			1: Pure Products, states of matter, mixture. 2: Quantities characterizing a chemical system. 3: material balance of chemical reactions. 4: Fundamentals of Energy. 5: Energy of the chemical reaction. 6: Chemical equilibrium. 7 Essentials acid-base aqueous solution. 8: Determination of the pH and the composition of aqueous acid-base solutions. 9: Examples of acid-base systems of biological interest. 10 Essentials redox in aqueous solution. 11: Potential and electrochemical cell. Practical lessons illustrate the course through 5 sessions involving titration manipulations by colorimetry, pH measurement and potentiometric Teaching methods (use numeric platform, supporting the student's personal work).				
							Animal body organization : Spongiaria, Cnidaria, Platelminthes, Annelids, Mollusc, Arthropodes, Echinoderms, Urochords, Cephalocords, Vertebrates
			Courses: Cell Concept: the use of the microscope and the discovery of the existence of cell to cell and modern molecular biology. Different cell types and structures: prokaryotic and eukaryotic, animal and plant cells. Concept of virus. essential biological molecules. plasma membrane and internal membranes. Endocytosis and exocytosis. Endoplasmic reticulum, Golgi apparatus, the cytosol, vacuole. Core and ultra-structure of chromatin. Energy Conversion organelles: mitochondria and chloroplasts. – *Directed works*: light and electron microscopy techniques. The cell and its organization. cell fractionation. The use of radioactive precursors in cell biology. Plant cell: vacuole wall and plastid. *Practical works*: use the light microscope. Observation of animal and plant cells. Microscopic study of mitosis. Cytochemistry.				

					Gradient, Local Extrema, uncertainties calculations.		
							Two areas selected: fluid mechanics (application to hydrology and blood circulation) and geometrical optics (functioning of the eye study of binocular microscope and the optical microscope).
		Selected students in the bilingual groups, will follow tutorial and practical lab courses in scientific english, both oral, written and exams.					
							The major morphological and anatomical characteristics of the Fungi, Algae and Embryophytes (Moss, ferns, gymnosperms and angiosperms) will be studied using examples. They will be addressed in an evolutionary angle (vegetative and reproductive apparatus). Physiology of elements necessary for understanding the adaptation to their environment will be made. The main food and non-food uses will be specified for each group.
		Structural Biochemistry: - Carbohydrates: monosaccharides (nomenclature and representations of aldoses and ketoses, neutral sugars, amino sugars and acid saccharides), main properties (optical rotation, redox, methylation), glycoside bond, oligosaccharides (maltose, lactose, sucrose, raffinose), polysaccharides (homo-polysaccharides such as starch, glycogen, cellulose, and examples having biodiversity hetero polysaccharides). - Proteins: amino acids, peptide bond and some peptides of biological interest (glutathione, hormones), proteins (primary, secondary and tertiary structures with examples of fibrous proteins and globular quaternary structure illustrated with hemoglobin) and definition hetero-proteins. -The Lipids: structure of saturated and unsaturated fatty acids, chemical properties (micelles, saponification, iodine, oxidation fixation), definition of families of simple and complex lipids (glycerides, glycerides, sterides, glycerophospholipids, sphingolipids and glyceroglycolipids). -The Nucleic acids: nitrogenous bases, nucleosides, nucleotides and nucleic acids (DNA and RNA, base pairing). Introduction to enzymology: The classification of enzymes, their main properties (specificity and concept of bio-catalysts) and the definitions of Km and Vm will be addressed. metabolic biochemistry: - Cellular Bioenergetics: ATP and its regeneration, the Krebs cycle, the respiratory chain and mitochondrial ATP synthase. -Origine Glucose catabolism (glycolysis, decarboxylation of pyruvate, ethanol fermentation and lactic). -Catabolisme Fatty acids (Lynen helix). The course will be complemented by tutorial works, for the part structural biochemistry and enzymology, particularly through application exercises, and 2 sessions of practical lab courses, experimental discovery of structural biochemistry.					
		1) Mendelian Genetics: Definitions of continuous and discontinuous characters. Role of the environment in					

