



Universitat de Lleida

DEGREE CURRICULUM
GENERAL CHEMISTRY

Coordination: GARCES GONZALEZ, JOSEP LLUIS

Academic year 2023-24

Subject's general information

| | | | | |
|---|---|---------------|------------------|------------------|
| Subject name | GENERAL CHEMISTRY | | | |
| Code | 102514 | | | |
| Semester | 1st Q(SEMESTER) CONTINUED EVALUATION | | | |
| Typology | Degree | Course | Character | Modality |
| | Bachelor's Degree in Agricultural and Food Engineering | 1 | COMMON/CORE | Attendance-based |
| Course number of credits (ECTS) | 6 | | | |
| Type of activity, credits, and groups | Activity type | PRALAB | PRAULA | TEORIA |
| | Number of credits | 0.8 | 1 | 4.2 |
| | Number of groups | 6 | 2 | 1 |
| Coordination | GARCES GONZALEZ, JOSEP LLUIS | | | |
| Department | ENVIRONMENT AND SOIL SCIENCES AND CHEMISTRY | | | |
| Important information on data processing | Consult this link for more information. | | | |
| Language | Catalan | | | |
| Distribution of credits | Attendance-based: 60 hours | | | |
| | Non-attendance based (personal work): 120 | | | |

| Teaching staff | E-mail addresses | Credits taught by teacher | Office and hour of attention |
|------------------------------|--------------------------|---------------------------|------------------------------|
| GARCES GONZALEZ, JOSEP LLUIS | josepluis.garces@udl.cat | 8,6 | |
| LARA AYALA, ISABEL | isabel.lara@udl.cat | 2,4 | |

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 the basic operations in a laboratory of chemistry and the use of the theoretical concepts
3. Obtention of quantitative results and correct interpretation of the results.
4. Relate the concepts of chemistry with those of the main subjects involved in food and agriculture sciences.

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 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 and their production with their physical, chemical and technological properties.

CE16: Interpret the physical, chemical and biochemical transformations that occur throughout the production, manufacturing and storage processes.

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

Subject contents

Contents

1. Introduction (6 T + 5 P + 2 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.- Thermodynamics (4 T + 4 P + 2 L)

Heat, work and energy. Enthalpy and thermochemistry. Entropy. Spontaneity and gibbs free energy.

3.- Chemical Equilibria (3 T + 4P)

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 Equilibria (3 T + 6 P + 2 L)

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

5.- Solubility and complexation equilibria (2 T + 4 P + 2 L)

Solubility product constant. Complexing. Precipitation equilibrium shift

6.- Electrochemistry (3 T +3 P)

Concepto de oxidación y de reducción. Igualación de reacciones redox. Pilas y cello electrolíticas. Polaridades. Potenciales de electrodo. Ecuación de Nernst. electrólisis

7.- Phase equilibria (3 T + 2 P)

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

T = Theory; P = Problems; L = Laboratory

Practical activities

Practice 1 (2h) Acid-base volumetry. Determination of the acetic degree of vinegar and redox volumetry.

Practice 2 (2h) Calorimetry: determination of heats involved in several chemical processes.

Practice 3 (2h) Buffer solutions: the system acetic acid/sodium acetate

Practice 4 (2h) Determination of the K_{ps} of CaSO₄ using of a cation exchange resin.

Problem solving and practical cases in small groups.

Methodology

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

Development plan

See Contents and Methodology

Evaluation

| Type of activity | Qualification | | Weight in the qualification | |
|----------------------------|---|---|-----------------------------|--|
| | Procedure | | Number | |
| Master class | Written examination of the theory | 4 | 35 | |
| Exercises and cases | Delivery of exercises and discussion of cases | 3 | 35 | |

| | | | |
|----------------------------|-------------------------------------|---|------------|
| Laboratory | Examination | 1 | 10 |
| Seminary | Attendance, reports and examination | 1 | 10 |
| Computer room | Reports and examination | 1 | 5 |
| Directed activities | Reports | 1 | 5 |
| Total | | | 100 |

Observations: the table above must be regarded as an estimation, and it can be slightly modified along the course.

Bibliography

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

CHANG, R. (7^a ed)-Química- McGraw-Hill Interamericana. 2002

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

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