

Academic Year 2020-2021

(Date last update: 08 /07/ 2020)

(Date approved in Department Meeting: 17/07/2020)

MODULE	SUBJECT	COURSE	SEMESTER	CREDITS	TYPE
Chemistry	Inorganic reactions and compounds in Food Technology	Starting from 2nd yr	First	6	Optional
<b>PROFESSOR</b>			<b>FULL CONTACT ADDRESS FOR TUTORIALS</b>		
<ul style="list-style-type: none"> <li>Juan Niclós Gutiérrez</li> </ul>			Department of Inorganic Chemistry, 3rd floor, Faculty of Pharmacy. Room 290. Email: jniclos@ugr.es		
			<b>TUTORING HOURS</b>		
			See Department website: <a href="http://inorganica.ugr.es/">http://inorganica.ugr.es/</a> Any case, students should request an appointment by contacting the professor either before of after the teaching lessons.		
<b>BELONGS TO UNDERGRADUATE DEGREE PROGRAMME</b>			<b>OTHER DEGREES IN WHICH THE SUBJECT COULD BE TAUGHT</b>		
Food Science and Technology Degree			Human Nutrition and Dietetics Degree		
<b>PREREQUISITES AND / OR RECOMMENDATIONS (if applicable)</b>					
<p>It is highly recommended to have already passed the mandatory subjects: (i) Chemical principles and (ii) Food Chemistry and Biochemistry. Despite this recommendation, it is required an adequate knowledge about:</p> <ul style="list-style-type: none"> <li>Basic chemical nomenclature, especially inorganic nomenclature.</li> <li>Knowledge of basic chemical terminology regarding electronic configuration, chemical bonding and chemical reactions, such as acid-base, REDOX, precipitation or complexation.</li> </ul>					
<b>BRIEF DESCRIPTION OF CONTENTS</b>					
<p>In this Course, it will be explained: (1) the relationship between the characteristics of Biological systems (reducing character, thermal regulation, pH equilibrium, concentration of electrolytes, compartmentation, etc.) and the stabilization of low oxidation states of metal ions in Biology; (2) the role of relevant metal ion REDOX pairs in biology, such as Fe(II)/Fe(III) or Cu(I)/Cu(II); (3) acid-base properties, REDOX properties and chelating agents of interest in Food Technology.</p>					



## GENERAL AND SPECIFIC COMPETENCIES

### A. General

CB2. To apply the gathered knowledge and the acquired competencies to their professional life, showing critical thinking and the ability to produce and defend their reasoning, as well as proposing solutions to problem within their field.

CB3. To acquire the capacity of gathering and interpreting data and produce comprehensive assessment in their field of expertise.

CB4. To communicate relevant information, problems and their solutions, regarding their field of expertise to non-specialized public.

CB5. To develop learning skills to develop postgraduate studies with autonomy.

### B. Specific

CE1. To recognize and apply basic knowledge about physics, chemistry, biochemistry, biology, physiology, mathematics and statistics to better understand and develop Food Science and Technology.

CE5. To know food preservation processes and identify the modifications that food may suffer in their absence.

CE6. To know, understand and apply classical methodologies and new technological methodologies aimed to improve food production and treatment.

CE7. To know and analyze biological, physical and chemical dangers in the food chain in order to contribute in the protection of public health.

CE9. To develop environmental protocols as well as quality control protocols for food industries.

## OBJECTIVES (EXPRESSED AS EXPECTED RESULTS OF EDUCATION)

- Knowing the chemical elements, and their combinations, of interest for the Food industry
- Understanding the basic chemical principles that contribute to: (1) food processing, (2) inorganic raw materials used in the food industry and their interactions, (3) alterations suffered by food, specially those related to inorganic compounds.

## DETAILED SYLLABUS

### THEORETICAL SYLLABUS:

UNIT 1: Electronic configurations and oxidation states of those chemical elements present in the Food industry. Chemical characteristics of inorganic compounds present in food and food technology. Stabilized oxidation states in the reducing biological environments. Oxidation states non-compatible with food and food technology.



**UNIT 2: Acids, bases and inorganic salts of interest in the Food industry.**  
Relative strength of inorganic acids-bases. Hydrolysis of salts and its relationship with the acid-base character of the media. Inorganic compounds and pH regulation. Acids and bases of special interest in Food industry.

**UNIT 3: Inorganic compounds and elements involving the “s” and the “p”-block in the Periodic Table.**  
Fundamental state. Inorganic oxides, hydracids and oxyacids in Food technology. Inorganic oxysalts in Food Science and Technology.

**UNIT 4: Transition metal ions and its complexes.**  
General characteristics: valence variability, formation of complexes and their color. REDOX functions of iron, copper and manganese: stabilization of rare oxidation states.

**UNIT 5: REDOX chemistry in inorganic compounds in Food industry**  
Stabilization of different oxidations states in oxygenated and inert atmospheres. Inorganic compounds as potential anti-oxidants.

**UNIT 6: Solubility of inorganic compounds and its application in Food industry.**  
Cation-anion incompatibilities due to solubility reasons in Food Science and Technology.

