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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Complete Version as of 1 October 2015
Curriculum for the
Bachelor's Programme Chemistry
at the Faculty of Chemistry and Pharmacy, University of Innsbruck

§ 1 Qualification profile

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

(2) The goal of the Bachelor's Programme 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 for pursuing 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 Chemistry is the basis for the Master's Programme Chemistry or related master's programmes.

(4) The Bachelor's Programme 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 competences (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 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 Chemistry covers 180 ECTS-Credits and has a duration of six semesters. One ECTS-Credit is equal to a workload of 25 hours.

§ 3 Types of courses and maximum number of students per course

(1) Courses without continuous performance assessment:

Lectures (VO) are courses held in lecture format. They introduce the research areas, methods and schools of thought for a given subject. Maximum number of participants: 220

(2) Courses with continuous performance assessment:

1. 1. **Practical courses** (UE) focus on the practical treatment of concrete scientific tasks within an area. Maximum number of participants: 10
2. **Seminars** (SE) provide in-depth treatment of scientific topics through students' presentations and discussion thereof. Maximum number of participants: 120
3. **Lectures with practical elements** (VU) focus on the practical treatment of concrete scientific tasks that are discussed during the lecture parts of the course. Maximum number of participants: 120
4. **Practical training courses** (PR) provide practical experience with concrete scientific tasks, complementing occupational and academic training. Maximum number of participants: 10

§ 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.

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

§ 5 Compulsory modules

The following compulsory modules corresponding to 180 ECTS-Credits must be passed:

1.	**Compulsory Module: Physics**	**h**	**ECTS-Credits**
a.	**VO Physics I for Chemical Students** 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	3	3
b.	**VO Physics II for Chemical Students** Optics, nuclear physics, particle physics, electrostatics, stationary electricity magnetism, electrodynamics, atomic physics	2	2
	Total	**5**	**5**
	Objectives: Students master the basic concepts of physics and understand the principles of the way of thinking in physics.		
	Prerequsities: none		

2.	Compulsory Module: Mathematics A	h	ECTS-Credits
	VU Mathematics I for Chemical Students Analysis in one variable: sets, functions, sequences, series, complex numbers, differential and integral calculus	3	5
	Total	**3**	**5**
	Objectives: Students understand advanced mathematics and are capable of applying the acquired mathematical methods on physical and chemical problems.		
	Prerequsities: none		

3.	Compulsory 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 for 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**
	Objectives: Students understand the basic concepts of general chemistry.		
	Prerequsities: none		

4.	Compulsory 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** 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, equilibrium constant for homogenous and heterogeneous equilibria, atomic mass of magnesium.	4	3
	Total	**7**	**7.5**
	Objectives: 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 practical course students gain multidisciplinary skills/key skills, such as the ability to work in a team and oral and written communication skills.		
	Prerequsities: none		

5.	**Compulsory 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, optical analysis, separation mechanisms (precipitation, distribution, ion exchange, chromatography, electrophoresis).	3	4.5
b.	**VO Data Analysis and Chemometrics** Fundamentals of statistics and data analysis (hypothesis testing, variance analysis, regression, threshold values, statistical planning of experiments, fundamentals of chemometric processes in data analysis)	1	1.5
c.	**VO Analytical Chemistry II:** Electroanalysis, potentiometry, ionselective electrodes, electrogravimetry, coulometry, amperometry, voltammetry, conductometry, potentiometric and conductometric end point excitation.	1	1.5
	Total	**5**	**7.5**
	Objectives: Students are familiar with the fundamentals of analytical chemistry (volumetric analysis, chromatography, electroanalytics and data analysis).		
	Prerequsities: none		

6.	**Compulsory Module: Mathematics B**	**h**	**ECTS-Credits**
	VU Mathematics II for Chemical Students Linear algebra: vector spaces, matrix calculus, analysis in several variables, multi-dimensional differential and integral calculus, ordinary and partial differential equation	3	5
	Total	**3**	**5**

