Note:
The following curriculum is a consolidated version. It is legally non-binding and for informational purposes only.
The legally binding versions are found in the University of Innsbruck Bulletins (in German).

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Curriculum for the **Bachelor's Programme in Chemistry** at the Faculty of Chemistry and Pharmacy, University of Innsbruck

§ 1 Profile

(1) The Bachelor's Programme in Chemistry is grouped among the natural sciences.

(2) The goal of the Bachelor's Programme in Chemistry is to provide vocational training for chemists. The bachelor's programme conveys basic subject-specific expertise, skills and methods of scientific writing and research, independent thinking and professional responsibility. The bachelor's programme is the basis to pursue career activities as a chemist in research, technology, environment and chemistry-related areas of public authorities. Graduates of the bachelor's programme are qualified to address, evaluate and implement scientific developments in the fields of chemistry and to apply them in interdisciplinary contexts.

(3) The Bachelor's Programme in Chemistry is the basis for the Master's Programme in Chemistry or related master's programmes.

(4) The Bachelor's Programme in Chemistry is designed to comply with international standards by closely linking theoretical knowledge and practical subject-specific skills. In addition to subject-specific expertise in the sub-disciplines of chemistry, the bachelor's programme also includes interdisciplinary key competencies-(soft skills) in team work, oral and written communication, interdisciplinary problem-solving, time and project management and sense of responsibility in regard to the benefits and risks of scientific research and applications. Moreover, aspects of gender studies also form an integral part of the Bachelor's Programme in Chemistry, in terms of gender awareness in teaching, student support and mentoring as well as female lecturers as role models.

§ 2 Scope and duration

The Bachelor's Programme in Chemistry covers 180 ECTS-Credits, with a duration of six semesters. One ECTS-Credit is equal to a work-load of 25 hours.

§ 3 Courses and numbers of participants

(1) **Lecture (VO „*Vorlesung*"):** Lectures serve to introduce methods of the subject and to convey concepts, an overview of the subject, specialist knowledge and current developments in the respective subject areas. Maximum number of participants: 120

(2) **Practical training course (PR „*Praktikum*"):** Practical training courses are courses using continuous assessment focusing on the autonomous experimental work of students in selected practical methods and problem areas under the guidance of responsible supervisors. The students'

independent experimental work may also be done in groups, in which case, a practical training course also imparts interdisciplinary skills in team work. The results of experimental works are gathered in a laboratory report. This serves to ensure standardized scientific documentation of data and results and the learning of interdisciplinary documentation and presentation techniques. Maximum number of participants: 10

(3) **Introductory seminar (PS „*Proseminar*“):** Introductory seminars are courses using continuous assessment, accompanying a lecture. Introductory seminars convey advanced subject-specific methods based on relevant and current examples, with independent participation of students. Maximum number of participants: 120

(4) **Seminar (SE „*Seminar*“):** Seminars are courses using continuous assessment in which students elaborate and present their own content in a subject-oriented way. Seminars help students to present a topic scientifically, encourage the discussion of specific topics and critical reflection on the current state of knowledge while they also promote communication skills, presentation techniques and project management. The assessment of seminar work by the responsible course lecturer takes into consideration the value to the subject and its methodology of the results presented, as well as the quality of the presentation and subject-specific discussion. Maximum number of participants: 120

§ 4 Allocation of places in courses with a limited number of participants

(1) The process of choosing students is based on the following priorities:
1. Students of the study programme for whom the course is compulsory and who could not attend the course due to a previous selection procedure.
2. Students of the study programme for whom the course is compulsory.
3. Students of other study programmes.
4. If the criteria in Z 1 to Z 3 do not suffice, the available places are drawn by random.

(2) In addition, parallel courses are to be held, if necessary during the vacation period.

§ 5 Compulsory modules

The following compulsory modules, amounting to 180 ECTS-Credits, are to be taken:

1.	**Module: Mathematics / Physics A**	**h**	**ECTS-Credits**
a.	**VO Mathematics for Chemists I:** Elemental functions, complex numbers, vector mathematics, matrices and linear illustrations, differential and integral calculus.	2	2.5
b.	**VO Physics for Chemists I:** Force and moment of force, kinematics, dynamics of a mass point, work, energy, dynamics of mass point systems, dynamics of inelastic bodies, mechanics of deformable media, mechanical vibrations and waves, molecular physics, hydrostatics, hydrodynamics, thermodynamics.	4	5
	Total	**6**	**7.5**
	Objective: Students understand advanced mathematics and are capable of applying the acquired mathematical methods on physical and chemical problems. Students master the basic concepts of physics and understand the principles of the physical way of thinking.		
	Prerequisites: none		

