

30800 - General chemistry

Syllabus Information

Academic Year: 2022/23

Subject: 30800 - General chemistry

Faculty / School: 105 - Facultad de Veterinaria

Degree: 568 - Degree in Food Science and Technology

ECTS: 6.0

Year: 1

Semester: First semester

Subject Type: Basic Education

Module:

1. General information

2. Learning goals

3. Assessment (1st and 2nd call)

4. Methodology, learning tasks, syllabus and resources

4.1. Methodological overview

The methodology followed in this course is oriented towards the achievement of the learning objectives. A wide range of teaching and learning tasks are implemented, such as lectures, problem-solving sessions, laboratory sessions and supervised work.

Students must follow the regulations described in:

- Prevention: A guide for students at the University of Zaragoza:
https://uprl.unizar.es/sites/uprl.unizar.es/files/archivos/Procedimientos/guia_preventiva_para_estudiantes.pdf
- Manual de seguridad en los laboratorios de la Universidad de Zaragoza y normas marcadas por la Unidad de Prevención de Riesgos Laborales:

https://uprl.unizar.es/sites/uprl.unizar.es/files/archivos/Procedimientos/manual_de_seguridad_en_los_laboratorios_de_la

<https://uprl.unizar.es/inicio/manual-de-procedimientos>

In addition, students will follow as well any instructions related to biosecurity given by the professor

4.2. Learning tasks

This course includes the following learning tasks:

Section 1. Principles of Chemistry. Fundamentals of Organic Chemistry

- **Lectures** (40 hours). Sessions with the whole group in the classroom. Students will participate with questions, if they deem it appropriate, as well as with the realization of self-assessment exercises proposed by the lecturer. There are some topics, which are an integral part of the program, that will not be presented in these lectures, but should be studied by the student.
- **Problem-solving sessions** (5 hours). The group will be split in two. In these sessions those problems previously

proposed to the students will be solved, particularly those in which the students found specific difficulties. The work in this activity will be fully participatory and interactive.

- **Autonomous work and study** (91 hours)

Section 2. Practice sessions. Supervised work

- **Laboratory sessions** (15 hours). During these sessions, every student will execute experimental procedures completely, including material preparation, its calculations and the interpretation of results. Such experimental procedures will be provided to the student, together with some questions that he/she must prepare and solve prior to the realization of the practice session. After the practice session, students should present another questionnaire to the lecturer.
- **Supervised work** (20 hours). It consists on the oral presentation of an assignment prepared and supervised by the teacher. It will be done in groups of three students. Two sessions for student supervision of about half an hour each are set, and then the oral presentation will be carried out in the laboratory which will last about 15 minutes. Finally, a round of questions about the presentation is done, as well as a final supervised session to collect results and conclusions.
- **Autonomous work and study** (27 hours).

All the material needed to complete the course is provided by the lecturers and will be available in the Reprographics Service of the Faculty, and online in the ADD.

4.3. Syllabus

This course will address the following topics:

1. Principles of Chemistry. Fundamentals of Organic Chemistry

Descriptors:

- **Topic 1.** The properties of matter. The scope of Chemistry. The scientific method. Properties of matter. Classification of matter. Measurement of the properties of matter. SI units. Density. Percentage composition and its use in solving problems. Uncertainty in measurement science. Significant figures.
- **Topic 2.** Water its significance in the field of Science and Food Technology. Composition. Functional significance of the properties. General solvent. Thermal conductivity. Latent heat of vaporization. Surface tension. Dielectric constant. Weak electrolytes. Water content in food. Water activity. Phase changes in Food. Drinking and mineral water. Nutritional properties. Activity. Content of permissible substances. Toxic Substances. Quality control.
- **Topic 3.** The chemical reactions. The chemical reactions and chemical equation. The chemical equation and stoichiometry. Chemical reactions in solution. Limiting reactant.
- **Topic 4.** Solutions and their properties. Types of solutions. Terminology. Classification. Expression of concentrations and interconversion. Concept of chemical equivalent. Normality. Colligative properties of solutions. Varying the vapor pressure. Increased boiling point. Freezing-point depression. Dissemination through the membrane. Osmosis and osmotic pressure. Isotonic, hypotonic and hypertonic solutions. Endosmosis and exosmosis. Electrolyte solutions. Conductivity. Strong electrolytes. Activity. Ionic strength. Weak electrolytes. Degree of dissociation. Vant'Hoff factor. Osmole and osmolality. Colligative properties of electrolytes. Colloidal solutions. properties
- **Topic 5.** Chemical kinetics. The speed of a chemical reaction. Measures of reaction speed. Dependence of the reaction rate with concentration. Rate equation. Reaction order. Dependence of the reaction rate with temperature. Reaction mechanisms.
- **Topic 6.** Chemical equilibrium. Principles of chemical equilibrium. Acid-base balance. Solubility and complex ion balance.
- **Topic 7.** Electrochemistry. Electrolysis and Faraday's laws. Batteries. Electrode potentials and their measurement. Normal hydrogen electrode. Reference electrodes. Relationship between the electrode potentials and concentration: Nerst equation.
- **Topic 8.** General principles of Organic Chemistry. Classes formulas. Bonding in carbon compounds. Types of carbon atoms. Homologous series and functional groups. Reactivity of carbon compounds. Nucleophilic and electrophilic reagents. Reaction mechanisms. Types of organic reactions.
- **Topic 9.** Importance, formulation, nomenclature, use and reactivity of organic compounds. Aliphatic and aromatic. Alcohols, phenols and ethers. Aldehydes and ketones. Carboxylic acids and their derivatives. Amines. Heterocyclic. Isomers, stereoisomers. Lipids. Carbohydrates. Amino acids and proteins.

