

## بيان التوصيف العلمي للمقررات الدراسية في قسم الكيمياء

- SLCH101     **Basic Chemistry**     (5 Cr.)
- Structures and properties of matter; Bonding, Molecular Geometry, VSEPR; Chemical Equations and Quantitative Relations, Stoichiometry; State of matter (Gas laws, liquids and solids) and Solutions.
- SLMT101     **Introductory Calculus**     (5 Cr.)
- Sequences, limit of a sequence, convergent and divergent sequences, adjacent sequences, functions in one variable, limit of a function, continuity of functions, derivative of a function, differentiable functions, Hospital's rule, Roll's theorem, Mean value theorem, logarithmic, exponential, trigonometric and hyperbolic functions, inverse functions, inverses of trigonometric and hyperbolic functions, equivalent functions, finite expansion, finite expansions and limits, Taylor's formula, Mac-Laurin's formula.
- SLBI102     **Cytology & Histology**     (5 Cr.)
- Cytology:** Chemical components of cells, Eukaryotes, prokaryotes and viruses, Plasma membrane, Cytosol and ribosomes, Endomembrane system, Mitochondria and plastids, Peroxisomes (microbodies), Cytoskeleton, Organization of the nucleus, The cell cycle.
- Animal Histology:** Epithelial tissue: Covering epithelium, Connective tissue, proper and specialized (cartilage, bone, blood), Muscle tissue, Nervous tissue.
- Plant Histology:** Structure of the cell wall, Meristems, Parenchyma, Protective, Tissues, Conducting tissues, Supporting tissues, Secretory tissues.
- SLCS101     **Introduction to Computers**     (4 Cr.)
- The course aims at making students competent in computer-related skills and provides them with a broad, general introduction to hardware and software fundamentals, productivity software, digital media, database applications, networking, the Internet, and security and privacy issues, as well as hands-on practice on common software applications such as Word, Excel, Power Point, Internet and Email.
- SLPH101     **Mechanics**     (4 Cr.)
- Measurements, motion in one dimension, vectors, motion in two dimensions, Newton's law with applications, work, energy and power, linear momentum and collisions, rotation and angular momentum, and oscillations.

**Lab. Mechanics****(1 Cr.)**

Error analysis, measuring of velocity and acceleration, measurement of gravitational acceleration forces, friction, conservation of energy and momentum, ballistic pendulum, rotation, harmonic motion.

**ILIS101 Islamic Culture****(2 Cr.)**

مدخل عام: معنى الثقافة ومفهومها، العلاقة بين الثقافة والحضارة. الأسس الدينية للثقافة الإسلامية: الوحي، النبوة، القرآن والسنة، العقيدة والشريعة. المفاهيم التربوية للثقافة الإسلامية: الإيمان، الإنسان، الأخلاق، العلم. خصائص الثقافة الإسلامية: عالمية الإسلام، ثقافة الحوار في الإسلام، الإسلام والتنوع الثقافي، الإسلام والتفاعل الحضاري.

**CLEN101 Remedial English****(2 Cr.)**

To get introduced to the language, To speak about oneself and one's surrounding, To communicate about simple daily tasks, To interact on different topics in a direct and simple way.

**CLFR101 Remedial French****(2 Cr.)**

Briser la glace avec la langue, Parler de soi et de son entourage quotidien, Communiquer sur des tâches simples et habituelles, Echanger des informations directes et simples sur des sujets variés.

**CLAR101 Remedial Arabic****(2 Cr.)**

يتوزع مقرر التأهيل في اللغة العربية على الشكل التالي: النص وتكوينه (الجملة، المقطع، النص) والكتابة والتعبير في مجالات التقنيات الأكثر رواجاً (الرسالة، المقالة التقريرية والقصة). دراسة آثار كتابية كاملة (ادبية وتواصلية)، التمرس على التعبير الشفوي (عرض، نقاش، تعليق) والتعبير الكتابي (تحليل، محاكاة، تعبير حر، التذوق الأدبي).

**SLCH201 Introduction to Physical Chemistry****(4 Cr.)**

Thermodynamics, Kinetics, Quantitative aspects of reaction of equilibrium, Ionic equilibrium; Acids and bases in solutions – PH, Electrochemical processes – Redox reactions.

