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9 Description of the education (the unit of study)

This chapter describes the education provided in your degree course in the form of a curriculum overview and description of the units of study, starting with the units of study in the propaedeutic phase, then those of the post-propaedeutic phase and finally those of the minors. Next a description is given of the abridged programme.

Curriculum table propaedeutical phase

A: Overview of Chemie (Dutch) Foundation Year

Term 1	Term 2	Term 3	Term 4
BMC1, BMC2a 2x 7,5 credits		C3K, C3P, C3T 3x 5 credits	C4K, C4P, C4T 3x 5 credits
BMC2b of BMC2c 7,5 credits	BMC2b of BMC2c 7,5 credits		

B: Overview of Chemistry (English variant) Foundation Year

Periode 1	Periode 2	Periode 3	Periode 4
CHLS1, CHLS2a 2x 7,5 credits		CH3K, CH3P, CH3T 3x5 credits	CH4K, CH4P, CH4T 3x 5 credits
CHLS2c 7,5 credits	CHLS2b 7,5 credits		

Curriculum table postpropaedeutical phase (voltijd)

A: Overview of Chemie (Dutch) postpropaedeutical phase

		periode 1	periode 2	periode 3	periode 4
2 ^e jaar		C7K, C7T 2x5 credits	C5K, C5T 2x5 credits	C6K, C6T 2x5 credits	C8K, C8T 2x5 credits
		C5-7Pa, C5-7Po 2x5 credits		C6-8Pa, C6-8Po 2x5 credits	
3 ^e jaar	Afstudeerrichting Organische chemie	C9 15 credits	C10 15 credits	Minor of stage (C13) 30 credits	
	Afstudeerrichting Analytische chemie	Minor of stage (C13) 30 credits		C11 15 credits	C12 15 credits
4 ^e jaar		Minor, stage (C13) of afstudeeropdracht (C14) 30 credits		Minor of afstudeer- opdracht (C14) 30 credits	

B: Overview of Chemistry (English variant) postpropaedeutical phase

Not applicable.

The English variant of the Chemistry program will start with the postpropaedeutical phase in the academic year 2020-2021.

Safety

If students by exemptions or other measures enter the degree programme in the main phase, they are required to take the workshop 'Safety in the laboratory' (BMLS1-Kv) and pass the assessment.

9.1 Units of study and modules of the propaedeutic phase, including elective units.

The foundation year of the study degree programme includes the following educational units with the associated studyload. There are no elective units.

Level 1

- A. Full-time Chemie (Dutch)
 - a. OWE 1: BMC1 (7.5 study credits)
 - b. OWE 2a: BMC2a (7.5 study credits)
 - c. OWE 2b: BMC2b (7.5 study credits)
 - d. OWE 2c: BMC2c (7.5 study credits)
 - e. OWE 3K: C3K (5 study credits)
 - f. OWE 3P: C3P (5 study credits)
 - g. OWE 3T: C3T (5 study credits)
 - h. OWE 4K: C4K (5 study credits)
 - i. OWE 4P: C4P (5 study credits)
 - j. OWE 4T: C4T (5 study credits)
- B. Full-time Chemistry (English variant)
 - a. Course unit 1: CHLS1 (7.5 study credits)
 - b. Course unit 2a: CHLS2a (7.5 study credits)
 - c. Course unit 2b: CHLS2b (7.5 study credits)
 - d. Course unit 2c: CHLS2c (7.5 study credits)
 - e. Course unit 3K: CH3K (5 study credits)
 - f. Course unit 3P: CH3P (5 study credits)
 - g. Course unit 3T: CH3T (5 study credits)
 - h. Course unit 4P: CH4P (5 study credits)
 - i. Course unit 4T: CH4K (5 study credits)
 - j. Course unit 4T: CH4T (5 study credits)

This section only contains the OWE descriptions of the English variant of the study program. The Dutch OWE descriptions can be found in the Onderwijs en Examenregeling of the study program Chemie.

Course unit 1: CHLS1 (7.5 study credits)

CHLS1	
General information	
Target group/groups	Full-time students common foundation year - Biology and Medical Laboratory Research, Life Sciences, Chemistry
Name of unit of study	ECU 1: Basic knowledge for Life Sciences
Code of unit of study	CHLS1
Lecture period	Term 1 and 2
ECTS credits	7,5 stp
Study load in hours	210 SBU
Study hours (contact hours)	Planned lesson/contact hours approximately 9 lesson periods per week, approx. 63 lesson periods per term 1 = approx. 47 hours approximately 8 lesson periods per week, approx. 56 lesson periods per term 2 = approx. 41 hours Planned time for self-study: Term 1 = 58 hours, Term 2 = 64 hours Total: 210 hours
Entry requirements for unit of study	HAVO (higher general continued education)/VWO (pre-university) diploma with the profile Nature and Technology or Nature and Health, MBO diploma level 4.
Content and organisation	
General description	In Course unit 1, subjects introduced are essential to the degree program. The basic knowledge on lab calculations, Mathematics and safety is the central focus of this course unit. The students are also introduced to the Biobased Economy.
Exit qualifications	Quality control Teamwork Guiding professional development
Professional task	Carrying out life science research.
Professional products	Poster Biobased Economy (CHLS1-BEpos)
Cohesion	Course 1 is the first course of the degree program. In this course is basic knowledge learned or brought to the required level.
Mandatory participation	Participation in the Workshops LPO Professional Skills 1 and Professional Skills 2 is compulsory.
Maximum number of participants	
Compensation options	Klab = Klab2, except if Klab1 \geq 5.5 then Klab = Klab2 + 1, Klab2 is compensable from 4.5 Kwis = Kwis2, except if Kwis1 \geq 5.5 then Kwis = Kwis2 + 1, Kwis2 is compensable from 4.5 Klab1 and Kwis1 are valid for 1 year
Activities and/or instructional formats	Supporting subject Lab calculations Density Percentages and fractions Atom mass, molecular mass and formula mass Molar and molecular mass Molecular- and mixture formulas

	<p>Mixing and dilution Concentration and dilution Reaction calculations <i>Teaching methods: combined lectures/response classes</i></p> <p>Supporting subject Mathematics Basic calculation rules (including formulas) Functions, including comparisons and isolating variables:- Lines- Quadratic functions- Broken functions- Power functions- Logarithms and exponential functions- Goniometric differentiation <i>Teaching methods: combined lectures/response classes</i></p> <p>Supporting subject Safety Laboratory Rules Safe handling of materials Waste categories Practical rules/accident or incident <i>Working methods: Response lectures and work discussion in the lab</i></p> <p>LPO Professional Skills 1 and Professional Skills 2 professional attitude, communication and co-operation. <i>Working methods: workshop</i></p>
Required literature	<p>The latest edition of: - Douwes D. J. et al., Basisvaardigheden Wiskunde, Groningen: Wolters-Noordhoff. - Leven, I. van 't Veiligheid en milieu in laboratoria. Utrecht: Syntax Media.</p>
Required software / required materials	-
Recommended literature	Verkerk G. et al. BINAS book VWO HAVO. Noordhoff Uitgeverij.
Examination	
	CHLS1-Klab /CH LS1-Klab1 / CH LS1-Klab2
Name [exams or modular exams]	Theory exam lab calculations / Theoretical exam 1 lab calculations / Theoretical exam 2 lab calculations
Code [exams or modular exams]	CHLS1-Klab / CHLS1-Klab1 / CHLS1-Klab2
Exam and modular exam format(s)	CHLS1-Klab: Administrative / CHLS1-Klab1 and CHLS1-Klab2: Individual, In writing, Open Questions
Judgement	Grade
Minimum result	CHLS1-Klab: 5.5 / CHLS1-Klab1: 0 / CHLS1-Klab2: 4.5
Weight factor of modular exam	CHLS1-Klab: 1 / CHLS1-Klab1: 0 / CHLS1-Klab2: 0
Exam opportunities	CHLS1-Klab1: term 1. CHLS1-Klab2: term 2, resits period 3. For participation in the modular examinations Klab1 there is one chance per academic year (EER paragraph 8.5). Participation in Klab1 is only possible in the first year of enrolment.
Permitted resources	Non-graphic calculator, periodic system

