25200 - Chemical foundations of the environment

Información del Plan Docente

Academic Year	2016/17
Academic center	201 - Escuela Politécnica Superior
Degree	571 - Degree in Environmental Sciences 277 - Degree in Environmental Sciences
ECTS	6.0
Course	1
Period	First Four-month period
Subject Type	Basic Education
Module	---

1.Basic info

1.1.Recommendations to take this course

1.2.Activities and key dates for the course

2.Initiation

2.1.Learning outcomes that define the subject

2.2.Introduction

3.Context and competences

3.1.Goals

3.2.Context and meaning of the subject in the degree

3.3.Competences

3.4.Importance of learning outcomes

4.Evaluation

5.Activities and resources

5.1.General methodological presentation

All the proposed activities in this subject are centred in the understanding and assimilation of the chemistry principles to understand the different chemical processes that occur in the environment.

All the contents explained in the theory classroom will be complemented by the laboratory sessions.

A group work will be proposed at the beginning of the course, which will involve the discussion of a proposed topic in

collaboration with Fundaments of Geology. Such topic will be closely related to contents included in both subjects: Chemistry and Geology.

Individualized tutoring will monitor the learning process development.

5.2.Learning activities

These are the required activities to achieve the expected results:

1. Theory and seminar classroom

Students will have the content of each lecture as well as the collection of numerical exercises at the beginning of each session.

1. Laboratory sessions

These laboratory sessions will take 2 hours, approximately every 15 days. Students will have the content before the session, which includes the practical procedure and the theoretical contents.

1. 3. Group work

During the course time the students will be divided in groups of 4-5 members in order to develop a particular topic in collaboration with Fundamentals of Geology for the study of the environment. The proposed topic will be closely related to contents included in both subjects: Chemistry and Geology. All the students are encouraged to submit an individual report previous to the final group presentation, which will include a summary with the different sections of the topic in addition to the corresponding bibliography.

5.3.Program

THEORY

The topics to be developed in the theory classes are divided into four sections:

Section 1: Atomic Structure

Atoms and atomic theory. The components of the atom. Introduction to the Periodic Table of Elements. Relationships of mass in chemistry: atomic mass, mole, empirical formula. Stoichiometry.

Section 2: State of Matter and Solutions

-Gaseous State: Gas Properties. Laws of gases, ideal gas equations. Kinetic-molecular theory. Equation of real gases. (Unit 2)

-Solid State: Types of solids. Van der Waals forces. Crystal structures. (Unit 3)

-Liquid State: Liquids Properties. Liquid-vapour balance. Changes of state. Phase diagrams. (Unit 4)

-Solutions: Units of Concentration. The basic fundamentals of solubility. Colligative properties. (Unit 5)

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Section 3: Thermodynamic Chemistry

Principles of heat transfer. The First Principal of Thermodynamics. Enthalpy. Thermodynamic equations. Enthalpy of formation, Bond Energy. (Unit 6)

Section 4: Chemical Equilibrium

-Equilibrium. Basic concepts of equilibrium. Constant of Equilibrium. Changes in the conditions of equilibrium. (Unit 7)

-Acid-Base equilibrium: Definition of acid and base. Ionic product of water. pH and pOH. Strength of acids and bases. Buffer solution. pH indicators. Acid-base titration (Unit 8)

- Redox equilibrium: voltaic cells. Standard Potential. Relation between E^o, K y DG^o. Electrolytic and commercial cells. (Unit 9)

- Precipitation equilibrium: constant of the product of solubility. Dissolving precipitates. Equilibrium of complex ions. (Unit 10)

Section 5: Carbon Compound . (Unit 11)

-Introduction to hydrocarbons: Alcanes, alkenes, alkynes

-Functional organic groups

LABORATORY SESSIONS

SESSION 1. Production and behaviour of gases. Production of hydrogen. Determination of atomic weight of a metal.

SESSION 2. Liquids and solutions. Concentration of solutions. Strong and weak electrolytes. Preparation of different solutions (sulphuric acid, hydrochloric acid, nitric acid, acetic acid, ammonium hydroxide and sodium hydroxide) to distinguish the behaviour of strong and weak electrolytes by measuring the pH.

SESSION 3. Liquid solutions. Separation by destilation. Destilation of a commercial wine. Determination of alcoholic grade

SESSION 4. Acids and Bases. Proton transfer reactions. Balances in solutions. Indicators. Recognize the behaviour of various indicators in different aqueous media: acid, basic and neutral. Study the acid-base behaviour of different salts depending on the colour they take on in the presence of an indicator. The study of different chemical equilibria.

SESSION 5. Acid bases reactions. Neutralization. The study of a neutralization process by stage. Acid-base titration.

SESSION 6. Oxidazing and reducing agents. Electron transfer reactions. Reaction of metals with the H+ ion (non oxidant

acids) and with oxidant acids. Displacement reactions.

SESSION 7 . Chemical behaviour of alkaline earth metals and chemical behaviour of anions. Precipitation. Determination of an unknown salt

5.4.Planning and scheduling

Activity/Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Tot
Classroom activity																					
Theory	2	2	2	2	2	2	2	2	2	2	2	2	2	2			2				30
Seminars	2	2		2		2	2		2			2	2								16
Laboratory sessions			2		2			2		2	2			2			2				14
Team work																	1				1
Evaluation										1									4		5
non presencial work																					
Individual work	4	4	4	2	4	2	4	4	2	3	8	2	2	2	4	4	3	8	8		64
Team work				2		2			2		2	2	2	2							14
TOTAL	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8			144

5.5.Bibliography and recomended resources

Basic bibliography

- Petrucci, Ralph H.. Química general / Ralph H. Petrucci, William S. Harwood, F. Geoffrey Herring; traducción, Concepción Pardo Gª Pumarino, Nerea Iza Cabo . 8ª ed. Madrid : Prentice Hall, cop. 2003
- Chang, Raymond. Química / Raymond Chang, Williams Coll>= traducción, María del Carmen Ramírez Medeles, Rosa Zugazagoitia Herranz ; revisión técnica, María Aurora Lanto Arriola. [et al.] . 7ª ed. México : McGraw-Hill, cop.

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- Química: la ciencia central / Theodore L. Brown...[et al.]; con la colaboración de Patrick Woodward ; traducción , Laura Fernández Enríquez ; Revisión técnica, María Aurora Lanto Arriola. 11ª ed. México: Pearson Educación, 2009.
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Complementary bibliography

- Manahan, Stanley E.. Environmental chemistry/Stanley E. Manahan. 8th ed. Boca Raton: CRC, cop. 2005.
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