**Lab. Introduction to Physical Chemistry****(1 Cr.)**

Formula of an hydrate, Molar mass determination of a volatil liquid, Acid-base titration, Redox titration, Preparation and standardization of solutions, Solubility product constant.

SLCH202      **Introduction to Organic Chemistry**      **(4 Cr.)**

Electronic structure of organic molecules (Isomers, structure formula), Electronic effects (inductive and resonance), Nomenclature, Stereochemistry, Nucleophilic substitution, Elimination, Electrophilic aromatic substitution.

SLBI201      **Biological Evolution @ Biodiversity**      **(5 Cr.)**

Behavior of chromosomes during mitosis and meiosis, Mutations, Mendelian or classical genetics, Sex-linkage, Human genetics, Gene interaction, polygenic inheritance and multiple-alleles genes, Asexual reproduction, Sexual reproduction, Spermatogenesis, Male reproductive system, Oogenesis. Female reproductive system, Fertilization, Biodiversity and systematic, Protista, Prokaryotes and viruses, Yeasts and molds.

SLMT201      **Introduction to Integration & Series**      **(5 Cr.)**

Antiderivative, antiderivatives of basic functions, indefinite integrals, integration of rational functions, definite integral, Mean value theorem, improper integrals, first and second kinds of improper integrals, functions of two variables, double integral, partial derivative, double integral with polar coordinates, series, convergent and divergent series, tests of convergence, differential equations of first order : separable, homogeneous and linear equations.

SLMT202      **Statistics and Probability**      **(5 Cr.)**

Population, Sample, Characteristics, Frequency distribution of one variable: Graphical representation, Measures of central tendency, Measures of dispersion, Frequency distribution of two variables (Bivariable Data): contingency table, Least square method, Correlation, Linear Regression, Probability: Counting, Conditional Probability, Bayes theorem.

SLPH201      **Electricity & Magnetism**      **(3 Cr.)**

This course deals with electricity and magnetism, Coulomb's law, Gauss theorem, electricity field and potentials, Ampere's law and magnetic field, electrical current and ohm's law, electromagnetic induction, alternating current and electromagnetic field, as well as optics including refraction, interference and diffraction.

**Lab. Electricity & Magnetism**      **(1 Cr.)**

Electricity and Magnetism: Electric fields, capacitance and constant measurements, construction of ammeters and voltmeters, Wheatstone Bridge, potentiometer, oscilloscope operations, RL, RC and RLC circuits.

Geometrical optics: Law of refraction and prism, mirrors and lenses, interference and diffraction, polarization

**CLEN201 Remedial English (2 Cr.)**

To get familiar with the target language, To express and react easily in different situations, To communicate spontaneously, easily, and efficiently, To be fluent in the language in all domains: personal, public, and professional.

**CLFR201 Remedial French (2 Cr.)**

Se lancer dans la langue du travail, Exprimer et réagir aisément dans des situations inhabituelles, Communiquer avec assez de spontanéité, d'aisance et d'efficacité, Perfectionner la langue dans le domaine personnel, public et professionnel.

**SLCH301 Organic Chemistry (4 Cr.)**

Synthesis and reactivity of organic compounds. Alkanes and cycloalkanes, Alkenes and Alkynes, Arenes, Alcohols, Ethers and Phenols, Aldehydes and Ketones, Carboxylic acid and their derivatives, Amines.

**Lab. Organic Chemistry (1 Cr.)**

Melting point, Distillation, Recrystallisation, Extraction, Chromatography, Desydration of Alcohols, Preparation of Aspirin, Oxidation of Alcohols, Esterification.

**SLCH302 Introduction to Inorganic Chemistry (4 Cr.)**

A review of simple concepts in bonding and acid-base theory, A survey of the chemistry of the elements, Trends and their relation to the periodic system.

**Lab. Introduction to Inorganic Chemistry (1 Cr.)**

Identification of an unknown liquid, Preparation of a double salt, Hardness of water, Determination of copper, Hydrogen peroxide.

**SLCH303 Chemical Kinetics (4 Cr.)**

Rate analysis modern experimental techniques, Theories of chemical kinetics, selected topics in gas phase and solution kinetics, Characterisation of transition states.

**Lab. Chemical Kinetics****(1 Cr.)**

Determination and study of Kinetic parameters for chemical reactions using various experimental techniques (conductimetry, spectrophotometry, polarimetry, ...)