			achieving. Importance of quantitative genetics in plant breeding. Defining first and second laws of Mendel. Introduction to polyhybridisme. Advanced Mendelian genetics: allelic series of concepts and intermediate dominance applied to blood groups, lethality, pleiotropic effects. Analysis of pedigrees and human genetics. 2) The chromosomal theory of heredity: Confrontation of the theory of Sutton and Boveri to the cytological description of mitosis and meiosis. Relationship of the mitotic cycle of cell division cycle. Description of gametogenesis and meiosis. Setting the brewing chromosomal and inter-chromosomal recombination. chromosome theory and gender link. Discover the intra-chromosomal recombination Morgan. Introduction to gene mapping. mapping function. 3) The gene-enzyme relationship: The life cycles of the most important eukaryotic microorganisms by genetic (*Saccharomyces, Neurospora*). Analysis of ordered and disordered tetrads. The relationship enzyme gene. Notions epistasis recessive and dominant. 4) Structure of nucleic acids, gene and central dogma of molecular biology: Definition of nucleic acids as a carrier of genetic information. Structure of nucleic acids and the central dogma of molecular biology. 5) Origin of allelic diversity and genetic diseases gene mutations, chromosomal and genomic. Mobile genetic elements causing chromosomal mutations. Main genetic diseases in humans. 6) Structure and function of the gene: application of biochemical genetics. 7) Tutorial of Formal Genetics: Exercises illustration of notions underway.
			Atomistic, Nucleus, atom, element constitution and propertie Interactions between electromagnetic waves and matter. wave-particle duality electronic structure of the atom in the quantum model periodic table of elements and atomic properties Chemical bonding covalent bond in the Lewis model covalent bond: geometric parameters, energy and electricity covalent bond in the quantum model van der Waals interactions and hydrogen bonding The skills are taught using the following tutorial documents: Nucleus, atom, element constitution and properties (Chapter 1) Interactions between electromagnetic waves and matter (Chapter 2) Wave-particle duality (Chapter 2) electronic structure of the atom in the quantum model (Chapter 3) Structure of the periodic table (Chapter 4) Evolution of atomic properties in the periodic table (Chapter 4) Determination of atomic properties using the Slater model (Chapter 4) covalent bond in the Lewis model (Chapter 5) VSEPR theory - Rules Gillespie (Chapter 5) Determination of the oxidation number of an atom from a Lewis structure (Chapter 5) covalent bond: geometric parameters, energy and electricity (Chapter 6) covalent bond in the quantum model (Chapter 7) van der Waals interactions and hydrogen bonding (Chapter 8)
			1-Introduction (what is a living organism, unicellular and multicellular multicellular, trophism) 2- Communications within the organization (Animal: cell junctions, blood and lymph, external and internal environment, Vegetal: plasmodesmata, phloem, traffic information) 3-The increasing complexity of organizations (why move from unicellular to multicellular animal histology) 4-Introduction to ecology (definition, history of science) 5- Animal Interactions, plant and within an ecosystem The 6-trophic relationships (flows of energy, biomass, food chains) 7-distribution of abiotic factors, and notions of habitat 8- Dynamics of ecosystems and biomes concept

			9-The impacts of man on ecosystems				
							Breathing, Digestion, Sexual reproduction
			Selected students in the bilingual groups, will follow tutorial and practical lab courses in scientific english, both oral, written and exams.				
			Historics. The bacteria: size and organization; variety of envelope the three domains of life. Taxonomy and phylogeny of bacteria. The metabolism of bacteria and specific metabolic pathways of some bacteria: anaerobic respiration, fermentation, methanogenesis (Archaea), sulfate reduction. Relations bacteria among themselves and with other agencies: the biofilms. bacterial associations: the intestinal flora, dental plaque. The use of bacteria by man: the food, detoxification - celled eukaryotes and parasites, viruses Yeast and filamentous fungi. The endosymbiosis unicellular eukaryotes. Virology: history, definitions, structures, methods, classification. Viruses infect animal cells. Bacteriophages. Viroids and prions				
			- Graphical Information Processing - Basic Distributions (Normal, Binomial, Poisson) - Parameters of a Distribution - Hypothesis test and Chi-square				
							Nutrition, Photosynthesis, Growth, Plasmolysis, Turgescence
			The skills acquired are both theoretical and experimental. At the end of this module, students will have acquired basic knowledge of the general operation of the plants. The student will also be able to conduct experimental work, will reflect critically on this work and write a summary of the results. The EU regards students wishing prepare a master to prepare a career researchers or teacher-researchers, public or private, in the plant science industry and agricultural research, as well as students wishing to make an engineering school. This module is also required for students wishing to move towards the preparation of the Capes or aggregation. In this teaching, will presented: * concepts for understanding the movement of water in the plant and between the plant and its environment (physical and chemical properties of water, concept soil-plant-atmosphere physical mechanisms of movement of water and water potential) * methods of study of the mineral nutrition, the concept of macro and microelements, essential element, the absorption of minerals from the ground and transport in the plant, * the transformation of light energy into chemical energy, * the photosynthetic cycle of carbon reduction, photorespiration and the cycle photosynthetic carbon oxidation, studies of photosynthetic type C3, C4 and CAM, * nitrogen nutrition and symbiotic nitrogen fixation * the concept of hormones (growth factors?) in plants, * the response of plants to environmental factors (light, photoperiod, temperature)				

