Study Plan

School: School of Sciences and Technology
Degree: Bachelor
Course: Chemistry (cód. 731)

1st Year - 1st Semester

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
QUI13539L	Principles and Methods of Chemistry	Chemistry	6	Semester	156
QUI13536L	Laboratory Techniques I	Chemistry	3	Semester	78
BIO13568L	Cell Biology	Biological Sciences	6	Semester	156
MAT11960L	Mathematics I	Mathematics	6	Semester	156
FIS13595L	PHYSICS 1	Physics	6	Semester	156
QUI13546L	Introduction to Green Chemistry	Chemistry	3	Semester	78

1st Year - 2nd Semester

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
QUI01084L	Physical Chemistry I	Chemistry	6	Semester	156
QUI11962L	Organic Chemistry I	Chemistry	6	Semester	156
QUI13559L	Laboratory Techniques II	Chemistry	3	Semester	78
QUI13548L	Principles and Methods of Biochemistry	Biochemistry	6	Semester	156
MAT12237L	Mathematics II	Mathematics	6	Semester	156
QUI13531L	Introduction to Environmental Chemistry	Chemistry	3	Semester	78

2nd Year - 3rd Semester

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
QUI11965L	Inorganic Chemistry I	Chemistry	6	Semester	156
QUI11966L	Analytical Chemistry I	Chemistry	6	Semester	156
QUI11967L	Organic Chemistry II	Chemistry	6	Semester	156
QUI01051L	Advanced Chemistry Laboratory I	Chemistry	6	Semester	156
MAT11959L	Biostatistics with Computer Software	Mathematics	6	Semester	156

2nd Year - 4th Semester

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
QUI11969L	Inorganic Chemistry II	Chemistry	6	Semester	156

2nd Year - 4th Semester

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
QUI11971L	Physical Chemistry II	Chemistry	6	Semester	156
QUI11970L	Analytical Chemistry II	Chemistry	6	Semester	156
QUI11972L	Advanced Chemistry Laboratory II	Chemistry	6	Semester	156
FIS13596L	PHYSICS 2	Physics	6	Semester	156

3rd Year - 5th Semester

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
QUI07212L	Colloids and Interfaces	Chemistry	6	Semester	156
QUI13533L	Organic Synthesis	Chemistry	6	Semester	156
QUI13547L	Current Chemistry Perspectives	Chemistry	3	Semester	78
QUI13532L	Computational Chemistry	Chemistry	6	Semester	156
QUI13519L	* Scientific Internship	Chemistry	18	Semester	468

Group of Options-Group 1

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
QUI13517L	Introduction to Pharmaceutical Chemistry	Chemistry	3	Semester	78
QUI13534L	Introduction to Quality	Chemistry	3	Semester	78
QUI13535L	Chemistry of Natural Products	Chemistry	3	Semester	78

Group of Options-Group 2

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
QUI00348L	Biochemistry	Biochemistry	6	Semester	156
QUI11980L	Chemistry Applied to Heritage	Chemistry	6	Semester	156
QUI11984L	Solids and Surfaces	Chemistry	6	Semester	156
QUI11983L	Forensic Chemistry	Chemistry	6	Semester	156
QUI13545L	Industrial Chemistry	Chemistry	6	Semester	156
FIT12244L	Wine and Olive Oil Technology	Agronomy	6	Semester	156
GES02310L	Entrepreneurship and Innovation	Management	6	Semester	156

3rd Year - 6th Semester

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
QUI01109L	Molecular Simulation	Chemistry	6	Semester	156
QUI13519L	Scientific Internship	Chemistry	18	Semester	468

3rd Year - 6th Semester

Component code	Name	Scientific Area Field	ECTS	Duration	Hours

Group of Options-Group 2

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
QUI00348L	Biochemistry	Biochemistry	6	Semester	156
QUI11980L	Chemistry Applied to Heritage	Chemistry	6	Semester	156
QUI11984L	Solids and Surfaces	Chemistry	6	Semester	156
QUI11983L	Forensic Chemistry	Chemistry	6	Semester	156
QUI13545L	Industrial Chemistry	Chemistry	6	Semester	156
FIT12244L	Wine and Olive Oil Technology	Agronomy	6	Semester	156
GES02310L	Entrepreneurship and Innovation	Management	6	Semester	156

Conditions for obtaining the Degree:

