



Universitat de Lleida

DEGREE CURRICULUM  
**GENERAL CHEMISTRY**

Coordination: SALVADOR TUREGANO, JOSE

Academic year 2021-22

## Subject's general information

<b>Subject name</b>	GENERAL CHEMISTRY			
<b>Code</b>	102514			
<b>Semester</b>	1st Q(SEMESTER) CONTINUED EVALUATION			
<b>Typology</b>	Degree	Course	Character	Modality
	Bachelor's Degree in Food Science and Technology	1	COMMON	Attendance-based
	Bachelor's Degree in Agricultural and Food Engineering	1	COMMON	Attendance-based
<b>Course number of credits (ECTS)</b>	6			
<b>Type of activity, credits, and groups</b>	<b>Activity type</b>	PRALAB	PRAULA	TEORIA
	<b>Number of credits</b>	0.8	1	4.2
	<b>Number of groups</b>	12	4	2
<b>Coordination</b>	SALVADOR TUREGANO, JOSE			
<b>Department</b>	CHEMISTRY			
<b>Important information on data processing</b>	Consult <a href="#">this link</a> for more information.			
<b>Language</b>	GRAU EN ENGINYERIA AGRÀRIA I ALIMENTÀRIA Català			
	GRADO EN CIENCIA Y TECNOLOGÍA DE ALIMENTOS Castellano			
<b>Distribution of credits</b>	<p>Contitioned to the evolution of the pandemy, the subject will be mixed attendance-based: 60 hours (recorded lessons plus practical attendance-based classes).</p> <p>Non-attendance based (personal work): 120</p> <p>Observation: depending on the evolution of the pandemy, this subject could be fully attendance-based or fully non-attendance based</p>			

Teaching staff	E-mail addresses	Credits taught by teacher	Office and hour of attention
DAVID , CALIN ADRIAN	calinadrian.david@udl.cat	1,2	
GALCERAN NOGUES, JOSE JUAN	josep.galceran@udl.cat	1,2	
GARCÉS GONZÁLEZ, JOSEP LLUÍS	josepluis.garces@udl.cat	9,8	
SALVADOR TUREGANO, JOSE	jose.salvador@udl.cat	9,8	

## Subject's extra information

The main goal of this subject is to provide the basic concepts of chemistry and the knowledge building of the basic skills for their application to agriculture and food sciences.

## Learning objectives

The main objectives to pass the subject are:

1. Knowing how to use the basic concepts and methodologies involved in chemistry
2. Knowing basic operations in a laboratory of chemistry
3. The correct use of formulae, units, and interpretation of the results.
4. Use of the necessary computational tools.
5. Relate the concepts of chemistry with those of physics and biology.

## Competences

### General competences

The following basic competencies will be guaranteed, as a minimum:

CB1: That the students have demonstrated that they possess and understand the basic knowledge of general secondary education at a level that, although supported by advanced textbooks, also includes some aspects that involve knowledge from the forefront of this area.

CB2: That students know how to apply their knowledge to their work or vocation in a professional way and possess the competencies that are usually demonstrated through the elaboration and defense of arguments and the resolution of problems within their area of study.

CB3: That students have the ability to gather and interpret relevant data to make judgments that include a reflection on relevant issues of a social, scientific or ethical nature.

CB4: That students can transmit information, ideas, problems and solutions to both specialized and non-specialized audiences.

CB5: That students have developed those learning skills necessary to undertake further studies with a high degree of autonomy.

In addition, the graduate must be able to:

CG1: Analyze specific situations, define problems, make decisions and implement action plans in search of solutions.

CG2: Interpret studies, reports, data and analyze them numerically.

CG3: Select and use the written and computerized information sources available related to the professional activity.

CT3: Use existing IT and communication tools as support for the development of their professional activity (UdL strategic competence)

CG4: Work alone and in a multidisciplinary team.

CG5: Understand and express oneself in the appropriate terminology.

CT1: Correctly present information in oral and written form (UdL strategic competence)

CG6: Discuss and argue in various forums.

CT2: Communicate and master a foreign language (UdL strategic competence)

CG7: Recycle in new technological advances through continuous learning.

CG8: Value comprehensive training, personal motivation and mobility.

CG9: Analyze and assess the social and ethical implications of professional activity.

CG10: Have a critical and innovative spirit.

CG11: Analyze and assess the environmental implications in their professional activity.

CT4: Respect the fundamental rights of equality between men and women, the promotion of Human Rights and the values of a culture of peace and democratic values.

## **Specific skills**

The graduate in Food Science and Technology after completing their studies will have acquired the following knowledge and skills:

CE1: Know and know how to apply the physical and mathematical foundations necessary for the development of other disciplines and of the activities of the profession.

CE2: Know and know how to apply the chemical fundamentals necessary for the development of other disciplines and the activities of the profession.

CE5: Apply the basic processes of a laboratory and know how to use equipment, handle reagents, meet safety conditions and prepare reports.

CE6: Raise and solve problems by correctly applying the concepts acquired to specific situations.

CE14: Know the chemical composition of food and its chemical reactions.

CE15: Relate the composition of foods with their physical, chemical and technological properties.

CE16: Interpret the physical, chemical and biochemical transformations that occur throughout the manufacturing

and storage processes.

CE17: Know and know how to use the methods and instrumentation for the physical-chemical and sensory analysis of food.