**SLCH304 Chemical Thermodynamics****(4 Cr.)**

The first law of thermodynamics, Relationships between work, Heat, Internal energy, and enthalpy. Thermo chemistry. Heat capacity. The second and third laws of thermodynamics. Entropy. Free energy. Chemical equilibrium and chemical potential. Phase equilibrium and phase diagrams. Ideal and real solutions. Raoult's law and Henry's law. Colligate properties. Thermodynamics of solutions and electrolytes in solution. Debye-Hückel theory, Ion migration and conductivity, Electrochemistry, Electrochemical cells and the Nernst equation.

**Lab. Chemical Thermodynamics****(1 Cr.)**

Variation of the density of water according to the temperature, Variation of the miscibility according to the temperature, Calorimetry, Ideal gas law, Diagrams of solubility.

**SLBC301 Structural Biochemistry****(4 Cr.)**

Carbohydrates: Classification. Structures. Chemical properties. Nucleic acids: Structures. Physico-chemical properties. Determination of nucleotide sequences. The different classes of RNA in the eukaryotic cells. Proteins: Classification. Structures. Chemical and physical properties. Study of the primary structure of peptides and proteins. Lipids: Classification. Structures. Enzymes: Nomenclature and classification of enzymes. Kinetics of enzymatic reactions. Influence of physical and chemical agents on the enzymatic activity. Active site of enzymes. Enzymatic activity and specificity of the enzymatic catalysis. Coenzymes and vitamins: Classification. General properties.

**Lab. Structural Biochemistry****(1 Cr.)**

Laboratory security. Preparation of solutions, Absorption spectrophotometry: Determination of  $\lambda_{max}$ . Determination of the concentration of a solution, Acid-base titration, Qualitative tests for carbohydrates, Qualitative tests for lipids. Determination of the iodine number of lipids, Determination of the saponification number of lipids. Determination of the acid number of lipids, Qualitative tests for proteins, Polarimetry: determination of the specific rotation of a carbohydrate, Determination of the concentration of a reducing sugar by a spectrophotometric method.

SLBI303     **Biophysics**     (5 Cr.)

Measurement and the scientific method, Elastic properties of biologic materials, Static biomechanics, Molecular phenomena related to biologic processes, The effect of heat, Circulation of blood, Light and modern physics, Nuclear radiation, Echography.

SLBI304     **Cellular Physiology**     (5 Cr.)

Intra and extra-cellular compartment, Functional structure of bio-membranes and permeability, Signal transduction via membranes, Transport of physical elements through the membrane, Cell motility, Cellular bioenergetics.

SLCH401     **Introduction to Analytical Chemistry**     (4 Cr.)

An introduction to fundamental principles of analytical chemistry, including analytical data, theory of acid-base and redox titrations, and separation schemes. Buffer solutions and precipitation equilibrium.

**Lab. Introduction to Analytical Chemistry**     (1 Cr.)

Titration of Barium, Acidimetry/Alcalimetry, Study of the precipitation of hydroxide Fe and Zn, Complexometry, Oxidimetry/reductimetry, Potentiometric titration of a solution of Vanadate by Fe(II).

SLCH402     **Groups Theory**     (5 Cr.)

To study the electronic and geometric structure of molecules and the basic ideas and methods in theoretical chemistry with special emphasis on applications in the investigation of molecular structure. **Content:** Quantum theory: angular momentum; Linear combination of Atomic Orbitals (LCAO); the Huckel theory; applications of Group Theory; molecular symmetry; symmetry groups; representation of symmetry groups; Combination of symmetry operations; Point Groups; Chemical applications: molecular symmetry and absorption bands; infrared spectroscopy; Selection rules; vibrational spectra; vibration and rotation energy levels; rotating diatomic molecules.

SLCH403     **Environmental Chemistry**     (5 Cr.)

Environmental pollution (air, water and soil pollutions), chemical reactions in atmosphere, smog's, major atmospheric pollutants, acid-rain, ozone and its reactions, effects of depletion of ozone layer, green house effect and global warming – pollution due to industrial wastes, green chemistry as an alternative tool for reducing pollution, strategy for controlling environmental pollution.

SLCH404      **Chemistry of Polymers**      (5 Cr.)