	Objectives: Students understand advanced mathematics and are able to apply the mathematical methods learned for finding solutions to physical and chemical questions.
	Prerequsities: none

7.	**Compulsory 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 classes; technically important processes, bioinorganic aspects, chemistry of lanthanides and actinoides.	2	2.5
	Total	**4**	**5**
	Objectives: Students acquire knowledge of the most important substances and fundamental principles of inorganic chemistry are familiar with the use of inorganic substances in the fields of environment and technology.		
	Prerequsities: none		

8.	**Compulsory Module: Organic Chemistry A**	**h**	**ECTS-Credits**
	VO Organic Chemistry I Structure and nomenclature of organic compounds, qualitative theoretical consideration of covalent bond in hydrocarbons, conformation, thermos hemistry, 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**
	Objectives: Students acquire theoretical knowledge of structure and reactivity of organic substances.		
	Prerequsities: none		

9.	Compulsory Module: Inorganic Chemistry B	h	ECTS-Credits
	PR Chemistry in Aqueous Solution 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**
	Objectives: 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.		
	Prerequsities: successful completion of compulsory module 3 (General Chemistry A)		

10.	Compulsory Module: Analytical Chemistry B	h	ECTS-Credits
a.	**VO Analytical Chemistry III** Atomic spectroscopy, atomic absorption spectroscopy, functionality of monochromators, detectors, interferences and their elimination, principle of FES, atomic fluorescence spectroscopy, plasmaOES (ICP, DCP), spectroscopy using arc, spark and laser excitation.	1	1.5
b.	**VO Analytical Chemistry IV** Modes of decay, interaction of ionizing radiation with matter, radio analytics (apha-, beta- and gamma-spectroscopy, liquid scintillation), radiation injuries, technical use of X-radiation, X-ray spectroscopy, electron spectroscopy	1	1
	Total	**2**	**2.5**
	Objectives: Students have an advanced knowledge of analytical chemistry (atomic spectroscopy, X-ray spectroscopy, radioactivity and radio analytics).		
	Prerequsities: none		

11.	Compulsory Module: : Physical Chemistry A	h	ECTS-Credits
	VU Introduction to Quantum Theory Fall of the classical world view, double-slit experiment, superposition principle, wave mechanics of plane waves, Schrödinger equation, formal fundamentals of quantum mechanics, specific solutions of the Schrödinger equation, spin, Aufbau principle, He atom, antisymmetry, exchange interaction, Pauli exclusion principle; H_2^+ molecule	3	2.5
	Total	**3**	**2.5**
	Objectives: Students understand the fundamental physical principles of the structure of matter within the scope of quantum mechanics.		
	Prerequsities: none		

12.	Compulsory Module: Analytical Chemistry C	h	ECTS-Credits
	PR Quantitative Analytical Chemistry – Basic Practical Course Basic analytical operations (measurement of volume and mass, precipitation, filtration, digestion, ignition), safety and quality control in an analytical laboratory, filtration, gravimetric and titrimetic analysis (neutralization, redox titrations, complex formation), endpoint detection with colour indication and instruments (photometry, Ca-selective electrode, pH-electrode, conductivity measurement), statistical evaluation of analytical data	4	5
	Total	**4**	**5**
	Objectives: Students gain basic skills in sample preparation and in gravimetric and trimetric analysis processes. Students are able to correctly evaluate and interpret analytical data.		
	Prerequsities: successful completion of compulsory modules 5 and 9 (Analytical Chemistry A and Inorganic Chemistry B)		