*** TRANSLATE ME: Para obtenção do grau de licenciado em Química é necessário obter aprovação a 165 ECTS em unidades curriculares obrigatórias e 15 ECTS em unidades curriculares optativas, distribuídas da seguinte forma:

1º Ano

1º Semestre:

6 UC Obrigatórias num total de 30 ECTS

2º Semestre:

6 UC Obrigatórias num total de 30 ECTS

2º Ano

3º Semestre:

5 UC Obrigatórias num total de 30 ECTS

4º Semestre:

5 UC Obrigatórias num total de 30 ECTS

3º Ano

5º Semestre:

4 UC Obrigatórias num total de 21 ECTS

1 UC Optativa do Grupo 1 num total de 3 ECTS

1 UC Optativa do Grupo 2 num total de 6 ECTS

6º Semestre:

2 UC Obrigatórias num total de 24 ECTS

1 UC Optativa do Grupo 2 num total de 6 ECTS ***

Program Contents

Back

Principles and Methods of Chemistry (QUI13539L)

Atomic theory. Atomic models. Quantum theory and electronic structure of atoms. Periodic relations between the elements. Basic concepts of chemical bonding. Ionic bonding. Fajans rules. Covalent bonding (Lewis structures, Valence Shell Electron Pair Repulsion model, Valence Bond theory, Molecular Orbital theory). Molecular interactions. States of aggregation. Gas equations. Perfect gas mixtures. Chemical thermodynamics. Phase equilibrium. Properties of solutions. General aspects of chemical equilibrium in ideal systems. Acid-base, solubility, complexation and oxidation-reduction equilibria. Electrochemistry. Chemical kinetics.

Back

Laboratory Techniques I (QUI13536L)

- Solutions.
- Laboratory Regulations and Safety Procedures.
- Classification and Labelling of Chemicals (GHS and CLP)
- Principles of Good Laboratory Practice (GLP)
- Information Sources.
- Experimental Planning and Production of Reports and Scientific Posters.
- Laboratory Techniques and Unit Operations.
- Volumetric Analysis.
- Distillation.
- Extraction
- Introduction to Chromatography:
- Thin Layer Chromatography and column chromatography.
- High performance liquid chromatography.
- Gas chromatography

Back

Cell Biology (BIO13568L)

Methods and Techniques used in cell study. Biomolecules. Origin of life. Cells: paradigms and diversity.
Cellular organization: cell membrane; membrane-bound organelles; semi-autonomous organelles; cytosol and its inclusions. Cytoskeleton. Extracellular structures: cell wall, extracellular matrix. Transmembrane transport and metabolism: Functional order. Energy: thermodynamics in the cell; redox reactions; energy conversion. Information: genomic information; intercellular and intracellular communication; cell recognition. Cell Reproduction: Mitosis; mitotic chromosomes; the mitotic cycle. Meiosis. Cell proliferation and differentiation: growth factors; mechanisms of differentiation. Cell death (apoptosis). Applications of cell biology.

Back

Mathematics I (MAT11960L)

1. Topological concepts in IR
2. Differential calculus in IR: Derivative at a point and physical interpretation. Rules of derivation. Rolle, Lagrange and Cauchy Theorems. L'Hôpital and Cauchy Rules. Monotonicity, concavity and asymptotes.
3. Primitives: Primitives. Primitives by parts and by substitution. Primitives of rational functions.
4. Integration: Integral of Darboux and Riemann. Properties of the integral. The fundamental theorem of calculus and Barrow's formula. Integration by parts and substitution.
5. Applications of integral calculus: Areas. Length of a line. Volumes and areas of solids of revolution.
6. Improper integrals: Convergence theorems. Absolute Convergence.
7. Numerical series: Geometric and Mengoli series. Nonnegative real series. Alternating series. Absolute convergence.
8. Power series: Definitions. Taylor and Mac-Laurin series.
9. ODE: Homogeneous non-homogeneous linear ODE of order n. Applications

Back

PHYSICS 1 (FIS13595L)

I. Mechanics
- The scientific method. Measurements, units, and dimensions.
- Kinematics and dynamics of mass points. Newton's laws and its applications.
- Work and energy. Collisions and momentum. Conservation laws.
- Systems of many particles. The rigid body. Angular momentum.

II. Electromagnetism
- Electrostatics. Electric charges and forces.
- Electric potential. Capacity and capacitors.
- Electric current. Kirchhoff's rules. RC circuits.
- Reference to Maxwell's equations and electromagnetic waves.