Method of enrolment for exam / enrolment period	Registration for the modular exam via Alluris. The registration period is a few weeks prior to the exam period. The registration and exam periods are specified in the annual timetable of the ITBC institute on Insite.
Discussion and review	The annual timetable of ITBC indicates when the exam periods / resit periods are and when the work made can be viewed. Inspection takes place in the presence of a supervisor. The follow-up discussion of the exam is scheduled in the following teaching period. The follow-up discussion of exams taken in a resit period is scheduled at the end of the education period. To the follow-up discussion is held at the end of period 4 before the start of the resit period of period 4.
Number of examiners	Two examiners for construction and evaluation. Assessment by one examiner using the correction model (theory lecturer).
Compensation possibility	$K_{lab} = K_{lab2}$, except if $K_{lab1} \geq 5.5$ then $K_{lab} = K_{lab2} + 1$ K_{lab1} is valid for 1 year
Competences and indicators	Knowledge of lab calculations: - knows the elementary calculation rules and the relevant laboratory core relationships. - has insight into the relations between several key relations
Assessment criteria	The student is able to: - systematically work out problems in lab work using elementary calculation rules and the several core relationships. - systematically work out problems with chemical reactions using several core relationships. - conversion of units - calculate volume and mass using density of a solution; - perform calculations with percentages and fractions; - calculate atomic mass, molecular mass and formula mass of a substance; - perform calculations with mol and molecular mass; - calculate molecular and empirical formulas of a substance; - calculate the concentration of a substance after mixing and dilution; - calculations with reactions.
Test matrix	Klab1 Conversion of units and isolation of units ~20%-30% Mol and molar mass, stoichiometrics, Molecular and mixture formulas ~40-50% Gaslaw and Calculations with reactions approx. 20-30% Klab 2 Conversion of units and isolation of units ~10%-20% Mol and molar mass, stoichiometrics, Molecular and mixture formulas ~20-30% Gaslaw and Calculations with reactions approx. 10-20% Dilutions and mixing ~40%-60%
	CHLS1-Kwis / CHLS1-Kwis1 / CHLS1-Kwis2
Name [exams or modular exams]	Theoretical exam Mathematics / Theoretical exam Mathematics 1 / Theoretical exam Mathematics 2

Code [exams or modular exams]	CHLS1-Kwis / CHLS1-Kwis1 / CHLS1-Kwis2
Exam and modular exam format(s)	CHLS1-Kwis: Administrative / CHLS1-Kwis1 and CHLS1-Kwis2: Individual, In writing, Open Questions
Judgement	Grade
Minimum result	CHLS1-Kwis: 5.5 / CHLS1-Kwis1: 0 / CHLS1-Kwis2: 4.5
Weight factor of modular exam	CHLS1-Kwis: 1 / CHLS1-Kwis1: 0 / CHLS1-Kwis2: 0
Exam opportunities	CHLS1-Kwis1: period 1. CHLS1-Kwis2: period 2, resits period 3. For participation in the modular examinations Kwis1 there is one chance per academic year (EER paragraph 8.5). Participation in Kwis1 is only possible in the first year of enrolment.
Permitted resources	Non-graphical calculator
Method of enrolment for exam / enrolment period	Registration for the modular exam via Alluris. The registration period is a few weeks prior to the examperiod period. The registration and examperiods are specified in the annual timetable of the ITBC institute on Insite.
Discussion and review	The annual timetable of ITBC indicates when the exam periods / resit periods are and when the work made can be viewed. Inspection takes place in the presence of a supervisor. The follow-up discussion of the exam is scheduled in the following teaching period. The follow-up discussion of exams taken in a resit period is scheduled at the end of the education period. To the follow-up discussion is held at the end of period 4 before the start of the resit period of period 4.
Number of examiners	Two examiners for construction and evaluation. Assessment by one examiner using the correction model (theory lecturer).
Compensation possibility	Kwis = Kwis2, except if $Kwis1 \geq 5.5$ then $Kwis = Kwis2 + 1$, Kwis2 is compensable from 4.5 Kwis1 is valid for 1 year
Competences and indicators	Knowledge of mathematics
Assessment criteria	The student masters the following basic mathematics skills: Calculating order and calculation with fractions Manipulating formulas with powers (with whole, negative and broken exponents)Factor analysis and eliminate brackets Find the equation rule of a line Solving equations on lines, quadratic functions, broken functions, power functions, logarithms and exponential functions Isolate variables on lines, quadratic functions, broken functions, power functions, logarithms and exponential functions Trigonometry in rectangular triangles Convert from degrees to radians and vice versa To know the connection between graphic waveform and trigonometric function Apply sinus rule and cosine rule in random triangles Differentiate with standard rules, sum rule, product line, chain rule

Test matrix	<p>Kwis1: 1 question on each of the following topics, where each of the 10 questions for Kwis1 determines 10% of the grade: Adding/subtracting fracture formulas + simplifying Break/split fracture formulas + simplify Simplify power formula (write without broken and/or negative exponent) Remove brackets Isolate at break equations Write equation for a line through two points Determine the cutting point of two lines or solve system equations Solving second-degree equations by means of decomposing in factors or abc-formula Solve broken equations Asymptote broken function</p> <p>Kwis2: 10 questions like Kwis1, plus 10 questions, of which 1 on each of the following topics, where each of the 20 questions for Kwis2 determines 5% of the grade: Solve equation with root Isolate with various types of equations Comparison with exponential function Comparison with logarithm or apply logarithm calculation rules Apply trigonometry in a rectangular triangle and/or calculate with radians Apply sine rule and/or cosine rule Determination of amplitude, period, equilibrium position and phase shift in trigonometric function Differentiate with standard rules Differentiate with product line Differentiate with chain rule</p>
	CHLS1-Kvei
Name [exams or modular exams]	Theory exam Safety
Code [exams or modular exams]	CHLS1-Kvei
Exam and modular exam format(s)	Individual, Written, Multiple choice
Judgement	Grade
Minimum result	5,5
Weight factor of modular exam	0
Exam opportunities	CHLS1-Kvei: period 1, resit end periode 1.
Permitted resources	
Method of enrolment for exam / enrolment period	Registration for the modular exam via Alluris. The registration period is a few weeks prior to the examperiod period. The registration and examperiods are specified in the annual timetable of the ITBC institute on Insite.