**UNIT 7: Complex formation in Food Technology**  
Chelators: binding affinity between ligands and metal ions in their different oxidation states (Pearson criteria). Preventing precipitation and solution of precipitates by complexation.

#### **PRACTICAL SYLLABUS**

- Nº 1 The use of ortho-phosphoric salts in the preparation of buffers
- Nº 2 Hydrolysis of sodium salts derived from carbonic acid
- Nº 3 Metal binding affinity between Ca, Fe or Cu with aminoacids (in proteins)
- Nº 4 Chelators to prevent precipitation in Food technology

#### **BIBLIOGRAPHY**

##### **A) ESSENTIAL BIBLIOGRAPHY:**

- Atkins y Jones, Principios de Química, 3ª edición, Editorial Médica Panamericana, 2006.
- Rayner-Canham, Química Inorgánica descriptiva, 2ª edición Pearson, 2000.
- Petrucci y otros. Química general, 8ª edición, Pentice-Hall / Pearson, 2002.
- Casas y otros, Química Bioinorgánica, Editorial Síntesis, 2002.

##### **B) COMPLEMENTARY BIBLIOGRAPHY:**

- Química de los alimentos, E. Primo Yúfera, Editorial Síntesis 1998.XXXX



<b>RECOMMENDED LINKS</b>
<p><a href="http://www.intute.ac.uk/cgi-bin/browse.pl?id=50">http://www.intute.ac.uk/cgi-bin/browse.pl?id=50</a></p> <p><a href="http://www.virtlab.com/main.aspx">http://www.virtlab.com/main.aspx</a></p> <p><a href="http://www.rsc.org/images/FOOD_tcm18-48151.pdf">http://www.rsc.org/images/FOOD_tcm18-48151.pdf</a></p>
<b>TEACHING METHODOLOGY</b>
<ul style="list-style-type: none"> <li>• Expositive classes where the teacher will promote the active participation of students with questions, comments, etc.</li> <li>• Seminars where doubts and practical questions will be solved.</li> <li>• Working groups promoting collaborative work</li> <li>• Both the expositive classes and the practicum will be face-to-face or online (Scenario A) or exclusively online (Scenario B), with the online version being synchronous or asynchronous streaming classes, according to the UGR rules.</li> <li>• Practical classes in which the student will improve their practical skills.</li> </ul>
<b>EVALUATION (EVALUATION INSTRUMENTS, EVALUATION CRITERIA AND PERCENTAGE ON THE FINAL QUALIFICATION).</b>
<p><b>ORDINARY CALL</b></p> <p>The evaluation will be based on different items in which students must demonstrate the skills acquired.</p> <ul style="list-style-type: none"> <li>• Several exams throughout the Course during teaching hours.</li> <li>• One final exam at the end of the Course: 70% of the grade of the subject.</li> <li>• Performance at practical classes, attendance and labjournal: 20% of the grade of the subject.</li> <li>• Class attendance and programmed activities (problems, presentations, etc.): 10% of the grade of the subject.</li> </ul> <p>Overcoming of any of the tests will not be achieved without a uniform and balanced understanding of all matter.</p> <p><b>EXTRAORDINARY CALL</b></p> <p>It will follow the same criteria as the ordinary call. One exam of theoretical contents will be carried out that counts for 70% of the final grade, keeping the 20% practicum and 10% attendance/activities obtained during the Course, thus reaching the 100% qualification. If the student does not want to keep the qualifications obtained during the Course, he/she should explicitly ask the teacher, thus accepting that the exam that carried out in the extraordinary call would count for 100% of the final grade.</p>
<b>DESCRIPTION OF THE EVIDENCE THAT WILL BE PART OF THE FINAL UNIQUE EVALUATION ESTABLISHED IN THE "REGULATIONS OF EVALUATION AND GRADING OF THE STUDENTS OF THE UNIVERSITY OF GRANADA"</b>
<ul style="list-style-type: none"> <li>• Those students who, for any reason, cannot attend regularly to the classes, and therefore cannot follow the continuous assessment plan, they can ask for a final single evaluation process. This request must be addressed to the Head of the Department within the first two weeks of the subject. This evaluation will consist in a single written or</li> </ul>



oral exam, which will evaluate the knowledge on the subject, with its qualification being considered as the final grade of the subject. In this Final Unique evaluation one exam of theoretical contents will be carried out, counting for 100% of the final grade.