Classification of polymers, general methods of polymerization-addition and condensation: addition-free radical, cationic, anionic polymerization, copolymerization, natural rubber, vulcanization of rubber, synthetic rubbers, condensation polymers, idea of macromolecules, biodegradable polymers. Some commercially important polymers (PVC, Teflon, polystyrene, nylon-6 and 66, Terylene and bakelite).

SLBC401      **Metabolic Biochemistry**      (5 Cr.)

Anabolism. Catabolism. Carbon, oxygen and nitrogen cycles. Heterotrophic, autotrophic cells, photosynthetic and chemotrophic cells. Bioenergetics. Carbohydrate catabolism. Glycogen catabolism. Glycolysis cycle. Oxidative degradation of glucose. Oxidation chain. Lipid catabolism. Biosynthesis of carbohydrates, fatty acids, triacylglycerols, phosphoglycerides and cholesterol. Oxidative degradation of amino acids. The genetic information and biosynthesis of proteins. Biosynthesis of amino acids. Biosynthesis of puric and pyrimidic rings.

SLBI402      **Physiology of functions**      (4 Cr.)

Homeostasis and control, Skeletal System: Functions of bone, bone formation and growth, Muscular Tissue Contraction and relaxation of muscle fibers and control of tension, Nervous Tissue and Autonomic Nervous System: Electrical signals and synapses, Sensory, Motor and Integrative Systems: sensation and integrative functions, Cardiovascular System: Functions and properties of blood, hemostasis, heart valves and conduction system, cardiac cycle and blood Vessels and hemodynamics, Respiratory, System: ventilation, lung volumes and capacities and gases exchanges, Digestive System: Phases of digestion, chemical and mechanical, Urinary System: Glomerular filtration, tubular reabsorption and secretion, urine elimination.

**Lab. Physiology of functions**      (1 Cr.)

Laboratory activities encourage critical thinking, understanding of tissue and organs structures by dissection, and the application of scientific methods. A series of laboratory exercises in which the students measure cardiovascular, neuromuscular and respiratory parameters on themselves using a computer based acquisition system.

SLBC402      **Clinical Biochemistry**      (5 Cr.)

Hydro-electric equilibrium. Acid-base equilibrium. Phosphocalcic metabolism. Iron metabolism. Magnesium, copper and lithium metabolism. Carbohydrate metabolism. Lipid and lipoprotein metabolism.

Generalities on nitrogen metabolism. Plasmatic proteins. Plasmatic enzymes. Non-protein nitrogenous constituents. Functional exploration of the liver and the kidney. Laboratory organization.

**SLCH501      Nuclear Chemistry      (5 Cr.)**

Nuclear chemistry is the subfield of chemistry dealing with radioactivity, nuclear processes and nuclear properties. It is the chemistry of radioactive elements such as the actinides, radium and radon together with the chemistry associated with equipment (such as nuclear reactors) which are designed to perform nuclear processes. This includes the corrosion of surfaces and the behavior under conditions of both normal and abnormal operation (such as during an accident). An important area is the behavior of objects and materials after being placed into a waste store or otherwise disposed of. The study of the chemical effects resulting from the absorption of radiation within living animals, plants, and other materials. The radiation chemistry controls much of radiation biology as radiation has an effect on living things at the molecular scale, to explain it another way the radiation alters the biochemical within an organism, the alteration of the bimolecular then changes the chemistry which occurs within the organism, this change in biochemistry then can lead to a biological outcome. As a result nuclear chemistry greatly assists the understanding of medical treatments (such as cancer radiotherapy) and has enabled these treatments to improve. The study of the production and use of radioactive sources for a range of processes. These include radiotherapy in medical applications; the use of radioactive tracers within industry, science and the environment; and the use of radiation to modify materials such as polymers. The study and use of nuclear processes in *non-radioactive* areas of human activity. For instance, nuclear magnetic resonance (NMR) spectroscopy is commonly used in synthetic organic chemistry and physical chemistry and for structural analysis in macromolecular chemistry.

**SLCH502      Quantum Chemistry      (5 Cr.)**

Quantum theory, Schrödinger equation, atomic structure, molecular symmetry and normal vibrations, the molecular orbital descriptions of molecules. Quantum states and spectroscopy of molecules, surface chemistry, X-ray structure, molecular spectroscopy and electronic transition.