Discussion and review	The annual timetable of ITBC indicates when the exam periods / resit periods are and when the work made can be viewed. Inspection takes place in the presence of a supervisor. The follow-up discussion of the exam is scheduled for the resit
Number of examiners	Two examiners for construction and evaluation. Assessment by one examiner using the correction model (theory lecturer).
Compensation possibility	
Competences and indicators	Competence 4: Quality control 4.1.1. Is aware of the health and safety rules and works according to these rules. Knowledge of safety in the lab.
Beoordelingscriteria	The student: can apply general and specific laboratory rules; is familiar with safety equipment available and how they should be used; recognize the safety symbols, GHS pictograms dangerous substances and knows how to act appropriately; know the short- and long-term effects of harmful substances on the human body and the environment; knows the definitions of safety concepts: MAC-value, LD50-value, R and S statements and can apply them; can estimate fire and explosion risk based on physical fire related concepts; can look up safety information on substances in MSDS sheets and chemistry charts; knows and recognises the biological agents knows the rules on "safe microbiological techniques"; knows the rules on processing lab waste (chemicals and biological agents); can indicate how first aid should be applied in lab situations.
Test matrix	10% laboratory rules 50% safe handling of materials 15% waste categories 25% Practical rules/accident or incident
	CHLS1-PS1
Name [exams or modular exams]	Professional Skills 1
Code [exams or modular exams]	CHLS1-PS1
Exam and modular exam format(s)	Individual, Oral
Judgement	Satisfactory / Unsatisfactory
Minimum result	Satisfactory
Weight factor of modular exam	0
Exam opportunities	See schedule lectures. For participation in the workshops there is one chance per academic year (EER paragraph 8.5).

Permitted resources	
Method of enrolment for exam / enrolment period	Participation in BMC1 counts as registration for CHLS1-PS1
Discussion and review	For questions about the assessment you can contact the examiner.
Number of examiners	Assessment by one examiner based on participation (lecturer workshop).
Compensation possibility	
Competences and indicators	<p>Competence 8: Teamwork Performance in a group</p> <p>8.1.1. Adheres to rules.</p> <p>8.1.2. Makes a valuable contribution to the group.</p> <p>Communication - Is able to communicate about their assignment with peers and lecturers applying basic rules of communication:</p> <p>8.1.6. Maintains eye contact with conversation partner.</p> <p>8.1.7. Gives others opportunity to speak.</p> <p>8.1.8. Verbally expresses their opinion/messages.</p> <p>8.1.9. Accepts and gives feedback, is <u>active</u> in conflict resolution</p> <p>Competence 11: Professional development</p> <p>11.1.3. Reflects critically on own performance and learning process; learns from mistakes.</p>
Assessment criteria	Participation in the Professional Skills Workshop and completion of the task are both required for a satisfactory assessment.
	CHLS1-PS2
Name [exams or modular exams]	Professional Skills 2
Code [exams or modular exams]	CHLS1-PS2
Exam and modular exam format(s)	Individual, Oral
Judgement	Satisfactory / Unsatisfactory
Minimum result	Satisfactory
Weight factor of modular exam	0
Exam opportunities	See schedule lectures. For participation in the workshops there is one chance per academic year (EER paragraph 8.5).
Permitted resources	
Method of enrolment for exam / enrolment period	Participation in BMC1 counts as registration for CHLS1-PS2
Discussion and review	For questions about the assessment you can contact the examiner.
Number of examiners	Assessment by one examiner based on participation (workshop lecturer).

Compensation possibility	
Competences and indicators	<p>Competence 8: Teamwork Performance in a group</p> <p>8.1.1. Adheres to rules.</p> <p>8.1.2. Makes a valuable contribution to the group.</p> <p>Communication</p> <p>Is able to communicate about their assignment with peers and lecturers applying basic rules of communication:</p> <p>8.1.6. Maintains eye contact with conversation partner.</p> <p>8.1.7. Gives others opportunity to speak.</p> <p>8.1.8. Verbally expresses their opinion/messages.</p> <p>8.1.9. Accepts and gives feedback, is <u>active</u> in conflict resolution</p> <p>Competence 11: Professional development</p> <p>11.1.3. Reflects critically on own performance and learning process; learns from mistakes.</p>
Assessment criteria	Participation in the Professional Skills workshop and the execution of the assignment are required for a sufficient assessment
	CHLS1-FG1
Name [exams or modular exams]	Performance review 1
Code [exams or modular exams]	CHLS1-FG1
Exam and modular exam format(s)	Individual, Oral
Judgement	Satisfactory / Unsatisfactory
Minimum result	Satisfactory
Weight factor of modular exam	0
Exam opportunities	3 performance reviews per year: start school year, semester 2, end propaedeutic year. FG1 is the performance review for the start of the school year
Permitted resources	
Method of enrolment for exam / enrolment period	Participation in CHLS1 counts as registration for CHLS1-FG1. The study coach makes an appointment with the student.
Discussion and review	For questions about the assessment you can contact the examiner.
Number of examiners	Assessment by one examiner (Study coach).
Compensation possibility	-
Competences and indicators	<p>Competence 8: Teamwork and communication</p> <p>8.1.1. Adheres to rules.</p> <p>Competence 11: Professional development</p> <p>11.1.2. Works on learning aims as described in the PDP and collated competency assessment products</p>

	<p>11.1.3. Reflects critically on own performance and learning process; learns from mistakes.</p> <p>11.1.4. Has study skills required by higher professional education; is motivated and determined.</p>
Assessment criteria	<ul style="list-style-type: none"> - Students meets agreements, is punctual, and has completed the preparatory assignment (e.g. DPF is in order). - The student can demonstrate that he has actively worked on the learning outcomes that are described in the PDP. - The student methodically critically reviews his/her learning process, identifies what went well, and what didn't go well, identifies the causes of these, and links it to his/her own actions. A plan for improvement in the future is formulated. - The student shows a pro-active attitude and is motivated. He/she shows determination in his study.
	CHLS1-BEpos
Name [exams or modular exams]	Poster Biobased Economy
Code [exams or modular exams]	CHLS1-BEpos
Exam and modular exam format(s)	Poster Assignment, in pairs
Judgement	Satisfactory / Unsatisfactory
Minimum result	Satisfactory
Weight factor of modular exam	0
Exam opportunities	Term 1 or term 2. Resits in agreement with the examiner
Permitted resources	-
Method of enrolment for exam / enrolment period	Participation in BMC1 counts as registration for CHLS1-BEpos The poster presentation is included in the class schedule
Discussion and review	For questions about the assessment you can contact the examiner.
Number of examiners	Assessment by one examiner (Study coach).
Compensation possibility	-
Competences and indicators	Knowledge of the Biobased Economy, comparison of a product made from fossil fuels with a product that is produced Biobased. See assessment form 'Poster Biobased Economy year 1' on #OnderwijsOnline - General information.
Assessment criteria	See assessment form 'Poster Biobased Economy year 1' on #OnderwijsOnline - General information.