13.	Compulsory Module: Analytical Chemistry D	h	ECTS-Credits
	PR Basic Practical Course in Instrumental Analysis Basic knowledge in sample preparation and instrumental analysis, use of HPLC, GC, voltammetry, extraction processes, UV/Vis spectroscopy, atomic spectroscopy (AAS, FES) for analyzing real samples.	4	5
	Total	**4**	**5**
	Objectives: Students acquire basic skills in instrumental analysis. They are able to generate, to protocol and to evaluate and interpret data. Students acquire interdisciplinary key competences for working in teams and oral and written communication.		
	Prerequsities: successful completion of compulsory module 10 and 12 (Analytical Chemistry B and C)		

14.	Compulsory 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
b.	**VO Structure Elucidation I** Fundamentals of the characterization of organic compounds by modern mass spectrometry.	2	1.5
c.	**VO Preparation Techniques in Organic Chemistry** Working techniques in preparative organic chemistry; instructions for the laboratory course in organic chemistry	2	1.5
	Total	**6**	**5**

	Objectives: Students acquire basic knowledge of the structure and reactivity of organic compounds and their characterization.
	Prerequsities: none

15.	**Compulsory Module: Physical Chemistry B**	**h**	**ECTS-Credits**
	VU Thermodynamics Introduction to chemical thermodynamics, equations of state of ideal glass, enthalpy, Carnot cycle, entropy, second law of thermodynamics, Helmholtz free energy, Gibbs enthalpy, chemical potential, law of mass action, phase equilibrium, colligative properties	4	5
	Total	**4**	**5**
	Objectives: Students are able to quantitatively analyse chemical processes and reactions.		
	Prerequsities: none		

16.	**Compulsory Module: Biochemistry A**	**h**	**ECTS-Credits**
	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		
	Objectives: Students acquire knowledge of the chemical fundamentals and components of living matter, catabolism and energy metabolism.		
	Prerequsities: none		

17.	**Compulsory Module: Inorganic Chemistry C**	**h**	**ECTS-Credits**
	PR Inorganic Synthesis Synthesis of inorganic compounds of main group and subgroup elements in aqueous solution; application of basic preparative techniques	5	5
	Total	**5**	**5**
	Objectives: Students acquire experimental-practical skills in the synthesis of inorganic compounds. They also acquire interdisciplinary key competences such as working in teams and acquire oral and written communication skills.		
	Prerequsities: none		

18.	Compulsory Module: Theoretical Chemistry A	h	ECTS-Credits
	VO Theoretical Chemistry I Types of atoms, bonding force, boding structures, torsions, electrostatic interactions, van der Waals force, hydrogen bonds, hydrophobic interactions, simplified force fields, minimization procedures, Hesse matrix interpretation, standard mode analysis, interrelations to oscillation spectroscopy, computer simulation, interrelations to NMR-spectroscopy	2	2.5
	Total	**2**	**2.5**
	Objectives: Students understand basic intra- and intermolecular forces, as well as their behaviour in force fields.		
	Prerequsities: none		

19.	Compulsory 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	3
b.	**VO Biochemical Methods** Nucleid acids (analysis, cloning, synthesis, sequencing), proteins (expression, cleaning, sequencing, structures), molecular interactions (identification, quantification, localization, functional analysis of protein-RNA ligands), system biology (genomics, proteomics, metabolomics), model organisms, model systems for physiological and pathological signal transduction cascades, bio technology	2	1
c.	**UE Biochemical Methods** Use of databases, graphic data processing, bio IT analysis of DNA, RNA, protein sequences and structures, analysis of molecular interactions and post-translational modifications, evolutionary interrelations, use of systemic biological analysis methods	1	1
	Total	**6**	**5**
	Objectives: Students acquire knowledge of anabolism, coordination of metabolism, fundamentals of molecular genetics, gene technology, and biochemical principles of complex biological processes. Students learn the fundamentals of modern biochemical methods and can apply them for preparing and analyzing biological macromolecules and their interactions.		
	Prerequsities: successful completion of compulsory module 16 (Biochemistry A)		