2.	Module: General Chemistry A	h	ECTS-Credits
a.	**VO Experimental Lecture General Chemistry:** Atomic theory, chemical formulas and equations, energy conversion in chemical reactions, electronic structure and properties of atoms, ionic and covalent bonding, molecular structure, molecular orbitals, basics of chemical thermodynamics, gases, liquids, solids, solutions, reactions in aqueous solution, chemical kinetics, chemical equilibrium, acids and bases, acid-base equilibria, solubility, product and complex formation equilibria, electrochemistry, nuclear chemistry.	5	6
b.	**VO Chemistry in Aqueous Solution:** Theoretical preparation of the laboratory course chemistry in aqueous solution: reactions of salts and metals with water, acids, bases and molten salts; group and identification reactions of ions; parallel chemical equilibria; ions in water: source and removal; important inorganic reactions in aqueous solution in nature and industry.	1	1.5
	Total	**6**	**7.5**
	Objective: Students understand the basic concepts of general chemistry.		
	Prerequisites: none		

3.	Module: General Chemistry B	h	ECTS-Credits
a.	**VO Laboratory Safety:** Rules of conduct for working in a chemical laboratory, safety and hazardous material labelling, precarious experimental work, personal safety equipment, hazardous materials, fire prevention, first aid.	1	1.5
b.	**VO Chemical Calculations:** Significant digit, empirical formula, mole, percentage of compounds, deduction of chemical formula, chemical equation, balancing redox equations, limiting reactants, yield of chemical reactions, concentration of solutions, stochiometric treatment of two and three component mixtures, gas equilibria, pH-calculations, weak acids and bases, di and tribasic acids, salts of weak acids and bases, buffer solutions, solubility product, precipitation reactions.	2	3
c.	**PR General Chemistry Laboratory Course:** Acid-base titration, water hardness, redox titration, column chromatography of plant dyes, thin layer chromatography of amino acids, ester synthesis, stannic oxide formula determination, Nernst equation experiments, electrochemical determination of equilibrium concentrations, heat of neutralization and solution, kinetics of catalysed decomposition of hydrogen peroxide, equilibrium constant for homogenous and heterogeneous equilibria, atomic mass of magnesium.	6	5.5
	Total	**9**	**10**
	Objective: Students acquire general knowledge of safe work in a chemical laboratory and responsible handling of hazardous materials. Students are capable of applying stochiometric calculations		

	and acquire practical laboratory skills in introductory chemical experiments on topics of general chemistry. In the "General Chemistry Laboratory Course" students gain multidisciplinary skills/key skills, such as the ability to work in a team and oral and written communication skills.
	Prerequisites: none

4.	**Module: Analytical Chemistry A**	**h**	**ECTS-Credits**
a.	**VO Analytical Chemistry I:** Basics (chemical equilibrium, concentration), analytical instruments (balance etc.), sample preparation and digestion, gravimetry, mass analysis, separation mechanisms (precipitation, distribution, ion exchange, chromatography, electrophoresis).	3	5
	Total	**3**	**5**
	Objective: Students acquire basic knowledge of analytical chemistry.		
	Prerequisites: none		

5.	**Module: Mathematics / Physics B**	**h**	**ECTS-Credits**
a.	**VO Mathematics for Chemists II:** Differential and integral calculus (continuation), case studies of ordinary differential equations, elements of statistics.	2	2.5
b.	**VO Physics for Chemists II:** Electrostatics, stationary currents, magnetism, alternating current, optics, atomic physics, nuclear physics, particle physics.	4	5
	Total	**6**	**7.5**
	Objective: Students understand higher mathematics and are able to apply mathematical methods to physical and chemical issues, implement the fundamental principles of physics and understand the principles of the physical way of thinking.		
	Prerequisites: none		

6.	**Module: Inorganic Chemistry A**	**h**	**ECTS-Credits**
a.	**VO Experimental Lecture Main Group Chemistry:** Introduction to main group chemistry (groups 1-2 and 13-18); description, properties and reactivities of s-block and p-block elements; importance of main group chemistry with regard to fundamental research and industrial processes based on critical discussions of ecological and toxicological connections.	2	2.5
b.	**VO Transition Metal Chemistry:** Transition metal chemistry focusing on d-block elements: general characteristics; basics, compound models, reactivity of coordination compounds; deposits, production and characteristics of d-metals; important compound	2	2.5

	classes; technically important processes, bioinorganic aspects, chemistry of lanthanides and actinoides.		
	Total	**4**	**5**
	Objective: Students acquire knowledge of the most important substances and fundamental principles of inorganic chemistry. They are able to implement inorganic substances in the fields of environment and technology.		
	Prerequisites: none		