Course unit 2a: CHLS2a (7.5 study credits)

CHLS2a	
General information	
Target group/groups	Full-time students common foundation year - Biology and Medical Laboratory Research, Life Sciences
Name of unit of study	ECU 2a: Basic practical skills Chemistry, Biology & Medical
Code of unit of study	CHLS2a
Lecture period	Term 1 and 2
ECTS credits	7,5 stp
Study load in hours	210 SBU
Study hours (contact hours)	Practical Biology and Medical Research/ Practical Chemistry Planned lesson/ contact hours: Avg. 8 periods (lesson hours) per week= 56 periods per term = 42 clock hours per term. Planned time for self-study: 63 clock hours per term. Total: 105 hours
Entry requirements for unit of study	HAVO diploma (higher general continued education) or higher, with the profile Nature and Technology or Nature and Health, MBO diploma level 4
General information	
General description	Practical Biology & Medical Students work on basic biology knowledge from different vantage points. Both prokaryotic and eukaryotic cells and tissues are covered. Practical Chemistry Students work on the synthesis and analysis of different food additives. These include vitamins, minerals, dyes, aromas and preservatives.
Exit qualifications	Designing an experimental plan Experiment Results analysis Quality control Management and administration Reporting and presenting Planning and project-based working Professional development
Professional task	Carrying out life science research.
Professional products	Lab journals
Cohesion	Course 2a is related to Course 2b and 2c. The practical of LS in course unit 2a is linked with the theory LS in course unit 2b. The chemistry practical of course unit 2a is linked with the chemistry theory in course unit 2c.
Mandatory participation	To participate in CHLS2a-Pb and CHLS2a-Pc, attendance at the practical lessons mandatory. CHLS2a-Pc and CHLS2a-Pb: in case of insufficient attendance of practicals (Knock-out) practical assessment is 0.0 (no further

	assessment will be given). CHLS2a-Pb: Participation in practical exam is not allowed when practical assessment is 0.0 (knock-out).
Maximum number of participants	
Compensation options	
Activities and/or instructional formats	<p>Practical Biology & Medical: Histological staining Cytology Microbiology Molecular techniques Microscopy Biochemical techniques <i>Teaching methods: lab practicals</i></p> <p>Practical Chemistry: Weighing, Pipetting, Titration Dilution, Spectrophotometry Synthesis (reflux) Melting point Refractive index IR spectrometry, TLC <i>Teaching methods: lab practicals</i></p>
Required literature	The latest version of: - Campbell N, Reece J, <i>Biology</i> , Pearson Education Inc - Nivaldo J Tro; <i>Principles of chemistry</i> , Pearson - Dean, J.R. <i>et al.</i> : <i>Practical skills in Chemistry/Biomolecular sciences</i> , Prentice Hall, Harlow
Required software / required materials	LabArchives
Recommended literature	
Examination	
	CHLS2a-Pb
Name [exams or modular exams]	Practical grade Biology and Medical
Code [exams or modular exams]	CHLS2a-Pb
Exam and modular exam format(s)	Individual, Practical, In writing
Judgement	Grade

Minimum result	5,5
Weight factor of modular exam	1
Exam opportunities	Term 2. For the modular examination Pb there is only one chance per academic year (EER paragraph 8.5). Independent resit of practical assessment and practical test is not allowed. When the practical test is missed due to illness and the student has officially reported sick, or personal circumstances (for review to the course coordinator and/or Examination Board) then the student has the right to resit the practical test.
Permitted resources	
Method of enrolment for exam / enrolment period	Participation in CHLS2a is sufficient for enrolment in CHLS2a-Pb
Discussion and review	Returning the completed assessment form to the student and any feedback on the form or in the professional product serves as inspection and discussion of this partial examination.
Number of examiners	Assessment by one examiner based on assessment form (Practical lecturer).
Compensation possibility	Final mark BMC2a-Pb = Practical assessment + Practical test/2 Component mark Practical assessment or Practical test <5.5 allowed when final mark BMC2a-Pb is at least 5.5.
Competences and indicators	<p>Competence 1: Design</p> <p>1.1.4. Forms a hypothesis based on the research question.</p> <p>Competence 2: Experiment</p> <p>2.1.1. Reads and understands the practical guide; understands the theoretical background of the main steps of the methods.</p> <p>2.1.2. Performs calculations prior to beginning lab work.</p> <p>2.1.4. Carries out experiments accurately according to the protocol.</p> <p>2.1.5. Carries out the experiment within the given time frame.</p> <p>Competence 3: Results analysis</p> <p>3.1.1. Carries out results analysis according to the prescribed methods; performs error analysis in the correct manner (if applicable).</p> <p>3.1.2. Evaluates the obtained results based on their accuracy and reliability.</p> <p>3.1.3. Makes conclusions relating to the initial research question (if possible).</p> <p>3.1.4. Discusses the execution of the experiment and results.</p> <p>Competence 4: Quality control</p> <p>4.1.1. Is aware of the health and safety rules and works according to these rules.</p> <p>4.1.2. Calibrates simple equipment (pH meters)</p> <p>Competence 5: Management and administration</p> <p>5.1.1. Encodes chemicals and samples; stores these in the prescribed manner.</p> <p>5.1.2. Leaves the workplace tidy and clean.</p>

	<p>5.1.3. Manages and archives data in lab journal (aim, experiment description, alterations, results, conclusion) and if relevant, other ways of storing data.</p> <p>Competence 6: Reporting and presenting 6.1.1. Reports their research according to the products criteria for lab journal and reports; level 1: uses correct spelling and grammar; is aware of the scientific style; uses simple and logical structure; describes results so the reader can understand; uses clearly labelled figures and tables. 6.1.3 Is familiar with the international conventions of scientific and academic writing.</p> <p>Competence 7: Methodology 7.1.2. Works according to the previously described plan.</p> <p>Competence 11: Professional development 11.1.5. Has study skills required by higher professional education; is motivated and determined.</p> <p>In the context of: Histology staining, Cytology, Microbiology, Molecular techniques, Microscopy and Biochemical techniques</p>
Assessment criteria	<p>Practical assessment: throughout the course are assessed as a total using the assessment form</p> <p>Practical exam: The student performs one or more individual experiments carried out during the hours of practical lessons. The student is assessed using the assessment form.</p> <p>For assessment forms see #OnderwijsOnline- general information</p>
Test matrix	<p>For assessment forms see #OnderwijsOnline- general information</p> <p>Practical assessment: Lab journal general = 18% Preparation = 20% Lab work = 44% Analysis = 18%</p> <p>Practical exam Lab work = 35% Lab journal = 65%</p>
	CHLS2a-Pc
Name [exams or modular exams]	Practical skills Chemistry
Code [exams or modular exams]	CHLS2a-Pc

Exam and modular exam format(s)	Individual, Practical, In writing
Judgement	Grade
Minimum result	5,5
Weight factor of modular exam	1
Exam opportunities	Term 1. For the modular examination Pc there is only one chance per academic year (EER paragraph 8.5).
Permitted resources	
Method of enrolment for exam / enrolment period	Participation in CHLS2a is sufficient for enrolment in CHLS2a-Pc
Discussion and review	Returning the completed assessment form to the student and any feedback on the form or in the professional product serves as inspection and discussion of this partial examination.
Number of examiners	Assessment by one examiner based on assessment form (Practical lecturer).
Compensation possibility	
Competences and indicators	<p>Competence 1: Design</p> <p>1.1.4. Forms a hypothesis based on the research question.</p> <p>Competence 2: Experiment</p> <p>2.1.1. Reads and understands the practical guide; understands the theoretical background of the main steps of the methods.</p> <p>2.1.2. Performs calculations prior to beginning lab work.</p> <p>2.1.4. Carries out experiments accurately according to the protocol.</p> <p>2.1.5. Carries out the experiment within the given time frame.</p> <p>Competence 3: Results analysis</p> <p>3.1.1. Carries out results analysis according to the prescribed methods; performs error analysis in the correct manner (if applicable).</p> <p>3.1.2. Evaluates the obtained results based on their accuracy and reliability.</p> <p>3.1.3. Makes conclusions relating to the initial research question (if possible).</p> <p>3.1.4. Discusses the execution of the experiment and results.</p> <p>Competence 4: Quality control</p> <p>4.1.1. Is aware of the health and safety rules and works according to these rules.</p> <p>4.1.2. Calibrates simple equipment (pH meters)</p> <p>Competence 5: Management and administration</p> <p>5.1.1. Encodes chemicals and samples; stores these in the prescribed manner.</p> <p>5.1.2. Leaves the workplace tidy and clean.</p> <p>5.1.3. Manages and archives data in lab journal (aim, experiment description, alterations, results, conclusion) and if relevant, other ways of storing data.</p>