III. Optics
- The nature of light. Geometric optics. Image formation by mirrors and lenses.
- Lasers

IV. The nucleus, nuclear reactions and radioactivity.

Back

Introduction to Green Chemistry (QUI13546L)
- Introduction. Importance of Chemistry and Chemical Technology in Modern Society: Advantages versus Disadvantages.
- The Agenda 2030 for Sustainable Development. Sustainable Development Goals (SDGs) and main targets.
- Chemistry and Sustainable Development.
- History and Evolution of Green Chemistry.
- The 12 Principles of Green Chemistry.
- Green Chemistry Metrics: Measuring and Monitoring Sustainable Processes
- Life Cycle Assessment: a Tool for Identification of More Sustainable Products and Process
- Green Chemistry in different areas of chemistry. Success and false cases
- Green Chemistry in everyday life. Real cases.
- The second 12 Principles of Green Chemistry.
- Seminars / Lectures on current topics within the Green Chemistry by invited specialists

Back

Physical Chemistry I (QUI01084L)

Back

Organic Chemistry I (QUI11962L)

Classification and nomenclature of organic compounds. The chemical bond in organic molecules. Drawing molecules. Constitutional isomers. Stereoisomers and conformational analysis. Electronic structure of organic molecules. Reactivity of organic molecules. Nucleophilic substitution at saturated carbon. Elimination reactions. Electrophilic addition to alkenes. Electrophilic aromatic substitution reactions. Accomplishment of laboratory experiments for the application of fundamental techniques of synthesis, extraction, isolation and identification of organic compounds.

Back

Laboratory Techniques II (QUI13559L)

Fundamentals of spectrometric methods. Molecular spectroscopy: an introduction to ultraviolet/visible molecular absorption spectrometry and molecular luminescence spectrometry. Applications. Equipment. Atomic spectroscopy. An introduction to optical atomic spectrometry, atomic absorption spectrometry and atomic emission spectrometry. Applications and equipment.
Electrochemical methods of analysis: fundamentals and applications. Instrumentation and types of electrodes used in conductometric and potentiometric methods: conductivity, reference and indicator electrodes. Conductometry and conductometric titrations. Potentiometric methods (selective electrodes and measurements, in particular, pH electrode and other ion (e.g., ammonium ion) selective electrode and respective measurements). Calibration methods for quantitative analysis.

Back

Principles and Methods of Biochemistry (QUI13548L)

Biochemistry: An Introduction. Methodology and technical approaches used in Biochemistry.
Water and biological systems. Functional characteristics of biomolecules. Carbohydrates: Mono and Polysaccharides. Amino acids, peptides and proteins. Nucleotides and nucleic acids. Lipids and lipoproteins. Structure and properties of biomembranes. Enzymes and enzymatic kinetic. Introduction to bioenergetics and bioelectrochemistry. The role of ATP in metabolic processes. Introduction to the metabolism and to major metabolic pathways.

Back

Mathematics II (MAT12237L)

I – Linear Algebra
1. Vector spaces
2. Linear functions
3. Matrices and Linear Systems of Equations .
4. Determinants – Permutations.
5. Eigenvalues and eigenvectors– Definitions. The caracteristic polynomial. Algebraic and geometric multiplicities. Inverse matrix calculation. Matrix diagonalization.
II – Differential Calculus in ℝn
1. Dot Product – Dot product. Euclidean spaces. Cauchy-Schwarz inequality. Orthogonal bases. Projections. Gram-Schmidt orthogonalization process. Cross and mixed products properties and geometrical applications
2. Topology & Scalar and Vector Fields - Notions of topology. Scalar and vector fields. Domain and range. Graphical representation. Level sets of scalar fields.
3.Limits and Continuity - Limit in scalar and vector fields. Branching limits. Properties of limits. Continuity and continuity prolongation.
4. Differential calculus -Differentiability of scalar and vector fields.

Back

Introduction to Environmental Chemistry (QUI13531L)

Chemistry of atmosphere – Chemical composition, structure and function; introduction to photochemistry reactions; anthropogenic action and its effects; air quality.

Chemistry of water – physical and chemical properties of water; sources of water; water quality control; introduction to chemical equilibriums in natural waters; atmosphere – water – sediments interaction.

Chemistry of soil – Geochemistry of surface; soil composition; plants growth and trace elements; soil pollution.