20.	Compulsory Module: Physical Chemistry C	h	ECTS-Credits
a.	**VO Thermodynamics: Advanced Course** Real gases: state equations, state charts, Joule-Thomson-effect, fugacity; thermodynamics and phase charts of real mixtures; thermodynamics of surfaces: surface tension, wetting phenomena; applications in technical chemistry; elements of non-equilibrium thermodynamics	2	2.5
b.	**VO Kinetics** Kinetic gas theory, transport processes, reaction rate, nature of reactants, simple reactions, counter-reactions, parallel reactions, consequent reactions, pre-equilibrium, "unimolecular" reaction, chain reactions	2	2.5
	Total	**4**	**5**
	Objectives: Students acquire in-depth knowledge of thermodynamics for special systems and actual applications as well as fundamental knowledge of chemical reaction kinetics for determining reaction rates.		
	Prerequsities: none		

21.	Compulsory Module: Physical Chemistry D	h	ECTS-Credits
	PR Laboratory Course in Physical Chemistry I Fundamentals of physical-chemical measurement methods: quantity, temperature and pressure gauge technique, creation of a vacuum, interpretation of data and measurement uncertainty, curve fitting; e.g. measurement of reaction warmth, electrolytic conductivity and molar mass; phase equilibria solid-liquid and liquid-gaseous	6	5
	Total	**6**	**5**
	Objectives: Students are familiar with basic experimental methods in physical chemistry and with the evaluation of the data. Students acquire interdisciplinary key competences in team work and oral and written communication.		
	Prerequsities: successful completion of compulsory modules 1, 2, 6 and 15 (Physics, Mathematics A and B, Physical Chemistry B)		

22.	Compulsory Module: Theoretical Chemistry B	h	ECTS-Credits
	VO Theoretical Chemistry II Hamiltonian operator for multi-electron systems, Born-Oppenheimer approximation, consequences of the Pauli exclusion principle for the multi-electron wave function, atomic orbital, molecular orbital, determinant basis in a multi-electron Hilbert space, ground state of the hydrogen molecule, distance dependence, variation principle, Full-CI, Gaussian distribution as one-electron basis, Hartree-Fock, Roothan method, electron correlations, perturbation theory, density functional theory	2	2.5
	Total	**2**	**2.5**
	Objectives: Students understand the fundamentals of describing multi-electron systems in chemistry.		
	Prerequsities: none		

23.	Compulsory Module: Organic Chemistry C	h	ECTS-Credits
a.	**VO Structure Elucidation II** Fundamental principles for characterizing organic compounds and natural substances by 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.	9	7
	Total	**11**	**10**
	Objectives: Students acquire practical experimental skills for the synthesis and characterisation of simple organic compounds. In the "Laboratory Course in Organic Chemistry I" they gain interdisciplinary skills/key skills, such as the ability to work in a team and oral and written communication skills.		
	Prerequsities: successful completion of compulsory modules 3, 4, 8 and 14 (General Chemistry A and B, Organic Chemistry A and B)		

24.	Compulsory 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 nanoporous materials).	2	3.5
	Total	**3**	**5**

	Objectives: 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.
	Prerequsities: none

25.	**Compulsory Module: Biochemistry C**	**h**	**ECTS-Credits**
	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.	5	5
	Total	**5**	**5**
	Objectives: Students acquire methodological knowledge of protein and nucleic acid bio-chemistry, gene technology and enzymology. Students also acquire interdisciplinary skills/key skills, such as the ability to work in a team and oral and written communication skills.		
	Prerequsities: successful completion of compulsory modules 16 and 19 (Biochemistry A and Biochemistry B)		

26.	**Compulsory Module: Macromolecular Chemistry**	**h**	**ECTS-Credits**
	VO Macromolecular Chemistry Definitions of terms, classifications, nomenclature, molecular 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 resources, biocompatible and medical special polymers, softener and stabilizer chemistry, ecological aspects.	2	2.5
	Total	**2**	**2.5**
	Objectives: Students acquire basic knowledge in macromolecular chemistry and are familiar with the technically most important polymers.		
	Prerequsities: none		