	<p>Competence 6: Reporting and presenting 6.1.1. Reports their research according to the products criteria for lab journal and reports; level 1: uses correct spelling and grammar; is aware of the scientific style; uses simple and logical structure; describes results so the reader can understand; uses clearly labelled figures and tables. 6.1.3 Is familiar with the international conventions of scientific and academic writing.</p> <p>Competence 7: Methodology 7.1.2. Works according to the previously described plan.</p> <p>Competence 11: Professional development 11.1.5. Has study skills required by higher professional education; is motivated and determined.</p> <p>In the context of: Acids and bases, Electrochemistry, Organic Chemistry</p>
<p>Assessment criteria</p>	<p>Data reports are assessed (insufficient, sufficient, good) using the assessment form.</p> <p>Practical assessment (grade): Lab journals, practical impression lab work and total assessment of data reports are assessed as a total using the assessment form.</p> <p>See assessment forms on #OnderwijsOnline for general information.</p>
<p>Test matrix</p>	<p>Lab journal general = 13% Preparation = 20% Lab work = 45% Data reports = 22%</p> <p>For assessment forms see #OnderwijsOnline- general information</p>

Course unit 2b: CHLS2b (7.5 study credits)

CHLS2b	
General information	
Target group/groups	Full-time students common foundation year - Biology and Medical Laboratory Research, Life Sciences
Name of unit of study	ECU 2b: Basic theory Biology and Medical
Code of unit of study	CHLS2b
Lecture period	Term 2
ECTS credits	7,5 stp
Study load in hours	210 SBU
Study hours (contact hours)	Lesson/contact hours, 8 lesson hours (periods) per week; 56 lesson hours per term = 42 clock hours Scheduled time for constructing exams: 6 lesson hours (periods) = 4.5 clock hours Planned time for self-study: 163.5 clock hours Total: 210 hours
Entry requirements for unit of study	HAVO (higher general continued education) diploma with the profile Nature and Technology or Nature and Health, MBO diploma level 4
Content and organisation	
General description	Students work on basic biology knowledge from different vantage points. Both prokaryotic and eukaryotic cells are covered, plant and animal tissues and several metabolic routers. The overall theme is energy. In addition to substantive biological knowledge, practical skills such as working with Excel and giving presentations are discussed.
Exit qualifications	Designing an experimental plan Experiment Results analysis Quality control Reporting and presenting Planning and project-based working Teamwork Managing professional development
Professional task	Carrying out life science research.
Professional products	Presentation LS (Prb)
Cohesion	Course 2b is related to the practical LS Course 2a. The theory offered in Course 2b is related to the lab practicals in Course 2a.
Mandatory participation	Attendance at the tutor groups is a prerequisite for participation in the modular exams IPS and Prb.
Maximum number of participants	
Compensation options	K = Ket. If Ktt ≥ 5.5 then K = Ket + 1. Ket is compensable from 4.5 Ktt is valid for 1 year.

Activities and/or instructional formats	<p>Supporting subject Biology Cells, Macromolecules, Tissues, Digestion, Photosynthesis, Cell respiration <i>Combined lectures/response classes</i></p> <p>Supporting subject Theory of the lab practicals Theoretical background to lab practice <i>Combined lectures/response classes</i></p> <p>Tutor Introduction and preparation of weekly assignments <i>Methods: Meetings</i></p>
Required literature	The latest version of: Reece. J.B. Campbell Biology. New York, NY Pearson Education.
Required software / required materials	LabArchives
Recommended literature	
Examination	
	CHLS2b-K / CHLS2b-Ktt / CHLS2b-Ket
Name [exams or modular exams]	CHLS2b-K: Theory exam / CHLS2b-Ktt: Theoretical exam 1 / CHLS2b-Ket: Theoretical exam 2
Code [exams or modular exams]	CHLS2b-K / CHLS2b-Ktt / CHLS2b-Ket
Exam and modular exam format(s)	CHLS2b-K: Administrative / CHLS2b-Ktt and CHLS2b-Ket: Individual, In writing, Multiple choice
Judgement	Grade
Minimum result	CHLS2b-K:5.5 / CHLS2b-Ktt: 0 / CHLS2b-Ket: 4.5
Weight factor of modular exam	CHLS2b-K: 1 / CHLS2b-Ktt: 0 / CHLS2b-Ket: 0
Exam opportunities	CHLS2b-Ktt: Term 2 CHLS2b-Ket: Term 2, resit during term 3. There is only one opportunity per year for the modular exam Ktt (EER paragraph 8.5). Participation in Ktt is only possible in the first year of enrolment.
Permitted resources	Regular calculator
Method of enrolment for exam / enrolment period	Registration for the modular exam via Alluris. The registration period is a few weeks prior to the exam period. The period is specified in the annual timetable of the ITBC institute on Insite.
Discussion and review	<ul style="list-style-type: none"> • The annual schedule of ITBC indicates when the exam periods / resit periods are and when the work can be reviewed. Review takes place in the presence of a supervisor. • The discussion of the exam is scheduled in the following teaching period. The discussion of exams taken in a resit period is scheduled at the end of the education period.. • Participation in the discussion is only permitted if you have taken the exam.
Number of examiners	Two examiners for construction and evaluation. Assessment by one examiner using the correction model (theory lecturer).

Compensation possibility	K = Ket. If Ktt ≥ 5.5 then K = Ket + 1. Ket is compensable from 4.5 Ktt is valid for 1 year.
Competences and indicators	Knowledge of 'basic cell and tissue biology' and 'background theory belonging to the processes taking place in the lab experiments'
Assessment criteria	Introduction Cell Biology and histology (Biology) The student has knowledge of: -eukaryotic cell structure and function; -differences between the prokaryotic and eukaryotic cell; -the structure and function of biological macromolecules; -the structure and function of plant tissues; -the structure and function of animal tissues; -food digestion in (enzymatic) breakdown of macromolecules; -photosynthesis in plants; -cellular respiration in animal cells. Background theory of experiments (theory for practicals) The student has knowledge of: -DNA isolation; -determination of macromolecules; -cell and tissue staining; -microscope use; -application of prior calculations for experiments; -starch digestion and determination; -urine composition; -fermentation
Test matrix	65% (± 5%) Basic cell biology and histology 35% (± 5%) Background theory experiments
	CHLS2b-T
Name [exams or modular exams]	Theme test B&M
Code [exams or modular exams]	CHLS2b-T
Exam and modular exam format(s)	In writing, Open Questions, Individual
Judgement	Grade
Minimum result	5,5
Weight factor of modular exam	1
Exam opportunities	Term 2, resit during term 3
Permitted resources	Regular calculator
Method of enrolment for exam / enrolment period	Registration for the modular exam via Alluris. The registration period is a few weeks prior to the exam period. The period is specified in the annual timetable of the ITBC institute on Insite.
Discussion and review	• The annual schedule of ITBC indicates when the exam periods / resit periods are and when the work can be reviewed. Review takes place in the presence of a supervisor.

