



## IDENTIFYING DATA

### Chemistry

Subject	Chemistry			
Code	V09G311V01105			
Study programme	Grado en Ingeniería de los Recursos Mineros y Energéticos			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	1st	1st
Teaching language	#EnglishFriendly Spanish			
Department				
Coordinator	Álvarez Álvarez, María Salomé			
Lecturers	Álvarez Álvarez, María Salomé Deive Herva, Francisco Javier Vecino Bello, Xanel Yañez Diaz, Maria Remedios			
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General description	The matter provides to students of first course of engineering the bases of the Chemistry that will be useful in the development of his future profession. English Friendly subject: International students may request from the teachers: a) materials and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English.			

## Training and Learning Results

Code	
A1	That the students demonstrate to possess and understand knowledge in an area of study that is part of the general education (second level), and often found at a level that, although based on advanced textbooks, also includes some aspects that involve knowledge from the avant-garde of the field of study
A2	That the students know how to apply their knowledge to their work or vocation in a professional way and that they possess the competences that are usually demonstrated through the elaboration and defense of arguments and the resolution of problems within their area of study
A3	That the students have the capability to gather and interpret relevant data (usually within their area of study) to issue judgments that include a reflection on relevant social, scientific or ethical issues
A4	That the students can transmit information, ideas, problems and solutions to a specialized and non-specialized audience
A5	That the students develop those learning capabilities necessary to undertake further studies with a high degree of autonomy.
B1	Scientific and technical training and qualification as a Mining Engineer and knowledge of the functions of consultancy, analysis, design, calculus, project, construction, maintenance, preservation and exploitation.
B2	To be familiar with the multiple technical and legal factors involved in the process of development, within the field of mining engineering, with the knowledge acquired in accordance with section 5 of order CIN/306/2009, pertaining to geological and mining prospecting and investigation, the explorations of all sorts of geological resources, including groundwater, underground construction, underground storage, treatment and benefit plants, energy plants, mineral processing and steel and iron plants, building materials plants, carbon chemistry, petrochemistry and gas plants, waste treatment and tributary plants, explosives factories, and ability to use well-tested methods and accredited technologies, with the aim of achieving the highest efficiency and ensuring the protection of the Environment and the safety and health of workers and users.
C22	Ability to understand and apply the principles and fundamentals of general chemistry, organic and inorganic chemistry and their applications in engineering.
D3	To suggest and develop practical solutions, using the relevant theoretical knowledge, to phenomena and problems-situations of ordinary reality that are specific to engineering, developing appropriate strategies.
D4	To foster collaborative working, communication, organization and planning skills, along with the ability to take responsibilities in a multilingual, multidisciplinary work environment that promotes education for equality, peace and respect for fundamental rights.

- D5 To be familiar with the relevant sources of information, including constant updating, in order to practice one's profession competently, accessing all the present and future tools of information search, constantly adapting to technological and social changes.
- D10 To become aware of the need for continuous training and the constant improvement of quality, developing the values that are characteristic of scientific thinking, showing flexible, open and ethical attitudes in the face of different situations and opinions, particularly as regards non-discrimination on the grounds of gender, race or religion, respect for fundamental rights, accessibility, etc.

### Expected results from this subject

Expected results from this subject	Training and Learning Results			
To understand the basic concepts of Chemistry	A1 A5		C22	D5
To understand how the scientific knowledge interacts with technology in accordance with the society characteristics and needs at any moment	A3	B1 B2		D3 D4 D5 D10
To know how to evaluate the information coming from different sources in order to make the own opinion that will ultimately allow the student to critically respond about technological problems related to Chemistry	A2 A4	B1 B2	C22	

### Contents

Topic	
Subject 1. Atomic structure, chemical bonds and states of aggregation	1. Atomic number, atomic mass, isotopes. Electronic configuration. Principle of Exclusion of Pauli, Principle of Aufbau, Rule of Hund, periodic Table of the elements 2. Inter and intramolecular bonds 3. States of aggregation
Subject 2. Chemical and thermodynamic equilibrium in the engineering	1. Chemical equilibrium 2. Enthalpy, entropy and free energy 3. Equilibrium constant 4. Le Chatelier principle
Subject 3. Acid-base equilibrium in the engineering	1. Definition of acid and base. Theory of Brønsted and Lowry 2. Strength of acids and bases. Concept of pH 3. Buffer solutions 4. Hydrolysis.
Subject 4. Solubility equilibrium in the engineering	1. Solubility and solubility product 2. Factors affecting solubility. Fractional Precipitation 3. Sparingly soluble salts 4. Influence of pH in the solubility equilibrium
Subject 5. Electrochemical processes	1. Concepts of oxidation 2. Electrochemical cells: basic concepts and redox potential. 3. Nernst equation
Subject 6. Kinetic chemistry in the engineering	1. Reaction rate and kinetic constant 2. Determination of the Rate Equation: Initial rate method. Integrated Rate Laws 3. Factors affecting the reaction rate. Catalysts.
Subject 7. Industrial processes of organic chemistry	1. Petrochemical. Foundations of a refinery 2. Biofuels

### Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	25	40	65
Problem solving	9	40.5	49.5
Laboratory practical	10	5	15
Case studies	6	12	18
Objective questions exam	1	0	1
Problem and/or exercise solving	1	0	1
Self-assessment	0.5	0	0.5

\*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

### Methodologies

	Description
Lecturing	Presentation of the most relevant concepts of the subject from the point of view of the engineering by the lecturer

Problem solving	A series of problems will be proposed to the students, some of them will be solved during the classroom hours and the other should be carried out autonomously
Laboratory practical	Laboratory practises will be performed by the students to reinforce in an empirical manner the main concepts tackled during the masterclasses
Case studies	The students will develop different practical cases where they will check the real utility of the theoretical concepts tackled during the masterclasses

### Personalized assistance

Methodologies	Description
Lecturing	Any doubt can be solved, individually or in groups, during tutorship. Likewise, the students will be able to do queries through telematic means (email, videoconference, Moovi forums, ...) after a previous request to the lecturer
Problem solving	Any doubt can be solved, individually or in groups, during tutorship. Likewise, the students will be able to do queries through telematic means (email, videoconference, Moovi forums, ...) after a previous request to the lecturer
Laboratory practical	Any doubt can be solved, individually or in groups, during tutorship. Likewise, the students will be able to do queries through telematic means (email, videoconference, Moovi forums, ...) after a previous request to the lecturer
Case studies	Any doubt can be solved, individually or in groups, during tutorship. Likewise, the students will be able to do queries through telematic means (email, videoconference, Moovi forums, ...) after a previous request to the lecturer

### Assessment

	Description	Qualification	Training and Learning Results			
Laboratory practical	The students will deliver the answers to the questions posed in each practice. The students will have to be able to organise, schedule and develop work in team, accepting the own responsibilities of the multilingual and multidisciplinary work. Expected results from this subject: To understand the basic concepts of Chemistry. To know how to evaluate the information coming from different sources in order to make the own opinion that will ultimately allow the student to critically respond about technological problems related to Chemistry To know how to evaluate the information coming from different sources in order to make the own opinion that will ultimately allow the student to critically respond about technological problems related to Chemistry	10	A3	C22	D3 D4 D10	
Case studies	The students will develop different practical cases where they will check the real utility of the theoretical concepts tackled during the masterclasses The practical cases will be developed in group and the students will have to deliver a report one week after finishing the session guided by the lecturer. Expected results from this subject: To understand the basic concepts of Chemistry. To know how to evaluate the information coming from different sources in order to make the own opinion that will ultimately allow the student to critically respond about technological problems related to Chemistry	10	A4 A5	B2	C22	D4

Objective questions exam	A global proof will be carried out comprising short answers for the evaluation of the competencies included in the subject that will be carried out at the official date. Expected results from this subject: To understand the basic concepts of Chemistry. To know how to evaluate the information coming from different sources in order to make the own opinion that will ultimately allow the student to critically respond about technological problems related to Chemistry	20	A1 B1 C22 A2 B2
Problem and/or exercise solving	Different problems will be given to the students in order to apply the theoretical concepts dealt with during the development of the subject in the official date of the exam. Expected results from this subject: To understand the basic concepts of Chemistry. To understand how the scientific knowledge interacts with technology in accordance with the society characteristics and needs at any moment.	20	A4 B1 C22 D5 A5 B2
Self-assessment	At the end of each block of topics, the teacher will carry out written tests where students will be able to analyze the degree of achievement of the partial objectives. Expected results from this subject: To understand the basic concepts of Chemistry.	40	A5 D5

#### Other comments on the Evaluation

- 1.- Considerations on continuous evaluation: Students may waive the continuous assessment system within the period set on the day of presentation of the subject. A minimum of 5 points out of 10 must be attained in each of the aspects considered for the assessment
- 2.- Considerations on the second chance: The qualification will be based solely on the evaluation of a final exam, which may include questions addressing laboratory practices and case studies. To pass the subject it will be necessary to achieve a score of more than 5 points out of 10.
- 3.- Considerations on the global evaluation: Students must achieve a minimum of 50% of the maximum grade to pass the subject in all the evaluation methodologies considered (laboratory practices, case studies, self-assessment tests and examination of objective questions and problem solving). Those students who have renounced the continuous evaluation must take a single exam on the date officially established in the EME calendar where the contents covered in all the aforementioned methodologies will be evaluated.

Exam calendar. Check/consult updates on the center's website: <http://minaseenerxia.uvigo.es/es/docencia/examenes/>

#### Sources of information

##### Basic Bibliography

R.H. Petrucci y col., **Química General**, Prentice Hall, 2017

R. Chang, **Química**, McGraw Hill, 2013

M.R. Fernández y J.A. Fidalgo, **1000 Problemas de Química General**, Everest, 1997

##### Complementary Bibliography

L.S. Brown y T.A. Hollme, **Chemistry for engineering students**, Brooks Cole Cengage Learning, 2018

M.A. Ramos Carpio, **Refino de Petróleo, Gas Natural y Petroquímica**, UPM, 1997

#### Recommendations