Section 2. Laboratory sessions. Supervised work

Descriptors:

- **Session 1.** Knowledge and use of laboratory equipment. Rules, health and safety in laboratory work. Audiovisual support.

- **Session 2.** Using balances and pH-meters. Basic laboratory operations. Using material and basic equipment.
- **Session 3.** Preparation of solutions I. Solid-liquid. Expressions of concentration and interconversion. Using laboratory balances.
- **Session 4.** Preparation of solutions II. Liquid-liquid. Expressions of concentration and interconversion. Using laboratory pipettes.
- **Session 5.** Preparation of solutions III. Preparation of solutions for analytical purposes. Dilutions.
- **Session 6.** Preparation of regulatory mixtures. Calculation and measurement of pH. Handling meter.
- **Session 7.** Preparation of buffers. Calculation and measurement of the buffer capacity. Applications of interest. Using the pH-meter.

4.4. Course planning and calendar

Further information concerning the timetable (<http://veterinaria.unizar.es/horarios1cta>), classroom, office hours, assessment dates and other details regarding this course will be provided on the first day of class or please refer to the Faculty of Veterinary website and Moodle.

4.5. Bibliography and recommended resources

[BB: Bibliografía básica / BC: Bibliografía complementaria]

- [BB] [Formulación de Química Orgánica] - Peterson, W. R.. Formulación y nomenclatura química orgánica : [según la normativa IUPAC] / W.R. Peterson . 16a ed. Barcelona : Edunsa, 1996
- [BB] [Principios de Química] - Chang, Raymond. Química / Raymond Chang, Kenneth A. Goldsby ; revisión técnica, Rodolfo Álvarez Manzo, Silvia Ponce López ; [traducción, Erika Jasso Hernán D' Bourneville] . 11ª ed. México D.F. : McGraw-Hill, 2013
- [BB] [Principios de Química] - Ebbing, Darrel D.. Química general / Darrell D. Ebbing, Steven D. Gammon ; traducción Jimena S. Zugazagoitia, Norma Angélica Moreno Chávez, Jorge Hernández Lanto ; revisión técnica, María Aurora Lanto Arriola. . 9ª ed. México D.F. [etc.]: Cengage Learning, cop. 2010
- [BB] [Principios de Química] - Química : la ciencia central / Theodore L. Brown ... [et al.] ; traducción, Ana Elisabeth García Hernández ; revisión técnica, Alberto Rojas Hernández ... [et al.] . 12ª ed. Naucalpan de Juárez (México) : Pearson Educación, cop. 2014
- [BB] [Principios de Química] - Química : un proyecto de la American Chemical Society / [versión española por Roberto Martínez-Alvárez, Mª Josefa Rodríguez Yunta, Luis Sánchez Martín]. Barcelona [etc.] : Reverté, D.L. 2005
- [BB] [Principios de Química] - Química general : principios y aplicaciones modernas / Ralph H. Petrucci ... [et al.] ; traducción, Concepción Pando García-Pumarino, Nerea Iza Cabo ; revisión técnica, Juan A. Rodríguez Renuncio . 10ª ed. Madrid [etc.] : Prentice Hall : Person educación, 2011
- [BB] [Principios de Química] - Whitten, Kenneth W.. Química general / Kenneth W. Whitten, Raymond E. Davis, M. Larry Peck ; con la colaboración con ensayos de Ronald A. DeLorenzo, Middle Georgia College ; traducción, Eduardo Gayoso Andrade, José Manuel Vila Abad . 5ª ed., (3ª ed. en español) Madrid [etc.] : McGraw-Hill, D.L. 1998
- [BB] [Problemas de Química] - Bermejo Martínez, Francisco. Problemas de química general y sus fundamentos teóricos / Francisco Bermejo Martínez, Manuel Paz Castro . 7a. ed. corr. y aum. Madrid : Dossat, D. L. 1993
- [BB] [Problemas de Química] - Fernández Oncala, Amada. Química / Amada Fernández Oncala, Carmen Pérez Escribano . 2ª ed. Madrid [etc.] : MacGraw-Hill, 2005
- [BB] [Problemas de Química] - Sienko, Michell J.. Problemas de química / M.J. Sienko . [reimp.] Barcelona [etc.] : Reverté, D.L. 1996
- [BB] [Problemas de Química] - Vinagre Jara, F.. Fundamentos y problemas de química / F. Vinagre Jara, L.M. Vázquez de Miguel ; revisado por A. Sánchez Misiego, M. Gómez Guillén . 1a ed., 3a reimp. Madrid : Alianza, 1996
- [BB] [Química Orgánica] - Schmid, George H.. Química biológica : Las bases químicas de la vida / George H. Schmid . [1a ed., 1a reimpr.] Madrid [etc.] : Interamericana, cop.1988
- [BB] [Química Orgánica] - McMurry, John. Química orgánica / John McMurry ; traducción, María del Carmen Rodríguez Pedroza ; revisión técnica, Gonzalo Trujillo Chávez, María Aurora Lanto Arriola . 8ª ed. México D.F. : Cengage Learning, cop. 2012
- [BB] [Química Orgánica] - Morrison, Robert Thornton. Química orgánica / Robert Thornton Morrison, Robert Neilson Boyd ; versión española de Rosa Zugazagoitia Herranz y Peter Fiedler, con la colaboración de Cristina Rock . 5a ed México [etc.] : Addison Wesley Longman, 1998