7.	**Module: Organic Chemistry A**	**h**	**ECTS-Credits**
a.	**VO Organic Chemistry I:** Structure and nomenclature of organic compounds, qualitative theoretical consideration of covalent bond in hydrocarbons, conformation, thermochemistry, stereochemistry, chemical substances (preparation and reactions of alkanes, alkyl halogenides, alcohols, ethers, amines, alkenes, alkynes, allenes & aromates, including polycyclic aromatic compounds); reactions (nucleophilic substitution on saturated carbons, elimination reactions, addition reactions, pericyclic reactions); conjugation and conjugated π systems.	4	5
	Total	**4**	**5**
	Objective: Students acquire theoretical knowledge of structure and reactivity of organic substances.		
	Prerequisites: none		

8.	**Module: Inorganic Chemistry B**	**h**	**ECTS-Credits**
a.	**PR Laboratory Course "Chemistry in Aqueous Solution":** Combination of the elements from the lectures in General Chemistry I/II with the chemistry of substances: experiments in solution and precipitation reactions, acid-base reactions and redox reactions; properties, chemical reactions, and experimental investigation of inorganic salts, metals, acids and bases in aqueous solution.	10	7.5
	Total	**10**	**7.5**
	Objective: With attention to the contents of the courses in general chemistry, students acquire experimental knowledge of the identification and qualitative analysis of inorganic salts and metals. Students gain multidisciplinary skills/key skills, such as the ability to work in a team and oral and written communication skills.		
	Prerequisites: none		

9.	**Module: Analytical Chemistry B**	**h**	**ECTS-Credits**
a.	**VO Analytical Chemistry II:** Electroanalysis, potentiometry, ionselective electrodes, electrogravimetry,	2	3.5

	coulometry, amperometry, voltammetry, conductometry, potentiometric and conductometric end point detection atomic spectroscopy: AAS (apparatus: monochromators, detectos, chemical and spectral interferences and their elimination), emission spectroscopy: FES, atomic fluorescence spectroscopy, plasmaOES (ICP, DCP), spectroscopy using arc, spark and laser excitation.		
b.	**VO Chemometrics and Data Analysis** Basics of statistics, application of chemometric methods in data analysis.	1	1.5
	Total	**3**	**5**
	Objective: Students acquire basic knowledge of electroanalysis and atomic spectroscopy and are able to apply data analysis and chemometric methods in analytical chemistry.		
	Prerequisites: none		

10.	**Module: Analytical Chemistry C**	**h**	**ECTS-Credits**
a.	**PR Quantitative Analytical Chemistry - Basic Practical Course:** Fundamental operations and handling of chemicals in analytical chemistry measurement of volume and mass, precipitation, filtration, digestion, ignition) gravimetric and volumetric analysis (neutralization, complex-formation, redox titrations) potentiometric and photometric endpoint detection, conductivity titration) pH-measurement of buffers, statistical evaluation of analytical data.	5	4

b.	**PR Basic Practical Course in Instrumental Analysis:** Basic skills in sample preparation and instrumental analysis, applications of HPLC, GC, voltammetry, extraction processes, UV/Vis spectroscopy, atomic spectroscopy (AAS and FES) to analyse real samples.	5	3,5
	Total	**10**	**7,5**
	Objective: Students acquire basic knowledge in sample preparation, gravimetric analysis and titration and instrumental analysis. They are able to interpret and analyse analytical data correctly. Students gain multidisciplinary skills/key skills, such as the ability to work in a team and oral and written communication skills.		
	Prerequisites: successful completion of modules 4, 8, 9 (Analytical Chemistry A, B; Inorganic Chemistry B)		

11.	**Module: Organic Chemistry B**	**h**	**ECTS-Credits**
a.	**VO Organic Chemistry II:** Aldehydes and ketones, enols, enolates and enamines, carboxylic acids and derivates of carboxylic acids, bifunctional compounds, heterocyclic compounds.	2	2.5
b.	**VO Structure Elucidation I:** Fundamentals of the characterization of organic compounds by modern mass spectrometry.	2	2.5
c.	**VO Preparation Techniques in Organic Chemistry:** Preparative organic working techniques, instructions for the laboratory course in organic chemistry.	2	2.5
	Total	**6**	**7.5**
	Objective: Students acquire basic knowledge of the structure and reactivity of organic compounds and their characterization.		
	Prerequisites: none		

12.	**Module: Physical Chemistry A**	**h**	**ECTS-Credits**
a.	**VO Physical Chemistry I:** Atomistic structure of matter, elements of statistical mechanics, gas kinetics, introduction to chemical thermodynamics, equations of state of an ideal gas, enthalpy, carnot cycle, entropy, second law, free energy and free enthalpy, chemical potential, law of mass action, phase equilibria.	3	4
b.	**PS Exercises in Physical Chemistry I:** Application and exercises accompanying the lecture "Physical Chemistry I".	1	1
	Total	**4**	**5**
	Objective: Students acquire the ability for quantitative calculation of processes and reactions in chemistry.		

