

GENERAL CHEMISTRY

(Date last update: 08/07/2020)

(Date approved in Department Council: 30/06/2020)

MODULE	CONTENT	YEAR	TERM	CREDITS	TYPE
I - Fundamentals	Chemistry	1	1	6	FB
LECTURER(S)			Postal address, telephone n°, e-mail address		
<ul style="list-style-type: none"> • María José Ruedas Rama: Part I (Groups C y E) • Ana Conejo García: Parte II (Group C) • Belén Rubio Ruiz: Part II (Group E) 			<p>Prof. María José Ruedas Rama (MJRR) Dpto. Físicoquímica, Second floor, Faculty of Pharmacy. Tel: +34 958 247887 e-mail: mjrueadas@ugr.es</p> <p>Prof. Ana Conejo García (ACG) Dpto. Química Farmacéutica y Orgánica, Third floor, Faculty of Pharmacy. C/ Campus de Cartuja s/n 18071, Granada. Tel: +34 958 249583 e-mail: aconejo@ugr.es</p> <p>Prof. Belén Rubio Ruiz (BRR) Dpto. Química Farmacéutica y Orgánica, Third floor, Faculty of Pharmacy. C/ Campus de Cartuja s/n 18071, Granada. Tel: +34 958 243848 e-mail: belenrubio@ugr.es</p>		
DEGREE WITHIN WHICH THE SUBJECT IS TAUGHT			TUTORSHIPS		
Human Nutrition and Dietetics			<p>MJRR: Tuesday and Thursday from 11:30 to 13:30. Fridays from 10:30 to 12:30</p> <p>ACG: Tuesday and Thursday from 9:30 to 12:30</p> <p>BRR: Tuesday and Thursday from 15:00 to 18:00</p>		



PREREQUISITES and/or RECOMMENDATIONS (if necessary)

- Suitable knowledge of Chemistry, high-school level.
- Basic knowledge on mathematical operations (logarithmic and exponential functions, use of calculator, etc.).

BRIEF ACCOUNT OF THE SUBJECT PROGRAMME

- Chemical and physical phenomena and their applications in biological-biochemical processes and in Nutrition and Dietetics.
- The basic operations of a chemistry laboratory.
- The concepts of heat, work and energy, as well as their application in calculating the energy content of food.
- Phase balances and chemical reaction.
- The properties of molecular and colloidal solutions.
- The surface adsorption processes.
- The kinetics of reactions and their application to metabolism.
- Reactivity.
- Stereochemistry.

GENERAL AND PARTICULAR ABILITIES

General: CG3, CG4, CG8, CG29
Specific: CE1, CE10, CE11, CE13.

OBJECTIVES (EXPRESSED IN TERMS OF EXPECTED RESULTS OF THE TEACHING PROGRAMME)

- Learn the chemical bases necessary to undertake further studies with a high degree of autonomy.
- Initiate the student in the study of chemical elements and their compounds.
 - Know the physicochemical properties of the chemical components of food.
 - Know the structure and properties of the organic chemical components of food.
 - Know the basic operations of a chemistry laboratory.
 - Know the scientific method, and the skills for the synthesis, isolation, characterization and determination of the physicochemical properties of chemical compounds.
 - Stimulate in students the ability to carry out experimental designs based on the scientific method and the interpretation of scientific work.

DETAILED SUBJECT SYLLABUS

LECTURES:

PART I

- UNIT 1. **Structure, chemical bonds, and reactivity.** Basic principles. Ionic networks. Covalent bond. Metallic bond. Intermolecular forces and biological role. Chemical reactions. Limiting reagent. Reaction yield.
- UNIT 2. **Solutions.** Classification. Concentration. Intermolecular forces and solubility. Colligative



properties and applications.