CE41: Develop chemical, physical, microbiological and sensory food evaluation analytics.

## Subject contents

### DEGREE IN FOOD SCIENCE AND TECHNOLOGY

#### 1. Introduction. (6 T + 4 P + 1 L)

Role of Chemistry in contemporary society. States of the material. Mole concept. Stoichiometry and chemical reactions. Solutions Units of concentration. Laws of gases.

#### 2.- Atomic and Molecular Structure. (3 T + 2 P + 1 L)

Atomic structure. Periodic System. Chemical bond. Lewis structures. Theory of the repulsions of the pairs of electrons of the valence shell. Intermolecular forces.

#### 3.- Chemical Equilibrium. (5 T + 3 P + 1 L)

Introduction to thermodynamics. First principle. Thermochemistry. Standard enthalpy of reaction. Hess's Law. Spontaneity and second principle. Gibbs energy. Conditions of spontaneity and balance. Equilibrium constants for ideal gases. Balance shifts. Chemical equilibrium in heterogeneous systems.

#### 4.- Acid-base Equilibrium. (5 T + 4 P + 2 L)

Acid and base concept. Dissociation equilibria of acids and bases. Hydrolysis. Regulatory solutions. Neutralization assessments. Indicators.

#### 5.- Precipitation and complexation equilibria. (4 T + 3 P + 1 L)

Solubility product constant. Complexing. Precipitation equilibrium shift

#### 6.- Equilibrium in oxidation-reduction reactions. (4 T + 3 P + 1 L)

Oxidation and reduction concept. Equalization of redox reactions. Batteries and electrolytic cells. Polarities. Electrode potentials. Nernst equation. Electrolysis

## 7.- Phase equilibrium. (5 T + 1 P + 1 L)

Gibbs phase rule. One and two component systems. Colligative properties

T = Theory; P = Problems; L = Laboratory or computer room

### Practical activities

Practice 1: Molecular Geometry (1 h). GINY software

Practice 2: Displacements of equilibrium (1 h). EQUIL Computer Program

Practice 3: Preparation and evaluation of solutions (2h). Introduction to the handling of volumetric material. Acid-base volumetry.

Practice 4: Determination of the acetic degree of vinegar and redox volumetry (2h) Acid-base volumetry. Titration of oxalate with permanganate.

Practice 5: The extraction procedure. Determination of the Kps of CaSO<sub>4</sub> (2 h). Separations based on pH, separations based on polarity. Cation exchange resin.

Problem solving and practical cases in small groups.

## Methodology

GRADO EN INGENIERÍA AGRARIA Y ALIMENTARIA y GRADO EN CIENCIA Y TECNOLOGÍA DE ALIMENTOS

Type of activity	Description	Attendance-based activity		Non attendance-based activity		Qualification	Total time/ECTS
		Objectives	Hours	Treball alumne	Hours	Hours	Hours
<b>Master class</b>	Master class (large group)	Introduction of main concepts	24	Adquiring, Synthesizing concepts	32	4	60/2.40
<b>Exercises and cases</b>	Discussion class (small grup)	Solution of exercises and cases	20	Learn to solve exercises and cases	38	6	64/2.56
<b>Seminary</b>	Discussion class (small group)	Discussion of questions, exercises and cases	8	Solve questions, exercises and cases. Discussion	8		16/0.64
<b>Laboratory</b>	Laboratory classe (small group)	Measuring, understanding phenomena, discussion	6	Examination and report	0		6/0.24
<b>Computer room</b>	Computer room (small group)	Understanding phenomena, discussion	2	Examination and report	2		4/0.16
<b>Total</b>			60		80	10	150/6

## Development plan

See "Continguts i Metodologia"

## Evaluation

"GRADO EN INGENIERÍA AGRARIA Y ALIMENTARIA" and "GRADO EN CIENCIA Y TECNOLOGÍA DE ALIMENTOS"

(Only indicative)

Type of activity	Qualification		Weight in the qualification
	Procedure		Number
<b>Master class</b>	Written examination of the theory	3	<b>35</b>
<b>Exercises and cases</b>	Delivery of exercises and discussion of cases	3	<b>35</b>
<b>Laboratory</b>	Reports and examination	3	<b>8.5</b>
<b>Seminary</b>	Reports and examination	2	<b>5</b>
<b>Computer room</b>	Reports and examination	2	<b>4.5</b>
<b>Directed activities</b>	Reports	3	<b>12</b>
<b>Total</b>			<b>100</b>

## Bibliography

"GRAU EN ENGINYERIA AGRÀRIA I ALIMENTÀRIA" and "GRAU EN CIÈNCIA I TECNOLOGIA D'ALIMENTS "

### Basic bibliography

PETRUCCI, R. H.; HARWOOD, W. S.; HERRING, F. G. (8<sup>a</sup> ed) -Química General (2 volúmenes)- Prentice Hall- Madrid, 2003

CHANG, R. (7<sup>a</sup> ed)-Química- McGraw-Hill Interamericana. 2002

ATKINS, P.; JONES, L.(3<sup>a</sup> ed)-Química. Moléculas. Materia. Cambio. Ed. Omega, 1998

SAÑA, J. – Química per a les ciències de la naturalesa i l'alimentació- Vicens Vives, 1993

### Complementary bibliography

LEVINE, I.N. - 2003 - Físicoquímica. - McGraw-Hill. Quinta edición