Back

Inorganic Chemistry I (QUI11965L)

Introduction to inorganic chemistry: background, classes of inorganic compounds, structures and inorganic reactions. The Periodic Table, chemistry, occurrence, recovery and uses of the elements and its compounds. An introduction to the coordination compounds: structure, representative ligands, nomenclature and isomerism. Electronic structure and spectra of d-metal complexes. d-Metal organometallic chemistry: basic concepts, structure and chemical bonding. Laboratory module: a set of laboratory experiments is included in the "Advanced Laboratory of Chemistry I" course.

Back

Analytical Chemistry I (QUI11966L)

1. Solubility and precipitation. Separation by selective precipitation. Qualitative analysis of cations. Properties of precipitates and precipitation reragents. Gravimetric analysis. 2. General aspects of volumetric titrations. Standard solutions and standardization. Equivalence and final points. Required characteristics of titration reactions. Direct and back-titrations. 3. Precipitation titrations. Methods of Mohr, Charpentier-Volhard and Fajans. Titration curves of one analyte and of mixtures. 4. Acid-base titrations. Buffers. Titration curves for simple and complex systems. Indicators. 5. Complex formation titrations. EDTA Titrations. Titration curves of simple and complex mixtures. Use of metallochromic indicators and of auxiliary complexing agents. 7. Redox titrations. Use of pre-oxidizing and pre-reducing agents. Titration curves of simple and complex systems. Indicators. 8. Thermal analysis.

Back

Organic Chemistry II (QUI11967L)

1. Carbonyl Compounds. Aldehydes and ketones, Electronic structure. Reactions: Nucleophilic addition reactions, including the aldol and its significance in biosynthesis.
-dicarbonyl and -unsaturated compounds. Acidity, the malonic ester and acetoacetic ester synthesis, the Micheal addition and the Claisen condensation reaction.
Carboxylic acids and their derivatives. Synthesis and interconversion between carboxylic acid derivatives.
2. Stereochemistry. Fundamental concepts. Chiral compounds without central chirality.
3. Relevance of carbonyl compounds in medicinal and pharmaceutical chemistry.
4. Spectrocopic Methods in Organic Chemistry. Nuclear Magnetic Ressonance (NMR) 1H e 13C, Infra-Red spectroscopy, UV/VIS spectroscopy, Mass spectrometry.

Back

Advanced Chemistry Laboratory I (QUI01051L)

The three components include: a) Preparation and characterisation of inorganic compounds. b) Use of several analytical techniques. c) synthesis of organic compounds. d) data analysis. e) laboratory work planning.

Back

Biostatistics with Computer Software (MAT11959L)

One-dimensional and two-dimensional descriptive statistics.
Probability topics. Random variables. Distribution function.
Discrete and continuous probability distributions.
Sampling. Sampling distributions.
Point estimation and confidence intervals
Tests for the mean, variance, proportion, comparison of means (independent samples and paired samples), comparison of variances and comparison of proportions. Analysis of variance. Nonparametric tests.
Use of programs on the MS Windows. MS Excel. SPSS statistical software.

Back

Inorganic Chemistry II (QUI11969L)

Packing, unit cells and interstitial space in crystalline solids. Representative structures of inorganic solids. Metallic alloys. Crystalline systems, Bravais lattices and Miller indexes. Characterisation by X ray diffraction (powder method). Energetics of ionic solid formation. Band theory. Defects in crystals. Mechanisms and kinetics of reactions in aqueous phase. Sol-gel process.

Back

Physical Chemistry II (QUI11971L)

The failures of classic mechanics. The origins of the quantum mechanics. The Schrödinger equation and the information contained in its solutions: average values probabilities. Heisenberg uncertainty principle. Quantum descriptions of the translaccional motion (particle in the box), vibracional motion (harmónico oscillator) and rotational motion (circular movement, rotation in a spherical surface). Structure of hidrogenoid and polielectronic atoms. Molecular structure. Molecular orbitals theory for polyatomic molecules. Variacional principle. Hückel method. Kinetic empirical chemistry. Elementary and complex reactions. The stationary state approach. Unimolecular reactions. Enzymatic catalysis. Chain reactions. Polymerization reactions. The collisions theory and the activated complex theory.