	Prerequisites: none

13.	Module: Biochemistry A	h	ECTS-Credits
a.	**VO Biochemistry I:** Subject and unifying principles of biochemistry; water, acids and bases; amino acids, peptides and proteins; structure and function of proteins and enzymes; vitamins and coenzymes; lipids; carbohydrates; nucleic acids; principal metabolic strategies; glycolysis; citric acid cycle; oxidative phosphorylation; pentose phosphate pathway; gluconeogenesis; glycogen metabolism; fatty acid metabolism; amino acid degradation.	3	5
	Total	**3**	**5**
	Objective: Students acquire knowledge of the chemical fundamentals and components of living cell, catabolism and energy metabolism.		
	Prerequisites: none		

14.	Module: Inorganic Chemistry C	h	ECTS-Credits
a.	**PR Laboratory Course Inorganic Synthesis:** Synthesis of inorganic compounds of the main group elements and transition metals in aqueous solution: complex salts of main group elements, coordination compounds of transition metals with mono and bidentate ligands, ionic liquids, application of basic preparative techniques, characterization by classical, non-spectroscopic methods.	6	5
	Total	**6**	**5**
	Objective: Students acquire experimental-practical skills in the synthesis of inorganic compounds of the main group elements and transition metals. Students gain multidisciplinary skills/key skills, such as the ability to work in a team and oral and written communication skills.		
	Prerequisites: none		

15.	Module: Biochemistry B	h	ECTS-Credits
a.	**VO Biochemistry II:** Photosynthesis; biosynthesis/degradation of complex lipids, steroids and amino acids, heme, nucleotides; coordination of metabolism; structure and replication of DNA; transcription and RNA processing; protein synthesis; regulation of gene expression in prokaryotes; eukaryotic chromosomes and gene expression; gene technology; molecular immunology; muscle contraction and motility; membrane transport; hormone function; signal transduction.	3	5
	Total	**3**	**5**
	Objective: Students acquire knowledge of anabolism, coordination of metabolism, fundamentals of molecular genetics, gene technology, and biochemical principles of complex biological processes.		
	Prerequisites: successful completion of module 13 (Biochemistry A)		

16.	Module: Physical Chemistry B	h	ECTS-Credits
a.	**VO Physical Chemistry II:** Statistical mechanics, collapse of the classical world view, Schrödinger equation, wave mechanisms of plane waves, general principles of quantum mechanics, special solutions of Schrödinger equation, spin, multi-electron systems, molecules.	3	4
b.	**PS Exercises in Physical Chemistry II:** Application and exercises accompanying the lecture "Physical Chemistry II".	1	1
	Total	**4**	**5**
	Objective: Students understand mathematical, physical and epistemological principles of quantum mechanics and are able to implement simple quantitative calculations.		
	Prerequisites: none		

17.	Module: Theoretical Chemistry A	h	ECTS-Credits
a.	**VO Theoretical Chemistry I:** Introduction to modern quantum mechanics (vector space formalism), time-dependent and time-independent Schrödinger equation, eigenvalue problems, commutators, uncertainty relations, spin, virtual particles and forces, approaches to the solution of multi-electron Schrödinger equation, chemical bond, perturbation theoretical approaches, group theory in quantum mechanics and spectroscopy.	2	2.5
	Total	**2**	**2.5**

	Objective: Students acquire basic knowledge of theoretical chemistry and computer chemistry.
	Prerequisites: none

18.	**Module: Physical Chemistry C**	**h**	**ECTS-Credits**
a.	**VO Methods of Physical Chemistry I:** Fundamental principles of physical-chemical measurement: mass, temperature and pressure measurement, vacuum generation; basics of measuring phase diagrams; methods to determine heat of solution, conductivities, molar mass, different types of phase diagrams, discussing the teaching assignments of the „Practical Course Physical Chemistry I".	1	1.5
b.	**PR Practical Course Physical Chemistry I:** Measurement of heats of reaction (heat of solution of a salt), measurement of electrolytic conductivity (determination of a constant of protolysis), measurement of measurement of molar mass according to Victor Meyer, phase equilibrium solid-liquid (melting diagram, freezing point depression, solubility of acid as a function of temperature), phase equilibrium liquid-gas (vapour pressure as a function of temperature, vapour pressure and boiling diagram).	6	6
	Total	**7**	**7.5**
	Objective: Students understand basic experimental methods of physical chemistry. In the "Practical Course Physical Chemistry I" they gain multidisciplinary skills/key skills, such as the ability to work in a team and oral and written communication skills.		
	Prerequisites: successful completion of modules 1, 5, 12 (Mathematics/Physics A, B; Physical Chemistry A)		