- In this case, evaluation will be carried out face-to-face (Scenario A) or online through the online platform PRADO EXAMEN or GoogleMeet (Scenario B)

### ADDITIONAL INFORMATION

<http://farmacia.ugr.es/cont.php?sec=2&pag=35>

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

### TUTORIALS

#### TIMETABLE

(According to Official Academic Organization Plan)

#### TOOLS FOR TUTORIALS

(Indicate which digital tools will be used for tutorials)

Available at: <http://inorganica.ugr.es/>

Email, PRADO Platform and GoogleMeet video conference

### MEASURES TAKEN TO ADAPT TEACHING METHODOLOGY

- The percentage of face-to-face and online classes will depend on the number of students enrolled in the Course and the security measures dictated by the corresponding health authorities. If possible, teaching will be preferentially developed face-to-face, keeping at least a 1.5 m distance among students. Theoretical classes with a high number of students will be splitted, with alternative groups that would receive teaching half face-to-face and half online. All students will receive the same number of face-to-face and virtual practicum sessions per week.
- The number of students will never overcome the maximum capacity of the given rooms/labs according to new COVID restrictions.
- Online/virtual classes will be carried out via the Google Meet platform or any other online platform officially recommended by the University of Granada. Synchronous sessions will be preferred, although certain personal circumstances, such as sickness of the teacher or any close relative, work/life balance, etc., might encourage an asynchronous scenario which would be complemented by monitoring and specific students' follow-up activities.
- Currently, the recommended online platforms at the University of Granada are Prado, Consigna UGR, Google Meet and Google Drive by means of the official account @go.ugr and also the official @correo.ugr.es email account. If any additional platform is required, instructions will be given to students.
- Teaching materials regarding online teaching will be given to students by any the aforementioned platforms.
- Practicum will be face-to-face in small groups to guaranty the mandatory social distance and other safety rules in the laboratory. Theoretical explanations regarding the practicum might be given online through explicative videos provided by the virtual platform PRADO.

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

Ordinary Call



<ul style="list-style-type: none"> <li>The evaluation will be carried out according to the criteria indicated in the corresponding general section, keeping the same percentage no matter the student attendance is on-site or on-line.</li> <li>The exams will be face-to-face provided the number of students enrolled allows it according to the safety regulations indicated by the authorities. If this is not possible, the evaluation will be online and will be carried out using the PRADO EXAMEN platform and / or the Google Meet video conference service.</li> </ul>	
<b>Extraordinary Call</b>	
<ul style="list-style-type: none"> <li>The evaluation will be carried out according to the corresponding general section with face-to-face exams provided the number of enrolled students allows it according to the safety regulations indicated by the authorities. If this is not possible, the evaluation will be carried out virtually by using the PRADO EXAMEN platform and / or the Google Meet video conferencing service.</li> </ul>	
<b>Single final Call</b>	
<ul style="list-style-type: none"> <li>The evaluation will be carried out according to the corresponding general section with face-to-face exams provided the number of enrolled students allows it according to the safety regulations indicated by the authorities. If this is not possible, the evaluation will be carried out virtually by using the PRADO EXAMEN platform and / or the Google Meet video conferencing service, according to UGR rules.</li> </ul>	
<b>SCENARIO B (ON-CAMPUS ACTIVITY SUSPENDED)</b>	
<b>TUTORIALS</b>	
<b>TIMETABLE</b> (According to Official Academic Organization Plan)	<b>TOOLS FOR TUTORIALS</b> (Indicate which digital tools will be used for tutorials)
Available at: <a href="http://inorganica.ugr.es/">http://inorganica.ugr.es/</a>	Email, PRADO Platform and GoogleMeet video conference
<b>MEASURES TAKEN TO ADAPT TEACHING METHODOLOGY</b>	
<ul style="list-style-type: none"> <li>All theoretical classes, seminars and practicum will be virtual. They will be carried out via the Google Meet platform or any other online platform officially recommended by the University of Granada. Synchronous sessions will be preferred, although certain personal circumstances, such as sickness of the teacher or any close relative, work/life balance, etc., might encourage an asynchronous scenario which would be complemented by monitoring and specific students' follow-up activities.</li> <li>Currently, the recommended online platforms at the University of Granada are Prado, Consigna UGR, Google Meet and Google Drive by means of the official account @go.ugr and also the official @correo.ugr.es email account. If any additional platform is required, instructions will be given to students.</li> <li>Teaching materials regarding online teaching will be given to students by any the aforementioned platforms.</li> </ul>	
<b>MEASURES TAKEN TO ADAPT EVALUATION</b> (Instruments, criteria and percentage of final overall mark)	
<b>Ordinary Call</b>	
<ul style="list-style-type: none"> <li>The exams will be carried out by using the PRADO EXAMEN platform and / or the GoogleMeet video conference service.</li> <li>According to the UGR rules and regarding Articles 9.1 and 9.2 about continuous online evaluation assessment, the percentages of evaluation will be divided as follows:</li> </ul>	



- One on-line theoretical written exam (divided in two parts) via the platform PRADO EXAMEN. Qualification will count for 60% of the final grade.
- One on-line written exam about the practicum; 20% of the final grade.
- Activities, self-evaluation and attendance to online classes: 20% of the final grade.

#### **Extraordinary Call**

- The evaluation criteria will follow that indicated in the corresponding general section.
- The exams will be carried out using the PRADO EXAMEN platform and / or the GoogleMeet video conference service.

#### **Single final Assessment**

- The evaluation criteria will follow that indicated in the corresponding general section.
- The exams will be carried out using the PRADO EXAMEN platform and / or the GoogleMeet video conference service.