Back

Analytical Chemistry II (QUI11970L)

Chromatographic methods: Statistics and chemometrics for analytical chemistry. Quantification methodology when using a chromatografic method of analysis. Sample preparation methodology for different sample materials: solid, liquid and gases. Chromatographic methods of analysis: HPLC, GC and CE. Different detectors with a special emphasis on the mass detector. Use of recent literature to illustrate the use of the different chromatographic techniques in different scientific areas.

Electrochemical Methods: Static interfacial methods. Dynamic interfacial methods, with total or partial controlled potential. Galvanostatic dynamic interfacial methods and bulk methods. Considerations about the experimental work. Results, its analysis and interpretation. Quantification of analytes by electrochemical methods. Detection limits and quantification. Use of recent literature to illustrate the use of the different electrochemical techniques in different scientific areas.

Back

Advanced Chemistry Laboratory II (QUI11972L)

The components of the unit include: a) synthesis, reactivity and characterisation of ceramic materials; b) construction and interpretation of models of inorganic solids; c) analysis and purification of complex mixtures; d) problems in quantum mechanics (fundamentals, applications to atomic and molecular structure), chemical kinetics and reaction mechanisms.

Back

PHYSICS 2 (FIS13596L)

I. Mechanics, Oscillations and Waves
• Revision of mechanical concepts.
• Universal gravitation.
• Periodic and simple harmonic motion. Forced oscillations and resonance.
• Coupled oscillators. Normal modes.
• Progressive waves. The Doppler effect.
• Superposition and interference. Standing waves in strings, air columns, and membranes.
II. I. Electromagnetism
• Revision of electricity and DC circuits.
• Magnetic fields and the Lorentz force.
• Sources of the magnetic field. Magnetism in matter.
• Electromagnetic induction. Faraday's law.
• Alternating-current circuits.
• Maxwell's equations.
• Electromagnetic waves. Polarization.
III. Optional selected topics on Modern and Contemporary Physics

Back

Colloids and Interfaces (QUI07212L)

Theoretical:
Preparation and properties of colloidal systems. Gas-liquid, liquid-liquid and liquid-solid interfaces.
Laplace, Kelvin, Gibbs, Young and Poisson-Boltzmann Equations. Tensioactive agents (surfactants).
Hydrophile-lipophile balance. Micelle directed synthesis. Monocamadas. LB films. Emulsions and foams.
Emulsion polymerisation. Wetting. Detergentes. Flotation. Origin of surface charge. Electric double layer models. Experimental methods. DLVO theory. Steric stabilisation.
Practical:
Presentation; Determination of surface tension; Gibbs isotherm; Demonstration experiments;
Determination of the cmc; Analysis of electrokinetic properties (4 classes); Resolution of problems (2 classes).

Back

Organic Synthesis (QUI13533L)

Synthesis and reactivity of 1,3-dicarbonyl compounds. Synthesis of -hydroxyketones.
Protective groups: a) acetal; b) protecting groups for alcohols; c) protecting groups for amines.
Retrosynthetic analysis. Disconnections. Idealized reagents: synthons. Equivalent reagents.Two-group disconnections. Multiple step synthesis. Functional group interconversion. Amine synthesis using functional group interconversion.
Reactivity of organometallic compounds: a) ligand substitution; b) oxidative addition and reductive elimination; c) insertion and elimination; d) electrophilic and nucleophilic addition and abstraction. Organometallic compounds in Organic Synthesis.

Back

Current Chemistry Perspectives (QUI13547L)

The course will address various topics from different areas of chemistry of current interest and with a perspective of future development.
The syllabus is divided into 3 essential segments:
• Visits to laboratories in the region, such as CVRA (wine), SYNLAB (clinical analysis) ARS Alentejo (public health).
• Visits to industries in the region, such as Kemet and Embraer
• Contact with researchers and research centers from various areas of relevance to the scope of the course through lectures and site visits.

Back

Computational Chemistry (QUI13532L)

The use of computers in science.
Conventional computational methods.
Visualization (graphical representation of results, design and visualization of molecules).
Quantum Chemistry (Hückel method, semi-empirical methods, ab initio methods).
Kinetics of complex reactions.
Molecular Mechanics (molecular dynamics methods, Monte Carlo method).
Computer simulation of chemical processes
Unconventional computational methods (models inspired by nature and their applications, introduction to intelligent systems and their applications, introduction to visual programming environments).
In silico experimentation.