19.	**Module: Organic Chemistry C**	**h**	**ECTS-Credits**
a.	**VO Structure Elucidation II:** Fundamental principles to characterize organic compounds and natural substances with modern NMR spectroscopy.	2	3
b.	**PR Laboratory Course in Organic Chemistry I:** Synthesis and characterization of simple organic compounds; practical implementation of esterification, hydrolyses, condensations, electrophilic substitutions on aromatics, oxidation and reduction reactions.	10	7
	Total	**12**	**10**

	Objective: Students acquire practical experimental skills for the synthesis and characterisation of simple organic compounds. In the "Laboratory Course in Organic Chemistry I" they gain multidisciplinary skills/key skills, such as the ability to work in a team and oral and written communication skills.
	Prerequisites: successful completion of modules 2, 3, 7, 11 (General Chemistry A, B; Organic Chemistry A, B)

20.	**Module: Inorganic Chemistry D**	**h**	**ECTS-Credits**
a.	**VO Environmental Chemistry:** The atmosphere of the earth, natural and anthropogenic greenhouse effect, formation and degradation of ozone in the stratosphere, ozone hole, ground-near ozone, DDT, aerosols, emissions of combustion engines.	1	1.5
b.	**VO Solid State Chemistry:** Solid state reactions, thermodynamics, kinetics, diffusion, phase transitions, phase diagrams, methods of crystal growth, solid state synthesis from gaseous phase, solid state structures, materials science applications of solids (super-hard materials, superconductors, optical and NLO materials, micro and nano porous materials).	2	3.5
	Total	**3**	**5**
	Objective: Students acquire basic knowledge of environmental chemistry of the atmosphere. Students are familiar with important concepts and the applications in materials science of solid state chemistry.		
	Prerequisites: none		

21.	**Module: Biochemistry C**	**h**	**ECTS-Credits**
a.	**PR Laboratory Course in Basic Biochemistry:** Sequence analysis of DNA; RNA preparation and separation; synthesis and modification of DNA; nucleic acid hybridization; DNA-protein interaction; protein expression and purification; function of proteins; molecular cloning; preparation of high molecular weight DNA.	4	2.5
	Total	**4**	**2.5**
	Objective: Students acquire methodological knowledge of protein and nucleic acid bio-chemistry, gene technology and enzymology. Students also attain multidisciplinary skills/key skills, such as the ability to work in a team and oral and written communication skills.		
	Prerequisites: successful completion of modules 13, 15 (Biochemistry A, Biochemistry B)		

22.	Module: Macromolecular Chemistry	h	ECTS-Credits
a.	**VO Macromolecular Chemistry:** Definitions of terms, classifications, nomenclature, molar mass, degree of polymerization, tacticity, isomers, thermal and mechanical properties, application and processing, mechanism of polymerization, copolymers, multi component systems, industrially important polymers, polymers from renewable feedstock, biocompatible and medical special polymers, softener and stabilizer chemistry, ecological aspects.	2	2.5
	Total	**2**	**2.5**
	Objective: Students acquire basic knowledge of macromolecular chemistry and understand technologically important polymers.		
	Prerequisites: none		

23.	Module: Analytical Chemistry D	h	ECTS-Credits
a.	**VO Analytical Radiochemistry:** Types of decay, interaction of ionising radiation with matter, measurement methods, methods of separation, gamma spectroscopy, liquid scintillation, alpha spectroscopy, environmental effects of radioactivity, radiation damage, technical application of x-ray radiation.	1	2.5
	Total	**1**	**2.5**
	Objective: Students understand the use of radiochemical and radio-analytical methods in environment measurement techniques and lab medicine.		
	Prerequisites: none		

24.	Module: Organic Chemistry D	h	ECTS-Credits
a.	**VO Structure Elucidation III:** Basics and modern techniques for the structural characterization of organic compounds III (IR, UV/Vis, CD and fluorescence spectroscopy, etc.).	1	1.5
b.	**VO Organic Synthesis:** Organic chemical synthesis that provides access to organic compounds such as natural products, active pharmaceutical compounds, cofactors, synthetics, catalysts and compounds with interesting theoretical properties; modern strategies and methods for selective material conversion, current concepts and examples for the (total) synthesis of organic compounds, natural products and active pharmaceutical compounds.	2	2

c.	**VO Chemical Biology:** Fundamentals of chemical biology, solid phase synthesis of peptides and nucleic acids, reactivities of peptides and nucleic acids, protein catalysis, nucleic acid catalysis, basics of cofactors and their roles in regulatory mechanisms.	1	1,5
	Total	**4**	**5**
	Objective: Students acquire knowledge of organic/chemical synthetic methods and absorptive spectroscopic techniques. They learn the fundamentals of structure and reactivity of the two classes of natural compounds proteins and nucleic acids.		
	Prerequisites: none		

