THE STUDY OF REACTIONS*

#### Topic 11 .- **Chemical reaction. Stoichiometry.**

Chemical Equations. The Limiting Reactant Concept and Percent Yields from Chemical Reactions.

### Module 6.- *INTRODUCTION TO THE CHEMICAL ANALYSIS AND THE ORGANIC CHEMISTRY*

#### Topic 12 .- **Introduction to Analytical Chemistry in Materials**

Gravimetric Methods. Volumetric Methods. Spectroscopic Methods and Others

#### Topic 13.- **Introduction to study of the Materials Construction .**

Sand. Clay. Stone. Metallic. Organic. Synthetic.

## **PRACTICAL CONTENTS**

### Practical 1. **Standards in Chemical Laboratory**

*Techniques, Equipment and Safety*

Practical 2. **Solution Preparation**

$\text{Na}_2\text{CO}_3$  0,1 M from  $\text{Na}_2\text{CO}_3$  solid;  $\text{CaCl}_2$  0,1 M from  $\text{CaCl}_2 \cdot 2\text{H}_2\text{O}$

Practical 3. **Filtration**

*Gravity Filtration and Vacuum Filtration*

Practical 4. Volumetric Analysis

*Water hardness; carbonates and bicarbonates in water.*

Practical 5. **Distillation**

**5.4.Course planning and calendar**

SECTION	Topic	Nº hours
0 y 1	Presentation.  Atom ( <i>Topic 1</i> ) and the Periodic System ( <i>Topic 2</i> )	10
2 y 3	The Chemical Bond ( <i>Topics 3, 4 y 5</i> ) and Intermolecular Bonds ( <i>Topic 6</i> )	12
4	Aggregation States ( <i>Topics 7, 8 y 9</i> )	6
5	Introduction to the study of solutions ( <i>Topic 10</i> )	8
6	Introduction to the study of reactions ( <i>Topics 11 y 12</i> )	8
7	Intro to Analysis Chemistry and Organic Chemistry ( <i>Topics 13 y 14</i> )	4
	Practical Course	6

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	Exams	6
<b>TOTAL</b>		60

The dates of the final exams will be those that are officially published at <http://www.eupla.es/secretaria/academica/examenes.html>.

### 5.5. Bibliography and recommended resources

#### References and resources

Basic material prepared by the lecturer:

GONZÁLEZ PAÚLES, J. y BURBANO GARCÍA, G. Apuntes de Química para el Grado en Ingeniería Civil. *Ed. Eupla. 2011. ISBN 978 84 694 0618 2*

GONZÁLEZ PAÚLES, J. Química General. Apuntes del curso práctico. *Ed. Eupla. 2010. ISBN 978-84-692-8044-7*

**Power Point** in moodle platform (<https://moodle.unizar.es/>)

#### BIBLIOGRAPHY

- Gonzalez Paúles, J . Burbano García, G.. Apuntes de Química para el grado de ingeniería civil/Javier Gonzalez Paúles y Gloria Burbano García.. - 1ª Edición Eupla:La Almunia de doña godina(Zaragoza), 2011
- González Paúles, J.. Química General. Apuntes del curso práctico/ Javier González Paúles. - 1ª edición Eupla:La Almunia de doña godina(Zaragoza), 2010
- Química : un proyecto de la American Chemical Society / [versión española por Roberto Martínez-Alvárez, M<sup>a</sup> Josefa Rodríguez Yunta, Luis Sánchez Martín] Barcelona [etc.] : Reverté, D.L. 2005
- Química / Ronald J. Gillespie ... [et al.] ; versión española por Aurelio Beltrán Barcelona [etc.] : Reverté, D.L. 1990
- Negro, José Luis. Iniciación al lenguaje químico inorgánico / José Luis Negro. Madrid: Alhambra, 1979
- Nyman, C.J.. Problemas de química general y análisis cualitativo / C.J. Nyman y G.B. King ; traducción de A. López-Lago . - [1a ed. española] Madrid : AC, D.L.1978
- Peterson, W.R. Formulación y nomenclatura química inorgánica/ W.R. Peterson. - 14 edición Barcelona: Edunsa, 1987
- Sienko, Michell J.. Problemas de química / M.J. Sienko Barcelona [etc.] : Reverté, D.L.1987
- Mahan, Bruce H.. Química : curso universitario / Bruce M. [sic] Mahan, Rollie J. Myers ; versión en español de María Isabel Pouchan...[et al.] . - 4a ed. Wilmington, Delaware [etc.] : Addison-Wesley Iberoamericana, cop. 1990