Back

Scientific Internship (QUI13519L)

Each student has an Internship theme, in the area of Chemistry, and approved by the Course Director, according to the Normas. The work will be original and preferably innovative, performed by the student individually and supervised by the advisors.
The student's work involves, among others, the research and analysis of bibliography; execution of the work plan, preparation of a written report and its oral presentation, in accordance with the Normas. In addition, the student should also be actively involved in planning the work plan.

Back

Introduction to Pharmaceutical Chemistry (QUI13517L)

1. Introduction to Pharmaceutical Chemistry; object of study. Therapeutic and drug evolution throughout history.
2. Nomenclature of drugs.
3. Main sources of obtaining drugs. Inorganic and organometallic drugs.
4. Molecular targets and mode of action of drugs. Drug interaction with molecular targets; pharmacophorus; receptor. Agonists and antagonist. Prodrugs.
5. Importance of stereoisomerism, ionization, solubility and lipophilia; partition coefficient on drug activity. Stability of drugs.
6. Main steps in obtaining a new drug: discovery, design and development of a drug.
7. The role of regulatory authorities (INFARMED, EMA and FDA) in drug approval.

Back

Introduction to Quality (QUI13534L)

1. Quality policies and their evolution.
Quality control and Quality management in the 20th century.
Quality promoters.

2.Basic Quality Tools:
Pareto chart, flow chart, control charts, cause-and-effect diagram.

3.Tools for quality planning, quality management, problem analysis and problem solving.
Brainstorming, Benchmarking, SWOT analysis, Audits, Quality circles.

4.Quality costs and non-quality costs
External and internal failure costs, preventive costs, inspection/appraisal costs.
Quality from the consumer's point of view.
Variables and attributes.

5. Portuguese System for Quality Assurance (SPQ). Main subsystems of SPQ.
The Portuguese Institute of Quality. Standardization, metrology and qualification.

6. Good Laboratory practices.
Qualification and calibration.
Benefits of the accredited and certification for businesses, public entities, consumer associations

Back

Chemistry of Natural Products (QUI13535L)

Different classes of natural products and main secondary metabolic pathways. Methodology for identification of natural products and establishment of biosynthetic pathways.
Study of the biosynthesis of the terpene compounds. Biosynthesis and biological functions of representative terpene compounds: gibberellins, taxoids, cholesterol, steroids, sex hormones, etc.
Study of the biosynthesis and biological functions of metabolites derived from polyvinyl chains. Biosynthesis of fatty acids and eucosanoids (prostaglandins, thromboxanes and leukotrienes). Biosynthesis of aromatic compounds.
Study of the biosynthesis and biological functions of shikimic acid derivatives. Shikimic acid biosynthesis, phenylalanine, tyrosine and tryptophan. Aliphatic alkaloids and alkaloid derivatives of phenylalanine and tryptophan. Metabolites biosynthesis mixed.

Back

Biochemistry (QUI00348L)

I – Lectures Program

1) Introduction to the metabolism. Metabolic pathways and their control. Clinical correlations.
2) Carbohydrate metabolism and their control: glycolysis. gluconeogenesis; glicogenolysis and glycogenesis; pentose phosphate pathways. Piruvic acid degradation.
3)Acetil Co-A pathways. Tricarboxylic acids cycle and their regulation.
4) Electron transport chain and oxidative phosphorylation.
5)Glyoxilic acid cycle. Photosynthesis and photorespiration.
6) Lipid metabolism and their control: Beta-oxidation and bio-synthesis of fatty acids; Ketone bodies; prostaglandins, thromboxanes and leukotrienes; phospholipids; sphingolipids; cholesterol; plasma lipoproteins.
7) Aminoacid metabolism and their control. Purine and pirimidine metabolism. Iron and heme metabolism.
8) Fundamentals of genetic information and expression. Acid nucleic biosynthesis. Transcription. Proteins biosynthesis.
9) Integration of metabolism. Metabolic interrelationships and their control. Role of hormones in Biochemistry.
10) Main metabolic correlations.