- UNIT 3. **Thermochemistry.** First law of Thermodynamics. Heat. Work. Internal energy. Enthalpy. Heat capacity. Enthalpy of physical changes. Reaction enthalpy. Determination of reaction enthalpy. Hess' law. Influence of the temperature on the reaction enthalpy. Food and energy resources.
- UNIT 4. **Equilibrium.** Spontaneous processes and equilibrium. Second law of Thermodynamics. Gibbs' free energy. Phase equilibrium and phase diagrams. Chemical equilibrium and law of mass action. Thermodynamic origin of the equilibrium constant. Le Chatelier's principle. Effect of pressure, concentration, and temperature on the equilibrium.
- UNIT 5. **Proton transfer reactions. Acid-base equilibria.** Strength of acids and bases. Dissociation constants. Water autoprotolysis. pH scale. pH determination in simple systems. Acid-base titrations. Buffers. Biological role of the acid-base equilibria.
- UNIT 6. **Electron transfer reactions. Redox equilibria.** Oxidation and reduction. Balancing redox reactions. Standard reduction potentials and equilibrium constant. Spontaneity and reaction direction. Applications and redox systems of biological importance. Antioxidants.

PART II

- UNIT 7. **Introduction to Organic Chemistry:** Concept and evolution. Carbon-carbon and carbon-heteroatom bonds. Intermolecular forces. Hydrocarbons: classification and nomenclature. Constitutional isomerism. Stereoisomerism.
- UNIT 8. **Functional Groups.** Classification of Organic Compounds. Nomenclature of functional groups. Concept of functional groups. Principal monovalent functional groups: alcohols, phenols, ethers and amines. Principal divalent functional groups: aldehydes, ketones and imines. Principal trivalent functional groups: acids, esters, amides and nitriles.
- UNIT 9. **Carbohydrates.** Overview of Carbohydrates. Classification and nomenclature. Acyclic and cyclic forms. Type of Representation: Fischer and Haworth. Reactivity of monosaccharides: oxidation, reduction, O- and N-glycosylation. Modification of monosaccharides: amino sugars and deoxy sugars. Classification of disaccharides. Main disaccharides. Oligo and polysaccharides.
- UNIT 10. **Lipids.** Overview of Lipids. Oils, fats and waxes. Phospholipids and sphingolipids. Structure of membrane lipids. Eicosanoids: arachidonic acid. Isoprene and Isoprenoids. Steroids.
- UNIT 11. **Amino acids, peptides and proteins.** Amino acids: Structure and classification. Properties synthesis and protection of amino acids. Peptides and proteins. Primary and secondary structures of proteins. Enzymes and cofactors.
- UNIT 12. **Vitamins.** Overview of vitamins. Hydrosoluble and liposoluble vitamins. Biological functions.

LABORATORY SESSIONS AND SEMINARS:

Seminars

- Problems solving

Laboratory sessions

- Session 1. *Introduction to laboratory. Solutions. Preparation of a buffer solution.*
- Session 2. *Acidity measurements of olive oil, milk, and vinegar.*
- Session 3. *Practical test: Acid - base titration.*
- Session 4. *Synthesis of Isoamyl acetate.*
- Session 5. *Synthesis of dibenzalacetone.*
- Session 6. *Hydrolysis of sucrose.*



READING

BASIC READINGS:

- **Chemical Principles.** 3^a-5^a Eds. P. Atkins, L. Jones.
- **General chemistry.** 10^a Ed. R.H Petrucci, F. G. Herring, J. D. Madura, C. Bissonnette.
- **Química Orgánica.** H. Hart, L. E. Crine, D. J. Hart y Ch. M. Hadad. Ed. McGraw Hill. 12^a edición., 2007.
- **Química de los alimentos.** H. D. Belitz. Ed. Acribia, 2011.

COMPLEMENTARY READINGS:

- **Química General.** J. L. Rosenberg, L. M. Epstein.
- **Resolución de Problemas de Química.** A. Sánchez Coronilla.
- **Resolución de Problemas de Química General.** C. J. Willis.
- **Química. Un proyecto de la American Chemical Society.** Varios autores. Ed. Reverté. 2005.
- **Cuestiones y ejercicios de Química Orgánica. Una guía de autoevaluación.** E. Quiñoá y R. Riguera (2^a Ed.) Ed. Mc Graw Hill 2004.
- **Nomenclatura y representación de los compuestos orgánicos (Una guía de estudio y autoevaluación).** E. Quiñoá y R. Riguera. Ed. Mc Graw Hill 2005.