**SLCH503      Industrial Chemistry      (5 Cr.)**

This course examines industrial processes for the production of organic and inorganic chemicals. The environmental impact and the challenges of a large-scale operation will be considered alongside the actual chemical processes involved.



SLCH504     **Analytical Chemistry**     (4 Cr.)

A study of modern approaches to chemical analysis, sampling, sample preparation separation techniques, trace methods of determination applied to the environment, standards and the problem of analytical quality, analytical decision making.

**Lab. Analytical Chemistry**     (1 Cr.)

Cationic and Anionic resin, Analysis of a mixture of Cu(II) and Pb(II) by gravimetry and iodometry, Study of the  $\text{CO}_3^{2-} / \text{HCO}_3^-$  and  $\text{HCO}_3^- / \text{CO}_2$  equilibrium by pH metry, Quantitative analysis of a two ions mixture by visible spectroscopy, Qualitative identification tests of some ions.

SLCH505     **Inorganic Chemistry**     (4 Cr.)

Atomic structure, molecular structure, molecular shape (VSEPR), and group theory, the structures of solid (metals, ionic), acids and bases (Bronsted, Lewis, HSAB, solvents).

**Lab. Inorganic Chemistry**     (1 Cr.)

Preparation of : tetraamine copper (II) sulphate, carbonato tetraamine cobalt(III) nitrate, hexaamine cobalt chloride, potassium trioxalat ferrate (III), cis and trans-potassium dioxalato diaquo chromate (III).

SLBC501     **Analytical Biochemistry**     (5 Cr.)

Solubility and solubility product. Liquid-liquid extraction. Evaluation of a biochemical method. Precipitation techniques. Filtration and ultrafiltration. Dialysis and electrodialysis. Centrifugation techniques. Electrophoresis techniques. Chromtography techniques.

SLBI301     **Anatomy and Histology of Organs**     (4 Cr.)

Organization of living systems, Tissues (epithelium, connective, muscular and nervous tissues), Organs wall: Skin, Brain, Spinal cord, Heart, Stomach, Lung, Bladder, Muscles, bones, Ovaries and testis and Endocrine glands, Systems (Circulatory, respiratory, urinary, nervous, muscular, skeletal, reproductive and digestive systems).

**Lab. Anatomy and Histology of Organs**     (1 Cr.)

Observation of slides and microscopic identification: Tissues (epithelium, connective, muscular and nervous tissues) and Organs: Skin, Heart, Stomach, Lung, Bladder, Bones, Ovaries and testis, Preparation of slides and staining.

**SLCH601 Electrochemistry****(5 Cr.)**

Electrolyte solutions: Fundamentals of electrostatics, electrical conductance and conductivity, transport numbers, strong and weak electrolytes, ionic strength. Electrochemical cells: Configuration of electrochemical cells, redox reactions in solution and at the interface, standard electrode potential, chemical cells and concentration cells. Thermodynamics and electrochemistry: Work function of metals, Fermi energy of electrons, Galvani and surface potentials, electromotive force and its measurement, Nernst equation, electrochemical and chemical equilibrium, determination of thermodynamic quantities. Electric double layer: Models of Helmholtz, Gouy and Chapman, and Stern, capacity of the double layer, zero charge potential, electrocapillarity equation, specific adsorption. Electrode kinetics: Concept of overpotential, activation overpotential: Butler-Volmer equation for elementary and multi-step reactions, Tafel approximation of the Butler-Volmer equation, concentration overpotential, diffusion overpotential, reaction overpotential. Technical and analytical applications: Electrolysis cells, batteries, fuel cells, corrosion, electrocrystallization, electrochemical sensors, photovoltaics, polarography, cyclic voltammetry.

**SLCH602 Advanced Organic Chemistry****(4 Cr.)**

Retrosynthetic analysis as an approach to the synthesis of complex molecules. Modern synthetic methods, Reaction mechanisms and the stability and reactivity to key organic reaction intermediates. Free energy relationships. Conservation of orbital symmetry and pericyclic reactions, rearrangement.

**Lab. Advanced Organic Chemistry****(1 Cr.)**

Preparation of: diphenylglycolic acid, 5,5-diphenyl hydantoin, p-nitroaniline. Rearrangement of benzyl to benzilic acid.