II - Laboratorial works:

1- Presentation. The Objectives and avaliationof laboratorial component.
2- Research and administration of Information in Biochemistry
3- Study of phosphate compounds hidrólise
4- Electron transport in thylakoid membrane and proton gradient
5- Oxydative Phosphorilation - Part I
6- Oxydative Phosphorilation - Part II
7- Biomembrane permebilization (Study of metabolic pathways in situ)

Back

Chemistry Applied to Heritage (QUI11980L)

Introduction and background (Art and Heritage, Conservation and the Charter of Venice, Heritage Science vs Heritage and Science). Color: physical, chemical and physiological properties. Pigments: history of its use, physical and chemical properties. Binders, varnishes, consolidants and glues. Easel painting - production techniques and conservation. Mortar and stone materials - classification, pathologies and conservation. Metals - classification, corrosion and conservation. Glass and ceramics - classification, production, pathologies and conservation. Textile and dyes – classification and conservation. Documents - classification, pathologies and conservation. Photography - chemistry of photographic processes, pathologies and conservation. Techniques of physical and chemical analysis of cultural and artistic artifacts - area exames, in-situ analytical techniques, microanalysis techniques

Back

Solids and Surfaces (QUI11984L)

Structure and surface texture. Surface chemical properties - type and degree of regularity of the porosity of various materials of fundamental importance as adsorbents and catalysts. Infra-red spectroscopy applied to the study of surface chemistry. Helium and Hg pycnometry. Estimation of specific surface area from particle size from TEM, SEM and XRD. Adsorption from the liquid phase. Adsorption from the gas phase. Mercury porosimetry. Immersion calorimetry. Isosteric enthalpies of adsorption.
Execution of a laboratory project, analysis of the results, developed report and respective oral presentation.

Back

Forensic Chemistry (QUI11983L)

The crime scene.
Collection and handling of evidence.
Analysis of drugs.
Analysis of traces of fuel in arson.
Analysis and processing of fingerprints.
DNA analysis.
Fiber analysis.
Analysis of firing of firearms.
Analysis of traces of paint.
Analysis of explosives.

Back

Industrial Chemistry (QUI13545L)

The chemical industry worldwide and in Portugal. The history of Chemical industry (topics). The evolution of chemical industry in some countries. Comparison with the History of Science and History of Technology. The developement of chemical industry in Portugal. Chemical Process industry. Raw materials. Products from oil, natural gas, charcoal, carbohydrates, vegetal oils and greases. Raw materials for inorganc products. Recycled materials. Energy. Types of energy. Uses of energy in chemical industry. Commodities. Industrial gases. Oil refinning. Chemical and physical processes of refinning. Petrochemical products. Olefines. Polyolefines : production and applications. Syn gas production. Carbochemical products. Acetylene. Chemicals from syn gas. Acid acetic production. Tereftalic acid and polyesthers. Pulp and paper industry. Concrete industry.

Back

Wine and Olive Oil Technology (FIT12244L)

Grape maturation. Chemical composition of grapes and wines. Wine technologies, red, white and rose wines. Corrections to be made in grape must and wine. Alcoholic and malolactic fermentation. Clarification and stabilization of wines. Wine aging. The use of wood and barrels in enology. Chemical analysis in grapes and wines.
Perspectives of olive tree and olive oil production. The influence of agronomic techniques in olive oil quality. Olive and olive oil composition. Technical aspects of olive oil production. Effluent treatment. Classification and sensorial and nutritional characteristics of virgin olive oil. Technology of olive-pomace oil and refined olive oil production. Technology of olives for human consumption.

Back

Entrepreneurship and Innovation (GES02310L)

Module 1 – Introduction to Entrepreneurship and Innovation
a. Definitions and concepts of Entrepreneurship
b. Profile and characteristics of entrepreneurs
c. Social entrepreneurship and intrapreneurship
d. What is innovation? Types of innovation
d. Dynamics of innovation

Module 2 – Conception and Structuring business ideas
a. Process and techniques of generating ideas
b. Design Thinking tool
c. Evaluation of business ideas
d. The process of creating a business idea and firm
e. Simulation games- from ideas to business formation

Back

Molecular Simulation (QUI01109L)

Statistical thermodynamics: distribution of molecular states, partition functions, fundamental relationships, applications to the calculation of thermodynamic properties and chemical equilibrium.

Introduction to the molecular simulations. Periodic boundary conditions. Trajectories and properties. Ergodicity.

The Molecular Dynamics method. Simulations in the microcanonical ensemble. Simulations in the canonical ensemble: the Nosé-Hoover and the Berendsen thermostats. Simulations in the isobaric ensemble: the Berendsen and the Parrinello-Rahman barostats.

The Monte Carlo method. Canonical ensemble, isothermal-isobaric ensemble, grand canonical ensemble and Gibbs ensemble.

Analysis of simulations results. Radial distribution functions. Mechanical properties. Fluctuations. Correlation functions. Dynamical properties.