	<ul style="list-style-type: none"> • The discussion of the exam is scheduled in the following teaching period. The discussion of exams taken in a resit period is scheduled at the end of the education period.. • Participation in the discussion is only permitted if you have taken the exam.
Number of examiners	Two examiners for construction and evaluation. Assessment by one examiner using the correction model (theory lecturer).
Compensation possibility	
Competences and indicators	<p>Competence 1: Design</p> <p>1.1.4. Forms a hypothesis based on the research question.</p> <p>1.1.5. Integrates information into a simple research plan.</p> <p>1.1.6. Understands and applies simple English literature relevant to the given context.</p> <p>Competence 2: Experiment</p> <p>2.1.1. Reads and understands the practical guide; understands the theoretical background of the main steps of the methods.</p> <p>2.1.2. Performs calculations prior to beginning lab work.</p> <p>Competence 3: Results analysis</p> <p>3.1.1. Carries out results analysis according to the prescribed methods; performs error analysis in the correct manner (if applicable).</p> <p>3.1.3. Makes conclusions relating to the initial research question (if possible).</p> <p>Competence 4: Quality control</p> <p>4.1.1. Is aware of the health and safety rules and works according to these rules.</p> <p>In the context of:</p> <p>Histology staining</p> <p>Cytology</p> <p>Microbiology</p> <p>Molecular techniques</p> <p>Microscopy</p> <p>Biochemical techniques</p>
Assessment criteria	<p>Basic cell and tissue biology (Biology) and tutor tasks</p> <p>The student has knowledge of:</p> <ul style="list-style-type: none"> -eukaryotic cell structure and function; -differences between the prokaryotic and eukaryotic cell; -the structure and function of macromolecules; -the structure and function of plant tissues; -the structure and function of animal tissues; -food digestion in (enzymatic) breakdown of macromolecules; -photosynthesis in plants; -cellular respiration in animal cells; -transcription and translation in animal cells; -Diabetes Mellitus; -MET values and can apply them in calculations.

	<p>Background theory of experiments (theory for practicals) The student: -understands the background theory of the experiments; -can perform calculations in preparation; -interprets results and can perform calculations; -can make correct conclusions based on results.</p>
Test matrix	<p>50 (± 5)% basic cell biology and histology (Biology) and Tutor tasks. 50 (± 5)% background theory experiments.</p>
	CHLS2b-Prb
Name [exams or modular exams]	Presentation B&M
Code [exams or modular exams]	CHLS2b-Prb
Exam and modular exam format(s)	Oral, Group (pairs)
Judgement	Individual Grade
Minimum result	5,5
Weight factor of modular exam	1
Exam opportunities	Term 2, resit in consultation with lecturer.
Permitted resources	
Method of enrolment for exam / enrolment period	Participation in CHLS2b is sufficient for enrolment in CHLS2b-Prb
Discussion and review	Returning the completed assessment form to the student and any feedback on the form or in the professional product serves as inspection and discussion of this partial examination.
Number of examiners	Assessment by one examiner based on assessment form (Theory lecturer).
Compensation possibility	
Competences and indicators	<p>Competence 1: Design 1.1.1. Identifies relevant background information required to answer the research question. 1.1.2. Knows the criteria defining reliable sources of information in scientific research.</p> <p>Competence 6: Reporting and presenting 6.1.5. Presents research to a target audience with similar knowledge background, applies general presentation techniques and answers questions: uses correct spelling and grammar; describes results so the reader can understand; uses clearly labelled figures and tables; there is an introduction-body-conclusion structure to the presentation; speaks clearly and coherently;</p>

	<p>has upright posture and hands are freely used; makes eye contact with the audience; makes organized and clear slides or other visual products.</p> <p>Competence 8: Teamwork Communicates his task to fellow students and lecturer according to the basic rules of communication; if needed, supervised by the lecturer. 8.1.6. Maintains eye contact with conversation partner. 8.1.7. gives others opportunity to speak. 8.1.8. Verbally expresses their opinion/messages clearly.</p> <p>In the context of: Biology and Medical</p>
Beoordelingscriteria	See Evaluation form "Presentation course 2" on #OnderwijsOnline - General information
Test matrix	See Evaluation form "Presentation course 2" on #OnderwijsOnline - General information
	CHLS2b-IPV
Name [exams or modular exams]	IPS B&M
Code [exams or modular exams]	CHLS2b-IPV
Exam and modular exam format(s)	Oral, Individual
Judgement	Satisfactory / Unsatisfactory
Minimum result	Satisfactory
Weight factor of modular exam	0
Exam opportunities	Terms 2. There is only one opportunity per year for the modular exam IPS (EER paragraph 8.5)
Permitted resources	
Method of enrolment for exam / enrolment period	Participation in CHLS2b is sufficient for enrolment in CHLS2b-IPV
Discussion and review	For questions about the assessment you can contact the examiner.
Number of examiners	Assessment by one examiner based on attendance and participation (tutor).
Compensation possibility	
Competences and indicators	<p>Competence 6: Reporting and presenting 6.1.5 In English: Can communicate in simple and routine tasks requiring a simple and direct exchange of information on familiar and routine matters</p> <p>Competence 7: Methodology 7.1.2. Works according to the previously described plan.</p> <p>Competence 8: Teamwork</p>

	<p>Performance in a group</p> <p>8.1.1. Adheres the rules.</p> <p>8.1.2. Makes a valuable contribution to the group</p> <p>Communication - Is able to communicate about their assignment with peers and lecturers applying basic rules of communication.</p> <p>8.1.6. Maintains eye contact with conversation partner.</p> <p>8.1.7. Gives others opportunity to speak.</p> <p>8.1.8. Verbally expresses their opinion/messages clearly.</p> <p>8.1.12 Is aware of the international character of the professional community</p> <p>Competence 11: Professional development</p> <p>11.1.5. Has study skills required by higher professional education; is motivated, has determined.</p>
Assessment criteria	<p>The student:</p> <ul style="list-style-type: none">-adheres to the rules agreed upon (k.o.);-fulfils his/her roles (Chair, secretary etc.);-has prepared for the meeting by completing the assignment to be discussed, and also completed the required reading for the following assignment to be discussed. the student is able to show weekly assignments to the tutor (according to agreement, in writing or as a presentation);-in all assignments all required aspects are complete;-asks questions and shares knowledge regarding the assignment during tutor meetings;-verbalises these clearly and audibly, maintains eye contact;-allows others to finish speaking;-the student offers feedback to group and class members and is open to receiving feedback.

