INSTITUTO POLITÉCNICO DE BRAGANÇA

Course Unit	Chemistry			Field of study	Chemistry		
Bachelor in	Food Engineering			School	School of Agriculture		
Academic Year	2023/2024	Year of study	1	Level	1-1	ECTS credits	6.0
Type	Semestral	Semester	1	Code	9087-641-1105-00-23		

Workload (hours)	162	Contact hours	T -	TP -	PL -	TC -	S -	E -	OT -	O -

T - Lectures; TP - Lectures and problem-solving; PL - Problem-solving, project or laboratory; TC - Fieldwork; S - Seminar; E - Placement; OT - Tutorial; O - Other

Name(s) of lecturer(s): Maria João de Almeida Pinto Santos Afonso

Learning outcomes and competences

At the end of the course unit the learner is expected to be able to:
Describe matter properties. To understand and solve Chemistry problems. To know how to handle laboratory materials and apply techniques correctly. To know the laboratory personnal safety procedures.

Prerequisites

Before the course unit the learner is expected to be able to:
To have sufficient basic knowledge of chemistry to follow the program.

Course contents

General Chemistry

Course contents (extended version)

1. The matter.
   - Classification of matter. Pure substances and mixtures. Suspensions and colloidal solutions.
   - States of matter.
   - International system of units.
   - Intermolecular forces.
   - Boyle's Law, Charles's Law and Gay Lussac's Law.
2. Atoms, Molecules and Ions.
   - Atomic number, mass number and isotopes.
   - The periodic table.
   - Molecules and ions. Nomenclature of compounds.
3. Chemical Kinetics.
   - The effect of concentration, pressure and temperature on reaction rate.
   - Stoichiometry and reaction rate.
   - 1st order reactions.
   - Collision theory. Catalysis.
4. Chemical Reactions.
   - Concept of mole. Avogadro's number.
   - Molar mass.
   - Stoichiometry. Lavoisier's Law.
   - Balancing of chemical equations.
   - Limiting reagent.
   - Reaction Yied.
   - Concentrations of solutions. Dilutions.
5. Chemical Equilibrium.
   - The concept of equilibrium and the equilibrium constant.
   - Equilibrium constant expressions.
   - Factors that affect the chemical equilibrium. Le Châtelier´s Principle.
6. Acid-Base Equilibrium
   - Acids and bases according to Arrhenius, Bronsted-Lowry and Lewis.
   - pH. Sorensen's scale.
   - Acid-base properties of water. The ion product of water.
   - Weak acids, weak bases and their ionization constants. Conjugated acids and bases.
   - Diprotic and polyprotic acids.
   - Ionization. Percentage Ionization.
   - Buffer solutions.
   - Acid-base titrations. Acid-base titrations curves.
   - Acid-base indicators.
7. Solubility.
   - Solubility and dissolution temperature.
   - Solubility product.
   - Precipitation.
   - Effect of pH on solubility.
   - The common ion effect.
8. Redox Equilibrium.
   - Electrochemistry. Redox reactions.
   - Electrochemical cells. Standard Reduction Potentials. The Nernst equation.
   - The potential or electromotive force of a battery.
   - Batteries.
9. Organic Chemistry.
   - Hydrocarbons.
   - Functional groups: Alcohols, Esters, Aldehydes, Ketones, Carboxylic acids, Amines.

Recommended reading

1. Chang, R, Goldsby, K, Química - 11ª Edição, Ed. McGraw Hill, 2002;
2. Goldberg, D, Fundamentals of Chemistry, Ed. McGraw-Hill, 2006;
3. Murray, J, Fay, R, Chemistry, Ed. Prentice Hall, 2003;
4. Zumdahl, S. S, Zumdahl, SA, Chemistry, Ed. Houghton Mifflin Company, 2007;
5. Solomons, T. W. G, Química Orgânica, Ed. LTC - Livros Técnicos e Científicos Editora Lda, 2012;

Teaching and learning methods

Theorical lessons: Presentation of theoretical concepts. Presentation, analysis and discussion of application examples. Practical lessons: Resolution of exercises and explanation of doubts related with exercises proposed. Laboratory work.

Assessment methods

1. Alternative 1 - (Regular, Student Worker) (Final)
   - Intermediate Written Test - 25% (Assessment of theoretical (75%) and practical (25%) knowledge acquired.)
   - Intermediate Written Test - 25% (Assessment of theoretical (75%) and practical (25%) knowledge acquired.)
   - Intermediate Written Test - 25% (Assessment of theoretical (75%) and practical (25%) knowledge acquired.)
   - Laboratory Work - 25% (Quizzes about laboratory work.)
2. Alternative 2 - (Regular, Student Worker) (Final)
   - Final Written Exam - 75% (Assessment of theoretical (75%) and practical (25%) knowledge acquired.)
   - Laboratory Work - 25% (Preparation of a written report on a practical activity carried out in laboratory classes.)
3. Alternative 3 - (Regular, Student Worker) (Supplementary, Special)
   - Final Written Exam - 100% (Exam with questions from the theoretical component (50%) and the practical component (50%).)

Language of instruction

1. Portuguese
2. Spanish
3. English

Electronic validation

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06-02-2024	08-02-2024	12-02-2024	12-02-2024