TEACHING METHODOLOGY

- Master classes for theory teaching
- Practical seminars regarding application problems of each lesson
- Practical lessons in the laboratory
- Quiz and test from online platforms for continuous evaluation

ASSESSMENT (ASSESSMENT INSTRUMENTS, CRITERIA AND PERCENTAGE VALUE OF FINAL OVERALL MARK, ETC.)

All the evaluation processes will be carried out according to the normative of the University of Granada.

1. Ordinary call

- Written exams about theoretical concepts. Percentage of the final mark: 35-45%.
There will be a mid-course exam and a final exam.
The qualification considered in this section will be the mark obtained in the final exam. If the subject has been passed by overcoming both mid-course and final exam, the qualification will be the average between them.
- Written exams about resolution of application problems. Percentage of the final mark: 45-35%.
There will be a mid-course exam and a final exam.
The qualification considered in this section will be the mark obtained in the final exam. If the



subject has been passed by overcoming both mid-course and final exam, the qualification will be the average between them.

- Practical lessons. Percentage of the final mark: 10%.
It is compulsory to attend to all practical lessons. Only for Part I, the global mark is divided in two tasks:
 - Laboratory book 30%
 - Exam about practical contents : 70%
- Continuous evaluation and attending to theoretical classes. 0-10%.

2. Extraordinary call and single final evaluation

- Written exams about theoretical concepts. Percentage of the final mark: 35-45%.
There will be a mid-course exam and a final exam.
The qualification considered in this section will be the mark obtained in the final exam. If the subject has been passed by overcoming both mid-course and final exam, the qualification will be the average between them.
- Written exams about resolution of application problems. Percentage of the final mark: 45-55%.
There will be a mid-course exam and a final exam.
The qualification considered in this section will be the mark obtained in the final exam. If the subject has been passed by overcoming both mid-course and final exam, the qualification will be the average between them.
- Practical lessons. Percentage of the final mark: 10%.

DESCRIPTION OF THE EXERCISES WHICH WILL CONSTITUTE SINGLE FINAL ASSESSMENT AS ESTABLISHED IN UGR REGULATIONS

This description is reported in the assessment section

SCENARIO A (ON-CAMPUS AND REMOTE TEACHING AND LEARNING COMBINED)

TUTORIALS

TIMETABLE

(According to Official Academic Organization Plan)

<http://www.ugr.es/~qfo/pdf/Tutorias2020-2021.pdf>
http://fisicoquimica.ugr.es/pages/docencia/curso_2021/_doc/horariotutorias2021

TOOLS FOR TUTORIALS

(Indicate which digital tools will be used for tutorials)

There will be both on-site and virtual tutorials.
Proposed telematic media are:

- Forums in virtual platform (PRADO, SWAD)
- E-mail
- Videoconference through Google Meet

MEASURES TAKEN TO ADAPT TEACHING METHODOLOGY



- **Theory lessons.** Teaching methodology will be the same proposed in the previous section about “teaching methodology”. In this case, the master classes will be broadcasted in real time to those students that cannot attend if the number of people in the classes is limited by the health situation.
- **Practical lessons.** Due to the limited capacity of the facilities of the faculty, practical groups will be divided into 2 subgroups. There will be 1-3 practical lessons in the lab corresponding to each part of the subject and an additional virtual lesson, concerning to the theoretical aspects of the on-site tasks. Virtual lesson will be given through Google Meet and it will include videos and practical simulations.
- **Seminars, assignments and activities related to continuous evaluation.** In these cases methodology will be the same proposed in the previous section about “teaching methodology” and preferentially, they will be developed on-site. In the event that there would be any capacity limitation, virtual media will be used (Google Meet, PRADO, Kahoot, etc).

MEASURES TAKEN TO ADAPT ASSESSMENT (Instruments, criteria and percentage of final overall mark)

Ordinary assessment session

- Adaptative measures have only been proposed for the practical lessons. Practical teaching evaluation will be virtual through the PRADO platform. Evaluation criteria and percentages are those described in the “assessment section”.