Course unit 2c: CHLS2c (7.5 study credits)

CHLS2c	
General information	
Target group/groups	Full-time students common foundation year - Biology and Medical Laboratory Research, Life Sciences
Name of unit of study	ECU 2c: Basic theory Chemistry
Code of unit of study	CHLS2c
Lecture period	Term 1
ECTS credits	7,5 stp
Study load in hours	210 SBU
Study hours (contact hours)	Planned lesson/contact hours: 9 lesson hours (periods) per week + 5 assessment hours; 68 lesson hours per term = 51 clock hours Planned time for self-study: 159 hours Total: 210 hours
Entry requirements for unit of study	HAVO (higher general continued education) diploma with the profile Nature and Technology or Nature and Health, MBO diploma level 4
Content and organisation	
General description	Students work on different aspects in chemistry. Students work on the synthesis and analysis of different food additives. These include: vitamins, minerals, dyes, aromas and preservatives. In addition to substantive chemical knowledge, practical skills such as working with Excel and giving presentations are discussed.
Exit qualifications	Designing an experimental plan Experiment Results analysis Quality control Reporting and presenting Planning and project-based working Teamwork Managing professional development
Professional task	Carrying out life science research.
Beroepsproducten	Presentation Chemistry (Prc)
Cohesion	Course 2c is related to the practical Chemistry Course 2a. The theory offered in Course 2c is related to the lab practicals in Course 2a.
Mandatory participation	Attendance at the tutor groups is a prerequisite for participation in the modular examination IPS and Prc.
Maximum number of participants	
Compensation options	$K = K_{et}$. If $K_{tt} \geq 5.5$ then $K_c = K_{et} + 1$, K_{et} is compensable from 4.5. K_{tt} is valid for 1 year.
Activities and/or instructional formats	Supporting subject: Chemistry theory Fundamentals: Basic chemistry

	<p>Strong acids and bases + titration (also weak acids) Spectrophotometry Atom and molecule structure Organic chemistry: functional groups and nomenclature <i>Combined lectures/response classes</i></p> <p>Supporting subject: Theory of the lab practicals Theoretical background to lab practice <i>Combined lectures/response classes</i></p> <p>Supporting subject: Tutor Introduction and preparation on weekly tasks.</p>
Required literature	<p>The latest edition of: - Nivaldo. J Tro, Principles of chemistry, a molecular approach.</p>
Required software / required materials	LabArchives
Recommended literature	
Examination	
	CHLS2c-Ktt / CHLS2c-Ket / CHLS2c-K
Name [exams or modular exams]	Theory exam 1 Chemistry (Ktt) / Theory exam 2 Chemistry (Ket) / Theory exam Chemistry (K)
Code [exams or modular exams]	CHLS2c-Ktt / CHLS2c-Ket / CHLS2c-K
Exam and modular exam format(s)	CHLS2c-Ktt: Individual, In writing, Open Questions / CHLS2c-Ket: Individual, In writing, Open Questions / CHLS2c-K Administrative
Judgement	Grade
Minimum result	CHLS2c-Ktt: 0 / CHLS2c-Ket: 4.5 / CHLS2c-K: 5.5
Weight factor of modular exam	CHLS2c-Ktt: 0 / CHLS2c-Ket: 0 / CHLS2c-K: 1
Exam opportunities	<p>CHLS2c-Ktt: during term 1 / CHLS2c-Ket: term 1, resit term 2.</p> <p>There is only one opportunity per year for the modular exam Ktt (EER paragraph 8.5). Participation in Ktt is only possible in the first year of enrolment.</p>
Permitted resources	Regular calculator
Method of enrolment for exam / enrolment period	Registration for the modular exam via Alluris. The registration period is a few weeks prior to the exam period. The period is specified in the annual timetable of the ITBC institute on Insite.
Discussion and review	<ul style="list-style-type: none"> • The annual schedule of ITBC indicates when the exam periods / resit periods are and when the work can be reviewed. Review takes place in the presence of a supervisor. • The discussion of the exam is scheduled in the following teaching period. The discussion of exams taken in a resit period is scheduled at the end of the education period.. • Participation in the discussion is only permitted if you have taken the exam.

Number of examiners	Two examiners for construction and evaluation. Assessment by one examiner using the correction model (theory lecturer).
Compensation possibility	K = Ket. if Ktt \geq 5.5 then K = Ket + 1, Ket is compensable from 4.5. Ktt is valid for 1 year.
competences and indicators	Knowledge of chemistry: -Basic chemistry -Acids and bases -Spectrometry -Organic Chemistry -Atom and molecule structure
Beoordelingscriteria	<p>Basic chemistry</p> <p>The student is able to:</p> <ul style="list-style-type: none"> -describe how an atom or simple ion is structured; -draw ratio formulas of ion and molecule formulas of molecules; -naming cations, anions ion compounds and inorganic compounds or vice versa; -calculate using the formulas $c = n/V$ and $m = n \cdot M_m$; -predict the possible reaction between 2 substances and balance the reaction equation; -calculating and working with precipitation reactions (balancing equations, calculate hvh, predict precipitate); -identifying an oxidizer and a reducing agent of the oxidation and reduction reaction by the determination of the oxidation numbers of the elements in a compound; -make balanced redox reactions on the basis of half-reactions. <p>Acids and bases</p> <p>The student is able to:</p> <ul style="list-style-type: none"> -balance acid-base reactions and identify acids and bases; -calculates the pH and pOH of a solution of strong acids and bases; -calculate the concentration H_3O^+ and OH^- from the pH and K_w; -calculation of pH at every point in a titration of a strong acid with a strong base or vice versa; -calculate the volume of titrant at the end point of the titration. <p>Spectrometry</p> <p>The student is able to:</p> <ul style="list-style-type: none"> -knows the relationship between wavelength and energy; -Calculate using the Lambert-Beer Law; -convert extinction to transmission and vice versa. calculate with the relation between the energy of light/a photon and the frequency of light. <p>Organic Chemistry</p> <p>The student is able to:</p> <ul style="list-style-type: none"> -identify two molecules as structural isomers or stereoisomers; -draw hydrocarbons with and without functional groups on the basis of the name and determine whether the name is correct; -nomenclature of hydrocarbons with and without functional groups;

	<p>-recognizing and naming functional groups (haloalkane, alcohol, ether, phenol, aldehyde, ketone, carboxylic acid, amine, amide or ester);</p> <p>-predict the influence of hydrogen bridges on the physical properties of organic molecules/describe trends in physical properties of alkanes;</p> <p>-drawing the structure formula of an ester or an amine from the reaction of an alcohol and acid, or an amine and an acid (and vice versa).</p> <p>Atom and molecular construction</p> <p>The student can / knows:</p> <p>-what is meant by the main quantum number, the magnetic quantum number, shell, sub-shell and s-, p-, d- and f-orbitals with the help of the Aufbau principle, the rule of Hund and the Pauli prohibition can divide the electrons of the elements over the different orbitals;</p> <p>-what is meant by the noble gas configuration, electron configuration and valence electrons;</p> <p>-what is meant by Lewis formula, Lewis symbol, octet rule and valences draw a Lewis structure from simple singular and multiple bonds;</p> <p>-calculate formal charges of the different resonance structures of poly atoms.</p>
Test matrix	<p>Ktt:</p> <p>Basic chemistry: Approx. 50%</p> <p>Acids and bases: approx. 50%</p> <p>Ket:</p> <p>Basic chemistry approx. 20%</p> <p>Acids and bases: approx. 30%</p> <p>Spectrometry/atom and molecule structure: approx. 35%</p> <p>Organic Chemistry: approx. 15%</p>
	CHLS2c-T
Name [exams or modular exams]	Theme test Chemistry
Code [exams or modular exams]	CHLS2c-T
Exam and modular exam format(s)	Individual, In writing, Open Questions
Judgement	Grade
Minimum result	5,5
Weight factor of modular exam	1
Exam opportunities	Term 1, resit term 2
Permitted resources	Regular calculator
Method of enrolment for exam / enrolment period	Registration for the modular exam via Alluris. The registration period is a few weeks prior to the exam period. The period is specified in the annual timetable of the ITBC institute on Insite.
Discussion and review	<ul style="list-style-type: none"> The annual schedule of ITBC indicates when the exam periods / resit periods are and when the work can be reviewed. Review takes place in the presence of a supervisor.