25.	**Module: Physical Chemistry D**	**h**	**ECTS-Credits**
a.	**VO Physical Chemistry III:** Kinetic gas theory, transport processes, reaction rates, reaction order, simple reactions, reverse reactions, parallel reactions, consecutive reactions, pre-equilibrium, "unimolecular" reactions, chain reactions, solvation energy, interionic interactions, activity coefficient, ionic conduction, potential and charge curve at phase boundaries, electro-kinetic phenomena, electrode equilibria, electrode kinetics, electrolysis, electrochemical power sources, corrosion.	4	5
b.	**VO Physical Chemistry: Methods II:** Measurement methods to determine the kinetics of reactions, determination of reaction and adsorption equilibria, methods to determine macroscopic (e.g., viscosity, dielectric constant) and microscopic (e.g. atomic diameters, dipole moment) material properties, discussion of the experiments to be conducted in the “Lab-Course in Physical Chemistry II”.	1	1
c.	**PR Lab-Course in Physical Chemistry II:** Viscosity of liquids and gases, kinetics of ester hydrolysis, adsorption of gases, surface area determination of finely dispersed powders, equilibrium constant of a gas chromatographic column, spectroscopy, dipole moment and dielectric constant.	6	4
	Total	**11**	**10**
	Objective: Students understand the basics of kinetic and electro-chemical approaches in theory and experiments. In the “Lab-Course in Physical Chemistry II” they gain multidisciplinary skills/key skills, such as the ability to work in a team and oral and written communication skills.		
	Prerequisites: successful completion of module 18 (Physical Chemistry C)		

26.	Module: Theoretical Chemistry B	h	ECTS-Credits
a.	**VO Theoretical Chemistry II:** Ab-initio Hartree-Fock approach, Roothaan equation, semi-empirical MO-SCF method, density function method, multi-determinant method, force field method, molecular modelling and QSPR, statistical-mechanical approaches (Monte-Carlo and molecular dynamics simulations) for condensed systems.	2	2.5
	Total	**2**	**2.5**
	Objective: Students acquire knowledge of the most important methods of computer chemistry, their applications and limits.		
	Prerequisites: none		

27.	Module: Theoretical Chemistry C	h	ECTS-Credits
a.	**PR Theoretical Chemistry Laboratory:** Molecular structure and visualization, energy calculation and structure determination of molecules, calculation of molecular spectra with ab-initio methods including correlated methods, density function methods and semi-empirical MO-SCF methods, simulations of molecules formations in random systems, simulation of liquid systems and biopolymers.	2	2.5
	Total	**2**	**2.5**
	Objective: Students are able to implement the most important methods of theoretical chemistry. They gain multidisciplinary skills/key skills, such as the ability to work in a team and oral and written communication skills.		
	Prerequisites: successful completion of modules 17, 26 (Theoretical Chemistry A, B)		

28.	Module: Physical Chemistry E	h	ECTS-Credits
a.	**VO Physical Chemistry IV:** Use of thermodynamic charts to calculate real systems, irreversible cyclic processes and real efficiency, determination of irreversible entropy changes, third law of thermodynamics, application of activity and fugacity to real systems, equitation of state of real gases, Joule-Thomson effect, thermodynamics of real mixtures, boundary equilibria, surface tension, wetting phenomena, thermodynamics of surfaces, equilibrium form of crystals, surface tension of multicomponent systems, micro-canonical ensemble, Boltzmann equation, canonical ensemble, partition function, Boltzmann distribution, chemical equilibrium, quantum statistics.	4	5
	Total	**4**	**5**
	Objective: Students understand qualitative and quantitative thermodynamics of real systems and know the concepts of statistical thermodynamics.		
	Prerequisites: none		

29.	Module: Organic Chemistry E	h	ECTS-Credits
a.	**PR Laboratory Course in Organic Chemistry II:** Synthesis, pure isolation and characterization of organic compounds; natural substances isolation; implementation of metal-organic & electro-cyclic reactions and use of protecting groups and heterogeneous synthesis techniques, practical examples of the classes of substances of nucleosides, amino acids, vitamins, natural pigments and fullerenes.	10	7.5
	Total	**10**	**7.5**
	Objective: Students possess knowledge of the synthesis and characterization of organic compounds. They acquire multidisciplinary skills/key skills, such as the ability to work in a team and oral and written communication skills.		
	Prerequisites: successful completion of module 19 (Organic Chemistry C)		