Extraordinary assessment session

- Adaptative measures have only been proposed for the practical lessons:
 - For those students that have attended to the practical lessons and have not passed the exam, there will be a virtual written exam through PRADO platform. Evaluation criteria and percentages are those described in the “assessment section”.
 - Those students that have not attended to the practical lessons will have to pass a practical exam in the laboratory. The evaluation will be carried out by those teachers in charge of the practical lessons.

Single final assessment

There are no adaptative measures in this type of assessment.

SCENARIO B (ONCAMPUS ACTIVITY SUSPENDED)

TUTORIALS

TIMETABLE

(According to Official Academic Organization Plan)

<http://www.ugr.es/~qfo/pdf/Tutorias2020-2021.pdf>
http://fisicoquimica.ugr.es/pages/docencia/curso_2021/_doc/horariotutorias2021

TOOLS FOR TUTORIALS

(Indicate which digital tools will be used for tutorials)

There will be exclusively virtual tutorials. Proposed telematic media are:



	<ul style="list-style-type: none"> - Forums in virtual platform (PRADO, SWAD) - E-mail - Videoconference through Google Meet
MEASURES TAKEN TO ADAPT TEACHING METHODOLOGY	
<ul style="list-style-type: none"> • Theory lessons. Synchronous online classes through Google-Meet. Recorded videos of the theoretical lessons will be available through PRADO platform. • Practical lessons. All the practical lessons will be virtual through Google-Meet. Videos and practical simulations will be used. • Seminars. Seminars related to problem solving will be taught through Google Meet. Students will upload the solutions via PRADO. • Activities related to continuous evaluation. Quiz and test about theoretical and practical contents will be carried out through PRADO, SWAD and Kahoot. Assignments or numerical problems will be uploaded via PRADO. 	
MEASURES TAKEN TO ADAPT ASSESSMENT (Instruments, criteria and percentage of final overall mark)	
Ordinary assessment session	
<ul style="list-style-type: none"> • Written exams about theoretical concepts. Percentage of the final mark: 35-45%. Individual exams will be carried out through PRADO platform. • Written problem-solving exams. Percentage of the final mark: 45-35%. Individual exams will be carried out through PRADO platform. • Practical lessons assessment. Percentage of the final mark: 10%. Individual exams will be carried out through PRADO platform and other virtual platforms. • Activities related to continuous evaluation. Percentage of the final mark: 0-10%. 	
Extraordinary assessment session	
<ul style="list-style-type: none"> • Written exams about theoretical concepts. Percentage of the final mark: 35-45%. Individual exams will be carried out through PRADO platform. • Written problem-solving exams. Percentage of the final mark: 45-55%. Individual exams will be carried out through PRADO platform. • Practical lessons assessment. Percentage of the final mark: 10%. <ul style="list-style-type: none"> - For those students that have attended to the practical lessons and have not passed the exam, there will be a virtual exam through PRADO platform. Evaluation criteria are those described in the “assessment section”. - Those students that have not attended to the practical lessons will have to pass an oral exam including questions about procedures used in the practical lessons. The evaluation will be carried out through Google Meet. 	
Single final assessment	



- **Written exams about theoretical concepts.** Percentage of the final mark: 35-45%. Individual exams will be carried out through PRADO platform.
- **Written problem-solving exams.** Percentage of the final mark: 45-55%. Individual exams will be carried out through PRADO platform.
- **Practical lessons assessment.** Percentage of the final mark: 10%.
 - For those students that have attended to the practical lessons and have not passed the exam, there will be a virtual exam through PRADO platform. Evaluation criteria are those described in the “assessment section”.
 - Those students that have not attended to the practical lessons will have to pass an oral exam including questions about procedures used in the practical lessons. The evaluation will be carried out through Google Meet.

ADDITIONAL INFORMATION (if necessary)

The move to scenario A to scenario B will be imposed by the health authorities' determination due to the evolution of the pandemic caused by COVID-19.

