Course guide
240014 - 240014 - Chemistry I

Last modified: 25/10/2022

Unit in charge: Barcelona School of Industrial Engineering
Teaching unit: 713 - EQ - Department of Chemical Engineering.

Degree: BACHELOR'S DEGREE IN INDUSTRIAL TECHNOLOGY ENGINEERING (Syllabus 2010). (Compulsory subject).

Academic year: 2022 **ECTS Credits:** 6.0 **Languages:** Catalan, Spanish

LECTURER

Coordinating lecturer: ANA MARIA SASTRE REQUENA

Others: Corcho Sanchez, Francisco Jose
Gonzalez Fernandez, Oscar
Lalueza Baro, Juana
Pastor Castillo, Maria Vicenta
Ruiz Planas, Montserrat
Sastre Requena, Ana Maria

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
1. Capacity to understand and apply basic knowledge principles of general chemistry, organic and inorganic chemistry and their engineering applications.

TEACHING METHODOLOGY

The module consists of lectures in which the professor presents the learning objectives related with the different contents and later a resolution of practical examples. Active participation is encouraged during the resolution of practical cases, while proposing a large amount of numerical problems in which students are presented with real cases related with the chemical environment.

During the course, students are provided with learning material and tools in order to guide their learning process and therefore consolidate knowledge on chemistry which is achieved during the course.

LEARNING OBJECTIVES OF THE SUBJECT

The module's general objective is to establish a chemical basis necessary to interpret the most important chemical reactions which take place in aqueous dissolution and to apply in the Chemical Industry and Environment.
At the end of the module, students should be able to:
1. Predict the reactivity and stability of the most common chemical inorganic composites.
2. Correctly write chemical reactions differentiating those which take place in chemical balances.
3. Use the corresponding equations in the mass and charge balances as well as the necessary thermodynamic constants to interpret chemical balances.
4. Calculate the concentrations of different species in an aqueous dissolution for balanced reactions: acid-base, complexation, solubility and oxidation-reduction.
5. Applying calculus of balanced systems in environment's examples and in chemical industry examples.

STUDY LOAD

Type	Hours	Percentage
Hours large group	56,0	37.33
Hours small group	4,0	2.67
Self study	90,0	60.00

Total learning time: 150 h

CONTENTS

TOPIC 1. Chemical fundaments

Description:
Properties of chemical elements and oxidation states: Periodic table. Industrial and environmental applications of chemical elements. Water as a solvent. Water properties. Electrolytes. Chemical balances in water. Balance constants. Chemical kinetics

Related competencies :
CE4. Capacity to understand and apply basic knowledge principles of general chemistry, organic and inorganic chemistry and their engineering applications.

Full-or-part-time: 25h
Theory classes: 10h
Self study : 15h

TOPIC 2. Acid-base reactions

Description:
Acidity and basicity definitions, strong and weak acids and bases. Description of the most widely used acids and bases in industry. Acid-base reactions. Acidity constant. Charge and mass balances. Application of acid-base balances: mixtures. Environmental and industrial interest examples: Acid rain. CO2 impact.

Related competencies :
CE4. Capacity to understand and apply basic knowledge principles of general chemistry, organic and inorganic chemistry and their engineering applications.

Full-or-part-time: 40h
Theory classes: 8h
Practical classes: 8h
Self study : 24h

TOPIC 3. Formation of complexs in dissolution

Description:
Chemical speciation. Predominance. Some examples. Complexation balances. Formation constants. Mass balances. Formation degree. Fraction diagrams environmental and industrial applications.

Related competencies :
CE4. Capacity to understand and apply basic knowledge principles of general chemistry, organic and inorganic chemistry and their engineering applications.

Full-or-part-time: 25h
Theory classes: 5h
Practical classes: 5h
Self study : 15h

TOPIC 4. Dissolution and precipitation

Description:
Soluble and insoluble solids, solubility, solubility product. Solubility balances: mass balances. Solubility diagrams applications. Precipitation and redissolution reactions. Parallel reactions.

Related competencies :
CE4. Capacity to understand and apply basic knowledge principles of general chemistry, organic and inorganic chemistry and their engineering applications.

Full-or-part-time: 30h
Theory classes: 6h
Practical classes: 6h
Self study : 18h

TOPIC 5. Redox reactions

Description:
Chemical reactions in high furnaces. Oxidation, reduction, pe. Semireactions and redox reactions. Redox reactions applications (batteries, piles, electrolysis). Pourbaix's diagrams. Environmental applications.

Related competencies :
CE4. Capacity to understand and apply basic knowledge principles of general chemistry, organic and inorganic chemistry and their engineering applications.

Full-or-part-time: 30h
Theory classes: 6h
Practical classes: 6h
Self study : 18h

ACTIVITIES

(ENG) PROVA AVALUACIÓ CONTINUADA AC

Full-or-part-time: 1h
Self study: 1h

GRADING SYSTEM

The final mark (NF) will be calculated according to:

NF = max (NF, 0,2*AC+0,2*AC+0,6*EF)
1) Continuous evaluation mark: AC
2) Partial exam mark: EP
3) Final Exam mark: EF

The reassessment mark (ReAv) will replace the final exam mark.
Final mark will be calculated according to: NF = 1.0 *ReAv

EXAMINATION RULES.

Both in continuous evaluation tests and in the partial and final exams, and in the reassessment exam, it is necessary to have a calculator. It will not be possible to use notes or any type of formulary under any circumstance.

BIBLIOGRAPHY

Basic:
- Farran, A. et al. Apunts de Química I. Barcelona: Serveis Gràfics Copisteria Imatge, SL, 2012.
- Aguilar Sanjuán, Manuel. Introducción a los equilibros iónicos [on line]. 2ª ed. Barcelona: Reverté, 1999 [Consultation: 08/09/2020]. Available on: http://www.ingebook.com/ib/NPcd/IB_BooksVis?cod_primaria=1000187&codigo_libro=8080. ISBN 8429175504.
- Casas, Ignasi [et al.]. Exàmens de Química. Barcelona: Publicacions d'Abast, 2006. ISBN 8495355639.
- Sawyer, Clair N. [et al.]. Química para ingeniería ambiental. 4a ed. Bogotá: McGraw-Hill, 2001. ISBN 9584101641.

Complementary:
- Atkins, Peter. Shriver & Atkins química inorgánica : cuarta edición. 4a. Mexico: McGraw-Hill/Interamericana, 2008. ISBN 9789701065310.
- Budevsky, O. Fonaments de l'Anàlisi Química. Barcelona: Edicions Universitat de Barcelona, 1998. ISBN 8483380331.
- Unitat de Química Inorgànica i Analítica. Diagramas ácido-base. Barcelona: CPDA-ETSEIB, 1996.
- Petrucci, Ralph H. [et al]. Química General [on line]. 11ª ed. Madrid: Prentice Hall, 2017 [Consultation: 10/09/2018]. Available on: http://www.ingebook.com/ib/NPcd/IB_BooksVis?cod_primaria=1000187&codigo_libro=6751. ISBN 9788490355336.
- QuimiCard : totes les fòrmules i lleis de la química. Barcelona: Castellnou, 2006. ISBN 849804202X.
- Tablas de Constantes de Equilibrio. Barcelona: CPDA-ETSEIB, 2002.

RESOURCES

Other resources:
In the ATENEA's platform, more information relative to the laboratory practice, questionnaires, self-evaluation multiple choice tests.