30.	Module: Seminar with Bachelor Thesis	h	ECTS-Credits
a.	**SE Bachelor Thesis Seminar:** Presentation of the bachelor thesis within a scientific lecture of approximately 20 minutes, professional discussion of the bachelor theses presented by others. **Bachelor Thesis:** Independent work in a chemical subject which can be chosen freely, supervised by subject-specific instructors with doctorates.	2	15
	Total	**2**	**15**
	Objective: Students are able to carry out a practical experiment on a chemical topic autonomously and to demonstrate and defend the results in the form of a scientific lecture. Students acquire interdisciplinary key skills in oral and written communication, presentation techniques and time and project management.		
	Prerequisites: successful completion of modules 1 to 19 (Mathematics/Physics A, B; General Chemistry A, B; Analytical Chemistry A, B, C; Inorganic Chemistry A, B, C; Organic Chemistry A, B, C; Physical Chemistry A, B, C; Biochemistry A, B; Theoretical Chemistry A)		

§ 6 Studies Induction and Orientation Stage

(1) The Studies Induction and Orientation Stage covers one semester (30 ECTS-Credits) and offers students an overview of the main contents of the degree programme and its structure in order to provide a factual basis to assess the decision to pursue the chosen field.

(2) The Studies Induction and Orientation Stage requires the following course examinations, which may be repeated twice, to be completed successfully:

1. Experimental Lecture General Chemistry (compulsory module 2a, VO 5, 6 ECTS-Credits)
2. Analytical Chemistry I (compulsory module 4a, VO 3, 5 ECTS- Credits)
3. Chemical Calculations (compulsory module 3b, VO 2, 3 ECTS- Credits)

(3) Passing the examinations specified in paragraph 2 permits students to attend all further courses and take all examinations following the Studies Induction and Orientation Stage and to write a bachelor's thesis as described in the curriculum. Registration requirements specified by the curriculum are to be followed.

§ 7 Bachelor's Thesis

(1) The topic of the bachelor's thesis may be chosen from the following subjects offered in the bachelor's programme: Analytical Chemistry, Inorganic Chemistry, Biochemistry, Organic Chemistry, Physical Chemistry or Theoretical Chemistry.

(2) A topic may be addressed jointly by several students with permission of the instructor of the course "Bachelor Thesis Seminar" provided that the work of each student can be assessed individually.

(3) With the permission of the responsible instructor of the course "Bachelor Thesis Seminar", a topic may practically be addressed and implemented at non-university institutions. However, the bachelor's thesis is to be assessed by the responsible instructor of the course „Bachelor Thesis Seminar".

(4) Bachelor's theses are to be submitted in paper form and in digital version as determined by the Director of Studies.

§ 8 Examination Regulations

(1) A module is completed when all of its courses have been successfully completed.

(2) For lectures, a written or oral examination at the end of the course tests knowledge of the material covered. The method of testing is to be defined by the instructor before the start of the course.

(3) Evaluation in continuous assessment courses ('immanent examination') (practical training course, introductory seminar, seminar) is based on continuous oral, written and/or practical-experimental contributions of students. The evaluation criteria are to be defined by the instructor before the start of the course.

§ 9 Academic Degree

Graduates of the Bachelor's Programme in Chemistry are awarded the academic degree "Bachelor of Science", abbreviated "BSc".

§ 10 Validity and Effect

(1) The curriculum is effective as of 1 October 2008.

(2) § 6 in the version published in the University of Innsbruck Bulletin of 8 June 2011, Issue 26, No. 460 is effective as of 1 October 2011 and applies to all students beginning their degree programme as of winter semester 2011/2012.

(3) § 6 in the version published in the University of Innsbruck Bulletin of 8 June 2011, Issue 26, No. 460 ceases to be effective at the end of 30 September 2014.

§ 11 Transitional Provisions

(1) Regular degree students who began the Diploma Programme in Chemistry at the University of Innsbruck before 1 October 2008 are entitled from this date to complete the first part of the diploma programme ("erster Studienabschnitt") within a maximum of seven semesters and the second part of the diploma programme ("zweiter Studienabschnitt") within a maximum of seven semesters.

(2) If a part of the Diploma Programme in Chemistry is not completed within the prescribed period, the student is required to follow the curriculum of the Bachelor's Programme in Chemistry. Furthermore, students may voluntarily choose to switch to the curriculum of the Bachelor's Programme in Chemistry at any time.

(3) Recognition of examinations according to § 78 Para 1 Universities Act 2002 is to be determined in Appendix 1 of this curriculum.