			Ecology is centrally located in Biology because it is placed at the interface many disciplines of this area. Several topics of this discipline will be presented to the student gets a global view and different perspectives on this matter. * Introduction (History and emergence of the concept of ecosystem; 4 levels hierarchical ecology; the parameters which act on the individual; example of a case studies in ecology at various scales of observation) * Evolutionary Ecology (Science of Evolution, biotic interactions; Ethology) * Functional Ecology (Operation of the Biosphere; Microbial Ecology) * anthropogenic impacts (human Pollution and its effects; Human & Biodiversity)				
			Describe the fundamentals of the embryo, its territories, the stages of its development, they are common to models or specific during evolution. Integrate associated cell biology concepts. Set experimental approaches to understanding the origin of the large development. Use the search tools and databases didacticielles preparing sessions practices and getting them to respond to continuous control issues or revise lessons. Content description: Courses and tutorial works : After short reminders Gametogenesis on bets prefiguring the seats early stages of development from the oocyte, the respective contributions of the sea urchin models amphibians, birds, and mammals for the understanding of the great phenomena of early development will be studied based on experimental methods studied that allowed the interpretation. The integration of this knowledge in the context of prior cell biology, animal biology and physiology will be privileged. Practical Lab works: practical work on the living will be conducted in workshop sessions. Study of gametogenesis and fertilization (amphibians), followed by segmentation (amphibians) and deleterious effects of certain molecules on these processes. Development of the chick and mouse (especially with study placentation).				
			The aims of this unit isto acquire the knowledge of the parameters governing the cellular excitability, coding and conduction of nervous information and the mechanisms of the transduction phenomenon electrical into mechanical force.. Cell physiology is the study of physiological processes at the cell level. The Lessons covered in this module will enable students to approach concepts: * laws and mechanisms governing exchange membrane, * membrane potential, cell excitability and ion channel, * coding, conduction and transmission of nerve information, * transducing an electrical signal into a force or coupling excitation contraction. The neuron and muscle cell models are the choices that will be used to develop these different concepts.				
			The unit aims, in a first time, to describe and explain practices laboratory, ie the fundamental rules and basic gestures good use. Basic tools: glassware (pipettes, volumetric flasks, graduated cylinders ...), automatic pipettes, scales (for weighing precision) spectrophotometer ... Safety rules to respect will Also detailed in this first part. The second part of this course will be devoted to the identification and study of the various families of organic molecules, ie the carbohydrates, proteins, nucleic acids and lipids. The structural study will be addressed to each family and the function of some of them will also be considered by a particular introduction to enzymology and metabolism study. In this part will also focus placed on the assays of various biological molecules. For practical work: * The laboratory safety (2h) * The material used in -Apparatus verrerie- and biochemistry (2h) * structural study of				

			carbohydrates (4h) * Study of lipids -application to vegetables- oils (4h) * Methodology (4h) * Study of amino acids and proteins (4h) * structure-function relationship of a protein: invertase (8h) * Preparation of biological macromolecules and study of nucleic acids (4h) * molecular fractionation (4h)				
							The physical and chemical properties of these families will be studied:- Grignard reagents- Alcohols and thiols - Phenols - The carbonyl compounds (aldehydes... and ketones) -The amines The reactivity of aromatic compounds will also be considered.
				Security rules in lab (2)-C, Languages 1 (2)-C, Languages 2 (1)-O, Sport (1)-O, Association involvment (1)-O, Scientific English (1)-O			
			Selected students in the bilingual groups, will follow tutorial and practical lab courses in scientific english, both oral, written and exams.				
			At the end of the course, the student is able to: • Understand the concept of genetic polymorphism in populations • Analyze the genetic structure of populations in terms of allele frequencies • Understand the impact of mating systems on frequencies genotypic • Predicting the evolution of genetic diversity under the influence of evolutionary pressures				
			The unit aims to integrate and deepen the knowledge acquired in Animal Biology 1 and prepares to study the ecophysiology. In the EU will be resumed and deepened the body plans of animals and Study qelques morpho-functional adaptations based on their habitat and biology (locomotion, feeding, reproduction, ...). All integrated in a context of evolutionary biology (natural selection, coevolution). At the end of the course, the student is able to: - Read dissect an animal by reading the anatomical relationships between organs in place and understand its organizational plan. - Know how to observe the metazoans adaptations to their environment and analyze interactions between species (Eg relationship between mimicry and predation, parasite and host, ...).				
			At the end of the course, the student is able to: • To understand the role of phylogenetic classification in biology and main approaches methodological • To replace major plant groups and fungi in the general classification of beings living • In detailing the major stages in the evolution of vegetative reproduction devices and modes • Analyse the vegetative and reproductive organizations belonging to different groups in identify their characteristics and possible adaptations • Understand the role of the biotic and abiotic environment in the evolution of adaptations anatomical or life cycles				

