SUBJECT TEACHING GUIDE

G769 - Advanced Chemistry

Degree in Chemical Engineering

Academic year 2023-2024

1. IDENTIFYING DATA					
Degree	Degree in Chemical Engineering			Type and Year	Compulsory. Year 2
Faculty	School of Industrial Engineering and Telecommunications				
Discipline	Subject Area: Materials and Chemistry Module: Compulsory Training in Common with the Industrial Branch				
Course unit title and code	G769 - Advanced Chemistry				
Number of ECTS credits allocated	6	Term		Semester based (1)	
Web					
Language of instruction	Spanish	English Friendly	Yes	Mode of delivery	Face-to-face

Department	DPTO. DE QUIMICA E INGENIERIA DE PROCESOS Y RECURSOS.
Name of lecturer	JOSEFA FERNANDEZ FERRERAS
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Other lecturers	TAMARA LLANO ASTUY

3.1 LEARNING OUTCOMES
- To be able to identify, name and predict the physical state of the main organic compounds.
- To know the main reactions experienced by each group of organic compounds and their industrial application.
- To solve basic problems of nomenclature, structure, physical properties and reactivity of organic compounds.
- To understand the relationship between the chemical structure of the compound and its physical and chemical properties.
- To know the meaning of all the thermodynamic functions
- To know the laws that govern the changes of condition and the equilibrium conditions between phases.
- To be able to calculate the composition and the balance between phases liquid - steam.
- To be able to calculate the constant of chemical balance to know the composition of the system.

4. OBJECTIVES
To improve the knowledge of nomenclature, physical properties, structure and reactivity, industrial source and applications of organic compounds, organized by functional groups.
To relate structure, physical properties, reactivity and applications of organic compounds.
To be able to relate the basic knowledge of organic chemistry with daily life and current topics
To be able to calculate the values of the molar partial properties of an open system . To determine which phase is stable under certain conditions.
To be able to determine the composition of the liquid- steam phases in equilibrium
To be able to calculate the value of the constant of a chemical equilibrium and to apply it to know the advance of the reaction and the composition of the system.

6. COURSE ORGANIZATION	
CONTENTS	
1	Organic Chemistry Item 1. Classification and nomenclature of organic compounds. Physical properties, acidity and alkalinity. Industrial source. Item 2. Halogenated organic compounds: stereochemistry. Main reactions, industrial importance and applications. Item 3. Alcohols, phenols and ethers: Main reactions, industrial importance and applications. Item 4. Aldehydes and ketones: Main reactions, industrial importance and applications Item 5. Carboxylic acids and their derivatives: Main reactions, industrial importance and applications. Item 6. Amines and related compounds: Main reactions, industrial importance and applications.
2	Physical Chemistry Item 1.Thermodynamic functions. Energies of Helmoltz and Gibbs. Equation of Gibbs-Helmholtz. Equations of Maxwell. Conditions of equilibrium and spontaneity. Item 2. Partial molar properties. The partial chemical potential. The chemical potential of perfect and real gases. Item 3. Physical transformations. Phases´s law. System of pure substances. Equations of Clapeyron and Clausius-Clapeyron. Rules of Gouldberg and Trouton. Item 4. Ideal solutions. Basic concepts. Chemical potential and mixing functions of ideal solution. Equilibrium of liquid-vapour. Ideal-diluted solutions. Laws of Raoult and Henry. Gases solubility in liquids. Colligative properties. Solid solubility in liquids. Two-component systems. Equilibrium liquid-liquid. Item 5. Real solutions. Activity and activity coefficient. Item 6. Chemical equilibrium. General case of chemical equilibrium. Equilibrium constant for system of ideal gases. The response of equilibria to temperature´s changes. Practical applications.

7. ASSESSMENT METHODS AND CRITERIA

Description	Type	Final Eval.	Reassessn	%
Continuous assessment blocks 1 and 2.The personal work will be added from a minimum grade of 4 in the written exam of each block.	Written exam	No	Yes	90,00
Continuous assessment. Personal work will be delivered throughout the semester, on the dates indicated. Class attendance will allow to resolve doubts about personal work. Some tests can also be carried out during classes.	Work	No	No	10,00
TOTAL				100,00

Observations

The personal work will be added after a minimum grade of 4 in the written exam in each block.

The student whose average of the continuous assessment reaches 5 (written exam + personal work), passes the subject.

In the ordinary call, the student may be examined in a single block if the other has been approved in the continuous assessment.

If the average of the two blocks does not reach 5 after the ordinary call, in the extraordinary call it will be necessary to re-examine the two blocks.

Observations for part-time students

The final exam for part-time students will be 60% of the final score, the remaining 40% being the result of the evaluation of two individual works assigned during the course, one per block, of a non-recoverable nature.

8. BIBLIOGRAPHY AND TEACHING MATERIALS

BASIC

Hart, H., Craine, L.E., Hart, D.J., Hadad, M." Química Orgánica". Ed. Mc Graw-Hill, 2007
Hart, H., Craine, L.E., Hart, D.J., Hadad, M. Organic Chemistry: A Short Course, 13th Edition, Ed. Mc Graw-Hill, 2012.

Klein, D. "Química Orgánica". Ed. Médica Panamericana, 2014.
P. Yurkanis Bruice, Fundamentos de Química Orgánica. Formato papel y libro electrónico. Ed. Pearson, 2015.

Peterson, W. R. "Introducción a la nomenclatura de las sustancias químicas". Ed Reverté, 2020. Formato papel y libro electrónico.

Peter Atkinns, Julio de Paula. "Química Física" 8º ed. Ed. Medica Panamericana, 2008.
Peter Atkins, Julio de Paula, James Keeler. Physical chemistry, 11th ed. Ed. Oxford University Press, 2018.

J. A. Rodriguez Renuncio, JJ Ruiz Sanchez, J. Urieta Navarro. Termodinámica Química. Ed Sintesis, 2000.