27.	Compulsory 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	2
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	3.5
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	2
	Total	**4**	**7.5**
	Objectives: 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 of proteins and nucleic acids.		
	Prerequsities: none		

28.	Compulsory Module: Physical Chemistry E	h	ECTS-Credits
	PR Laboratory Course in Physical Chemistry II Measurement methods for determining the kinetics of reactions, reactions and absorption equilibria, macroscopic and microscopic material properties, .e.g. viscosity, reaction kinetics, absorption, surface determination of finely dispersed powders, distribution coefficient of a gas chromatographic column, spectroscopy, dipole moment and dielectric constant.	6	5
	Total	**6**	**5**
	Objectives: The students understand the basics of kinetic and electrochemical processes in theory and experiment. In the laboratory course, the students acquire interdisciplinary key qualifications, such as working in teams and oral and written communication skills.		
	Prerequsities: successful completion of compulsory module 21 (Physical Chemistry D)		

29.	Compulsory Module: Theoretical Chemistry C	h	ECTS-Credits
a.	**VU Methods of Theoretical Chemistry** High performance computer, introduction to unix, introduction to quantum mechanical and molecular mechanical software suites that are employed to study and describe chemical problems	1	1.5
b.	**PR Theoretical Chemistry Laboratory** Molecular structure and visualization of small molecules and biomolecular systems; prediction of structures and spectroscopic properties by use of quantum mechanics; prediction of biomolecular bonding processes by docking	3	3.5
	Total	**4**	**5**
	Objectives: Students command the fundamental working techniques of theoretical chemistry.		
	Prerequsities: successful completion of compulsory modules 11, 18 and 22 (Physical Chemistry A, Theoretical Chemistry A and B)		

30.	Compulsory Module: Physical Chemistry F	h	ECTS-Credits
a.	**VO Physical Electrochemistry** Basics of electrochemistry, electrostatics and intramolecular interactions, solvation, interionic interactions and Debye-Hückel-model, activity coefficient, ionic conduction, potential and charge curve at phase boundaries, electrokinetic phenomena, electrode equilibria, electrode kinetics, electrolysis, basics of technical electrochemistry.	2	2.5
b.	**VO Statistical Thermodynamics** Microcanonical ensemble, Boltzmann equation, canonical ensemble, partition function and free energy, factorization of the partition function, Boltzmann distribution, chemical equilibrium, quantum statistics	2	2.5
	Total	**4**	**5**
	Objectives: Students acquire basic physical-chemical knowledge of electrochemical processes and their application and the statistical-mechanical description of thermodynamic systems respectively.		
	Prerequsities: none		

31.	Compulsory 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.	8	7.5
	Total	**8**	**7.5**

	Objectives: 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.
	Prerequsities: successful completion of compulsory modules 23 and 27 (Organic Chemistry C and D)

32.	**Compulsory Module: Interdisciplinary Skills**	**h**	**ECTS-Credits**
	Courses from the offer of the University of Innsbruck or from the field of "Equality and Gender Studies" corresponding to 2.5 ECTS-Credits must be taken.	2	2.5
	Total	**2**	**2.5**
	Objectives: Advanced qualification of the students according to their choice.		
	Prerequsities: The prerequisites specified by the respective curricula must be met.		