Appendix 1:

Recognition of examinations

The course examinations successfully completed and required by the curriculum for the Diploma Programme in Chemistry at the University of Innsbruck (in the version published in the University of Innsbruck Bulletin of 16 August 2011, Issue 49, No. 797) are considered equivalent according to § 78 Para 1 UniStG 2002 to the Bachelor's Programme in Chemistry at the University of Innsbruck as follows:

Positive completion of examinations:	**Recognition as:**
Mathematics for Chemists I (VO 2)	Mathematics for Chemists I (VO 2)
Mathematics for Chemists II (VO 2)	Mathematics for Chemists II (VO 2)
Physics for Chemists I (VO 4)	Physics for Chemists I (VO 4)
Physics for Chemists II (VO 4)	Physics for Chemists II (VO 4)
Laboratory Safety and First Aid (VO 1)	Laboratory Safety (VO 1)
Hazardous Materials (VO 1)	Laboratory Safety (VO 1)
General Chemistry I (VO 2)	Experimental Lecture General Chemistry (VO 5)
General Chemistry II (VO 2)	
General Chemistry III (VO 2)	Chemistry in Aqueous Solution (VO 1)
Chemical Calculations (VO 2)	Chemical Calculations (VO 2)
General Chemistry Laboratory Course (PR 6)	General Chemistry Laboratory Course (PR 6)
Main Group Chemistry (VO 2)	Experimental Lecture Main Group Chemistry (VO 2)
Transition Metal Chemistry (VO 2)	Transition Metal Chemistry (VO 2)
Solid State Chemistry (VO 1)	Solid State Chemistry (VO 2)
Environmental Chemistry (VO 1)	Environmental Chemistry (VO 1)
Laboratory Course "Chemistry in Aqueous Solution" (PR 10)	Laboratory Course "Chemistry in Aqueous Solution" (PR 10)
Inorganic Synthesis, Cryo-Chemistry (PR 6)	Laboratory Course Inorganic Synthesis (PR 6)
Analytical Chemistry I (VO 3)	Analytical Chemistry I (VO 3)
Analytical Chemistry II (VO 2)	Analytical Chemistry II (VO 2)
Chemometrics and Data Analysis (VO 1)	Chemometrics and Data Analysis (VO 1)
Quantitative Analytical Chemistry - Basic Practical Course (PR 5)	Quantitative Analytical Chemistry - Basic Practical Course (PR 5)
Basic Practical Course in Instrumental Analysis (PR 5)	Basic Practical Course in Instrumental Analysis (PR 5)
Analytical Radiochemistry (VO 1)	Analytical Radiochemistry (VO 1)
Organic Chemistry I (VO 4)	Organic Chemistry I (VO 4)
Organic Chemistry II (VO 2)	Organic Chemistry II (VO 2)
Preparation Techniques in Organic Chemistry (VO 2)	Preparation Techniques in Organic Chemistry (VO 2)
Methods in Synthesis (VO 2)	Organic Synthesis (VO 2)
Strategies in Synthesis (VO 1)	Chemical Biology (VO 1)
Structure Elucidation I (VO 2)	Structure Elucidation I (VO 2)
Structure Elucidation II (VO 2)	Structure Elucidation II (VO 2)
Structure Elucidation III (VO 1)	Structure Elucidation III (VO 1)
Laboratory Course in Organic Chemistry I (PR 10)	Laboratory Course in Organic Chemistry I (PR 10)
Laboratory Course in Organic Chemistry II (PR 10)	Laboratory Course in Organic Chemistry II (PR 10)
Physical Chemistry I (VO 4)	Physical Chemistry I (VO 3) Exercises in Physical Chemistry I (PS 1)
Physical Chemistry II (VO 4)	Physical Chemistry II (VO 3)

	Exercises in Physical Chemistry II (PS 1)
Physical Chemistry III (VO 4)	Physical Chemistry III (VO 4)
Physical Chemistry IV (VO 4)	Physical Chemistry IV (VO 4)
Physical Chemistry: Methods I (VO 1)	Physical Chemistry: Methods I (VO 1)
Lab-course in Physical Chemistry I (PR 6)	Lab-course in Physical Chemistry I (PR 6)
Physical Chemistry: Methods II (VO 1)	Physical Chemistry: Methods II (VO 1)
Lab-course in Physical Chemistry II (PR 6)	Lab-course in Physical Chemistry II (PR 6)
Biochemistry I (VO 3)	Biochemistry I (VO 3)
Biochemistry II (VO 3)	Biochemistry II (VO 3)
Laboratory Course in Basic Biochemistry (PR 4)	Laboratory Course in Basic Biochemistry (PR 4)
Theoretical Chemistry I (VO 2)	Theoretical Chemistry I (VO 2)
Theoretical Chemistry II (VO 2)	Theoretical Chemistry II (VO 2)
Theoretical Chemistry Laboratory (PR 2)	Theoretical Chemistry Laboratory (PR 2)
Macromolecular Chemistry (VO 2)	Macromolecular Chemistry (VO 2)