			At the end of the course, students gained knowledge on ecosystems (study methods, description, mass transfer and energy processes involved, microorganisms roles, human impact). Student will be able to exploit the theoretical and practical knowledge to identify a particular problematic and interpret data. He is sensitized to sustainable development and is responsible for its shares when they affect the environment and biodiversity.				
			At the end of the course, the student is able to: Understand the structures and mechanisms involved by animals to cope with problems posed by the environment in which they live and how they exploit the opportunities offered by this particular environment. Become familiar with the methodological approaches used in classic studies of animal ecophysiology. Being able to carry out an experiment on animal organisms and write a scientific report				
				Job profiles and missions, Association involvement, Scientific English, Microscopical technologies for life sciences, sport, scientific bibliographic dissertation, epistemology, sexual ratio and genders			
			Selected students in the bilingual groups, will follow tutorial and practical lab courses in scientific english, both oral, written and exams.				
			At the end of the course, the student is able to: • apply the genetic patterns of populations of difference situations panmixia (Inbred or subdivided populations) • understand the influence of evolutionary forces on genetic diversity for traits complex (quantitative genetics) and nucleotide sequences (molecular evolution) • analyze pedigrees and calculate the inbreeding coefficient • understand and analyze the multifactorial determinism of complex characters				
			In terms of learning, outcomes these teachings highlight theoretical concepts allow: • to understand the main stages of the origin of the complexity and diversification of beings living. • understand the evolutionary processes responsible for the current species diversity. • Understand the main methods of re-enactments of the implementation of this Diversity (phylogeny). In terms of skills, these lessons aim to: • learn how to search, use, and synthesize concerted scientific documentation date and relevant to prepare an oral summary. • understand and analyze the content of scientific publications in English. • learn how to conduct research and use biological databases freely available on Internet. • learn to use copyright free software used for phylogenetic reconstructions.				
			At the end of the course, the student is able to:				

			• Understand the major problems of pollution that ecosystems exposed in terms of sources and types • Conduct a literature review and produce a written and oral summary presentation • Implement a toxicity test and discuss the results
			At the end of the course, the student is able to: Highlight structures (and their functions) involved in the perception and communication in the animal world. Keywords: Ecophysiology; sense organs; relations functions; adaptations; relationship inter- and intra-specific; perception ; communication
			Knowledge: Specialized knowledge in the field of recognition of marine animals as plants. Ecology certain species. Skills: recognize, characterize and analyze ecosystems: identifying flora, wildlife. Implement sampling techniques in the field of Ecology. Be aware of biodiversity issues, sustainable development. Additional and Skills: To learn the techniques and observations methods of systematic determination.
			At the end of the course, the student is able to: • Understand the dynamics of species communities, relations between soil dynamics and the dynamics of plant and animal communities, changes in terms of diversityfunctional. • Know the main plant and animal families in our latitudes. Being able to use a key determination, organize a vegetation sampling.
			Depth understanding of the major stages in the history of scholarly representation of variation and transformation of living species. Learning to read and analyze a critical biological text of the past but also a historian or philosopher life sciences (in French or English but in other languages if known the student). Whether to build an informed opinion on these issues and argue. Making critical distance according to its own knowledge of biology. awareness historical determinism.
			Selected students in the bilingual groups, will follow tutorial and practical lab courses in scientific english, both oral, written and exams.
			Student can choose to undergo this 'Label'. It contains : 20h on business knowledge, one month full-time internship in a research Lab, scientific report, and oral defence.
			At the end of the course, the student is able to: • Mastering basic knowledge of ecology: biogeography, diversity within communities and species interactions • Analyze scientific documents in English, presenting synthetically and debate fields of fundamental and applied ecology (the impact of GMOs on global warming the environment)

- Use predictive models on changes in species distribution areas
- Handle the different methods of estimating biodiversity and use of this information

			• Explain, in a simple way, the origins of climate change and pollution and linkages with climate change • Describe the consequences of abiotic stress (drought, cold, salt, UV, Ozone ...) on the physiology of a plant and / or population • Understand and introduce various mechanisms and coping strategies used by plants • Present examples of phyto-pathogens and diseases in plants
			Selected students in the bilingual groups, will follow tutorial and practical lab courses in scientific english, both oral, written and exams.
			Student can choose to undergo this 'Label'. It contains : 20h on buisiness knowledge, one month full-time internship in a research Lab, scientific report, and oral defence.

Type* : compulsory (C) or optionnal (O)