33.	**Compulsory Module: Bachelor's Thesis**	**h**	**ECTS-Credits**
	SE Bachelor's Thesis Independent work in a chemical subject of choice supervised by pertinent lecturers holding a Doctor/PhD-title. Presentation of the own Bachelor's Thesis, discussion of the Bachelor's Theses of others.	1	14+ 1
	Total	**1**	**15**
	Objectives: Students are capable of independently performing a practical-experimental study of a topic in chemistry and can present and rationalize the results within a scientific lecture. Students gain interdisciplinary key skills in oral and written communication, presentation techniques as well as in time and project management.		
	Prerequsities: successful completion of compulsory modules 1 to 23 (Physics, Mathematics A, B; General Chemistry A, B; Analytical Chemistry A, B, C, D; Inorganic Chemistry A, B, C; Organic Chemistry A, B, C; Physical Chemistry A, B, C, D; Biochemistry A, B; Theoretical Chemistry A, B)		

§ 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 following course examinations, which may be repeated twice, are to be taken within the scope of the studies induction and orientation stage:

1. Experimental Lecture General Chemistry (CM 3a, VO 5, 6 ECTS-Credits)
2. Analytical Chemistry I (CM 5a, VO 3, 4.5 ECTS-Credits)
3. Chemical Calculations (CM 4b, 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 "Bachelor's Thesis" course, provided that the work of each student can be assessed individually.

(3) With the permission of the responsible instructor of the "Bachelor's Thesis" course, 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 "Bachelor's Thesis" course.

(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) Courses are evaluated by written or oral examinations covering all contents of the course. The course lecturer must communicate the examination method before the start of the course.

(3) Courses with continuous performance assessment are evaluated based on the student's regular, written and/or oral contributions and/or practical-experimental contributions. The course lecturer must communicate the evaluation criteria 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 Coming into force

(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) out of force according to

(5) § 10 para. 3 ceases to be effective after 30 September 2014.

(6) § 6, as announced in the University of Innsbruck Bulletin of 8 June 2011, Issue 26, No. 460, ceases to be effective after 31 December 2015.

(7) The modification of the curriculum in the version of the University of Innsbruck Bulletin of 12 May 2015, Issue 36, No. 400 comes into effect on 1 October 2015 and is to be applied to all students.

§ 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 within a maximum of seven semesters and the second part of the diploma programme 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.

Equivalence List - Bachelor's Programme Chemistry

Positively assessed exams, taken as part of the Bachelor's Programme Chemistry at the University of Innsbruck according to the curriculum of 21 April 2008, Issue 28, No. 257 will be recognised as equal towards the exams of the curriculum published in the version of the University of Innsbruck Bulletin of 12 May 2015, Issue 36, No. 400 as follows:

Curriculum in the version of the University of Innsbruck Bulletin of 21 April 2008, Issue 28, No. 257		**Curriculum in the version of the University of Innsbruck Bulletin of 12 May 2015, Issue 36, No. 400**	
§5.1a	Mathematics for Chemists Part I (VO 2/2.5 ECTS-Credits)	§5.2	Mathematics I for Students of Chemistry (VU 3/5 ECTS-Credits)
§5.1b	Physics for Chemists Part I (VO 4/5 ECTS-Credits)	§5.1a	Physics I for Students of Chemistry (VO 3/3 ECTS-AP)
§5.5b	Physics for Chemists Part II (VO 4/5 ECTS-Credits)	§5.1b	Physics II for Students of Chemistry (VO 2/2 ECTS-Credits)
§5.2a	Experimental Lecture General Chemistry (VO 5/6 ECTS-Credits)	§5.3a	Experimental Lecture General Chemistry (VO 5/6 ECTS-Credits)
§5.2b	Chemistry in Aqueous Solution (VO 1/1.5 ECTS-Credits)	§5.3b	Chemistry in Aqueous Solution (VO 1/1.5 ECTS-Credits)
§5.3a	Laboratory Safety (VO 1/1.5 ECTS-Credits)	§5.4a	Laboratory Safety (VO 1/1,5 ECTS-Credits)
§5.3b	Chemical Calculations (VO 2/3 ECTS-Credits)	§5.4b	Chemical Calculations (VO 2/3 ECTS-Credits)
§5.3c	General Chemistry Laboratory Course (PR 6/5.5 ECTS-Credits)	§5.4c	General Chemistry (PR 4/3 ECTS-Credits)
§5.4a	Analytical Chemistry I (VO 3/5 ECTS-Credits)	§5.5a	Analytical Chemistry I (VO 3/4.5 ECTS-Credits)
§5.5a	Mathematics for Chemists Part II (VO 2/2.5 ECTS-Credits)	§5.6	Mathematics II for Students of Chemistry (VU 3/5 ECTS-Credits)
§5.6a	Experimental Lecture Main Group Chemistry (VO 2 /2.5 ECTS-Credits)	§5.7a	Experimental Lecture Main Group Chemistry (VO 2/2.5 ECTS-Credits)
§6.6b	Transition Metal Chemistry (VO 2/2.5 ECTS-Credits)	§5.7b	Transition Metal Chemistry (VO 2/2.5 ECTS-Credits)
§5.7	Organic Chemistry I (VO 4/5 ECTS-Credits)	§5.8	Organic Chemistry I (VO 4/5 ECTS-Credits)
§5.8	Laboratory Course "Chemistry in Aqueous Solution" (PR 10/7.5 ECTS-Credits)	§5.9	Chemistry in Aqueous Solution (PR 10/7.5 ECTS-Credits)
§5.9a	Analytical Chemistry II (VO 2/3.5 ECTS-Credits)	§5.5c	Analytical Chemistry II (VO 1/1.5 ECTS-Credits)
		§5.10a	Analytical Chemistry III (VO 1/1.5 ECTS-Credits)
§5.9b	Chemometrics and Data Analysis (VO 1/1.5 ECTS-Credits)	§5.5b	Data Analysis and Chemometrics (VO 1/1.5 ECTS-Credits)
§5.10a	Quantitative Analytical Chemistry - Basic Practical Course (PR 5/4 ECTS-Credits)	§5.12	Quantitative Analytical Chemistry – Basic Practical Course (PR 4/5 ECTS-Credits)
§5.10b	Basic Practical Course in Instrumental Analysis (PR 5/3.5 ECTS- Credits)	§5.13	Basic Practical Course in Instrumental Analysis (PR 4/5 ECTS-Credits)
§5.11a	Organic Chemistry II (VO 2/2.5 ECTS-Credits)	§5.14a	Organic Chemistry II (VO 2/2 ECTS-Credits)
§5.11b	Structure Elucidation I (VO 2/2.5 ECTS-Credits)	§5.14b	Structure Elucidation I (VO 2/1.5 ECTS-Credits)

§5.11c	Preparation Techniques in Organic Chemistry (VO 2/2.5 ECTS-Credits)	§5.14c	Preparation Techniques in Organic Chemistry (VO 2/1.5 ECTS-Credits)
§5.12a	Physical Chemistry I (VO 3/4 ECTS-Credits)	§5.15	Thermodynamics (VU 4/5 ECTS-Credits)
§5.12b	Exercises in Physical Chemistry I (PS 1/1 ECTS-Credit)		
§5.13	Biochemistry I (VO 3/5 ECTS-Credits)	§5.16	Biochemistry I (VO 3/5 ECTS-Credits)
§5.14	Laboratory Course Inorganic Synthesis (PR 6/5 ECTS- Credits)	§5.17	Inorganic Synthesis (PR 5/5 ECTS-Credits)
§5.15	Biochemistry II (VO 3/5 ECTS-Credits)	§5.19a	Biochemistry II (VO 3/3 ECTS-Credits)
		§5.19b	Biochemical Methods (VO 2/1 ECTS-Credit)
		§5.19c	Biochemical Methods (UE 1/1 ECTS-Credit)
§5.16a	Physical Chemistry II (VO 3/4 ECTS-Credits)	§5.11	Introduction to Quantum Theory (VU 3/2.5 ECTS-Credits)
§5.16b	Exercises in Physical Chemistry II (PS 1/1 ECTS-Credits)		
§5.17	Theoretical Chemistry I (VO 2/2,5 ECTS-Credits)	§5.18	Theoretical Chemistry I (VO 2/2.5 ECTS-Credits)
§5.18a	Methods of Physical Chemistry I (VO 1/1.5 ECTS-Credits)	§5.21	Laboratory Course in Physical Chemistry I (PR 6/5 ECTS-Credits)
§5.18b	Practical Course Physical Chemistry I (PR 6/6 ECTS-Credits)		
§5.19a	Structure Elucidation II (VO 2/3 ECTS-Credits)	§5.23a	Structure Elucidation II (VO 2/3 ECTS-Credits)
§5.19b	Laboratory Course in Organic Chemistry I (PR 10/7 ECTS-Credits)	§5.23b	Laboratory Course in Organic Chemistry I (PR 9/7 ECTS-Credits)
§5.20a	Environmental Chemistry (VO 1/1.5 ECTS-Credits)	§5.24a	Environmental Chemistry (VO 1/1.5 ECTS-Credits)
§5.20b	Solid State Chemistry (VO 2/3.5 ECTS-Credits)	§5.24b	Solid State Chemistry (VO 2/3.5 ECTS-Credits)
§5.21	Laboratory Course in Basic Biochemistry (PR 4/2.5 ECTS-Credits)	§5.25	Laboratory Course in Basic Biochemistry (PR 5/5 ECTS-Credits)
§5.22	Macromolecular Chemistry (VO 2/2.5 ECTS-Credits)	§5.26	Macromolecular Chemistry (VO 2/2.5 ECTS-Credits)
§5.23	Analytical Radiochemistry (VO ½.5 ECTS-Credits)	§5.10b	Analytical Chemistry IV (VO 1/1 ECTS-Credit)
§5.24a	Structure Elucidation III (VO 1/1.5 ECTS-Credits)	§5.27a	Structure Elucidation III (VO 1/2 ECTS-Credits)
§5.24b	Organic Synthesis (VO 2/2 ECTS-Credits)	§5.27b	Organic Synthesis (VO 2/3.5 ECTS-Credits)
§5.24c	Chemical Biology (VO 1/1.5 ECTS-Credits)	§5.27c	Chemical Biology (VO 1/2 ECTS-Credits)
§5.25a	Physical Chemistry III (VO 4/5 ECTS-Credits)	§5.20b	Kinetics (VO 2/2.5 ECTS-Credits)
		§5.30a	Physical Electrochemistry (VO 2/2.5 ECTS-Credits)
§5.25b	Methods of Physical Chemistry II (VO 1/1 ECTS-Credit)	§5.28	Laboratory Course in Physical Chemistry II (PR 6/5 ECTS-Credits)

§5.25c	Practical Course Physical Chemistry II (PR 6/4 ECTS-Credits)		
§5.26a	Theoretical Chemistry II (VO 2/2.5 ECTS-Credits)	§5.22	Theoretical Chemistry II (VO 2/2.5 ECTS-Credits)
§5.27	Theoretical Chemistry Laboratory (PR 2/2.5 ECTS-Credits)	§5.29a	Methods of Theoretical Chemistry (VU 1/1.5 ECTS-Credits)
		§5.29b	Theoretical Chemistry Laboratory (PR 3/3.5 ECTS-Credits)
§5.28	Physical Chemistry IV (VO 4/5 ECTS-Credits)	§5.20a	Thermodynamics: Advanced Course (VO 2/2.5 ECTS-Credits)
		§5.30b	Statistical Thermodynamics (VO 2/2.5 ECTS-Credits)
§5.29	Laboratory Course in Organic Chemistry II (PR 10/7.5 ECTS-Credits)	§5.31	Laboratory Course in Organic Chemistry II (PR 8/7.5 ECTS-Credits)
§5.30	Bachelor Thesis Seminar (SE 2/15 ECTS-Credits)	§5.33	Bachelor's Thesis (SE 1/14+1 ECTS-Credits)