	<ul style="list-style-type: none"> • The discussion of the exam is scheduled in the following teaching period. The discussion of exams taken in a resit period is scheduled at the end of the education period. • Participation in the discussion is only permitted if you have taken the exam.
Number of examiners	Two examiners for construction and evaluation. Assessment by one examiner using the correction model (theory lecturer).
Compensation possibility	-
Competences and indicators	<p>Competence 1: Design</p> <p>1.1.4. Forms a hypothesis based on the research question.</p> <p>1.1.5. Integrates information into a simple research plan.</p> <p>1.1.6. Understands and applies simple English literature relevant to the given context.</p> <p>Competence 2: Experiment</p> <p>2.1.1. Reads and understands the practical guide; understands the theoretical background of the main steps of the methods.</p> <p>2.1.2. Performs calculations prior to beginning lab work.</p> <p>Competence 3: Results analysis</p> <p>3.1.1. Carries out results analysis according to the prescribed methods; performs error analysis in the correct manner (if applicable).</p> <p>3.1.3. Makes conclusions relating to the initial research question (if possible).</p> <p>Competence 4: Quality control</p> <p>4.1.1. Is aware of the health and safety rules and works according to these rules.</p> <p>Competence 7: Methodology</p> <p>7.1.1. Plans and organises activities in a simple work plan</p> <p>In the context of: Basic chemistry Acids and bases Spectrometry Organic Chemistry</p>
Assessment criteria	The student: <ul style="list-style-type: none"> -Lists important safety aspects of chemicals; -Notes relevant information of chemicals on a safety form; -names chemical compounds correctly; -explains which particles precipitate in a reaction and which remain in solution; -is able to explain which particle remains in solution; -is able to write an ionic equation; -proposes a correct reaction equation or ion equation for a precipitation reaction;

	<ul style="list-style-type: none"> -performs calculations on various types of reactions; -is able to select relevant information from articles and express in for example, molecular and structural formulas, and reaction equations; -correctly writes molecular formulas; -draws a block diagram of a spectrophotometer; -explains the mechanism of the different components of a spectrophotometer; -explains the background of UV/VIS spectrometry; -can draw up a calibration curve from data points; -can calculate the concentration of a substance from a calibration curve using Beer's Law; -draws chemical structures of organic substances in the correct manner; makes a distinction between different organic compounds based on characteristic groups (e.g. alcohol, acid, ester); -can write a correct reaction equation with structure formulas for the synthesis of an ester; -performs correct calculations on acid-base titrations.
Test matrix	Safety: ca 5% Nomenclature: ca 5% Calculations on comments/precipitation reactions: ca 15% Spectrophotometry approx. 30% Acid-base titrations approx. 25% Organic chemistry approx. 20%
	CHLS2c-Prc
Name [exams or modular exams]	Presentation Chemistry
Code [exams or modular exams]	CHLS2c-Prc
Exam and modular exam format(s)	Oral, Group (pairs)
Judgement	Individual Grade
Minimum result	5,5
Weight factor of modular exam	1
Exam opportunities	Term 1, resit in consultation with lecturer.
Permitted resources	
Method of enrolment for exam / enrolment period	Participation in CHLS2c is sufficient for enrolment in CHLS2c-Prc
Discussion and review	Returning the completed assessment form to the student and any feedback on the form or in the professional product serves as inspection and discussion of this partial examination.
Number of examiners	Assessment by one examiner based on assessment form (Theory lecturer).

Compensation possibility	
Competences and indicators	<p>Competence 1 Design</p> <p>1.1.1. Identifies relevant background information required to answer the research question.</p> <p>1.1.2. Knows the criteria defining reliable sources of information in scientific research.</p> <p>Competence 6: Reporting and presenting</p> <p>6.1.5. Presents research to a target audience with similar knowledge background, applies general presentation techniques and answers questions:</p> <p>uses correct spelling and grammar;</p> <p>describes results so the reader can understand;</p> <p>uses clearly labelled figures and tables;</p> <p>there is an introduction-body-conclusion structure to the presentation;</p> <p>speaks clearly and coherently;</p> <p>has upright posture and hands are freely used;</p> <p>makes eye contact with the audience;</p> <p>makes organised and clear slides or other visual products.</p> <p>Competence 8: Teamwork – Communicates his task to fellow students and lecturer according to the basic rules of communication; if needed, supervised by the lecturer.</p> <p>8.1.6. Maintains eye contact with conversation partner.</p> <p>8.1.7. Gives others opportunity to speak.</p> <p>8.1.8. Verbally expresses their opinion/messages clearly.</p> <p>In the context of (Body of Knowledge and Skills) Chemistry</p>
Assessment criteria	See assessment form "Presentation course 2 Chemistry" on #OnderwijsOnline - general information
Test matrix	See assessment form "Presentation course 2 Chemistry" on #OnderwijsOnline - general information
	CHLS2c-IPV
Name [exams or modular exams]	IPS Chemistry
Code [exams or modular exams]	CHLS2c-IPV
Exam and modular exam format(s)	Individual, Oral
Judgement	Satisfactory / Unsatisfactory
Minimum result	Satisfactory
Weight factor of modular exam	0
Exam opportunities	Term 1. There is only one opportunity per year for the modular exam IPS (EER paragraph 8.5)
Permitted resources	

Method of enrolment for exam / enrolment period	Participation in CHLS2c is sufficient for enrolment in CHLS2c-IPV
Discussion and review	For questions about the assessment you can contact the examiner.
Number of examiners	Assessment by one examiner based on attendance and participation (tutor).
Compensation possibility	
Competences and indicators	<p>Competence 6: Reporting and presenting 6.1.5 In English: Can communicate in simple and routine tasks requiring a simple and direct exchange of information on familiar and routine matters.</p> <p>Competence 7: Methodology 7.1.2. Works according to the previously described plan.</p> <p>Competence 8: Teamwork - Functioning in a group 8.1.1. Adheres to rules. 8.1.2. Makes a valuable contribution to the group. Communication - Is able to communicate about their assignment with peers and lecturers applying basic rules of communication: 8.1.6.Maintains eye contact with conversation partner. 8.1.7. Gives others opportunity to speak. 8.1.8. Verbally expresses their opinion/messages clearly. 8.1.12 Is aware of the international character of the professional community</p> <p>Competence 11: Professional development 11.1.5. Has study skills required by higher professional education; is motivated and determined.</p>
Assessment criteria	<p>The student:</p> <ul style="list-style-type: none"> - adheres to the rules agreed upon (k.o.); - fulfils his/her roles (Chair, secretary etc.); <p>the student has prepared for the meeting by completing the assignment to be discussed, and also completed the required reading for the following assignment to be discussed.is able to show weekly assignments to the tutor (according to agreement, in writing or as a presentation);</p> <ul style="list-style-type: none"> - in all assignments all required aspects are complete; - asks questions and shares knowledge regarding the assignment during tutor meetings; verbalises these clearly and audibly, maintains eye contact; allows others to finish speaking; - offers feedback to group and class members and is open to receiving feedback.

Course unit 3K: CH3K (5 study credits)

CH3K	
General information	
Target group	Full-time students foundation year Chemistry / Full-time students of the MLO-transfer programme.
Name of unit of study	ECU 3K: Separation and purification: Organic and Polymer Chemistry Knowledge
Course unit code	C3K
Teaching Term	Term 3. If there are sufficient student numbers, the curriculum will be mirrored in Term 4.
ECTS credits	5 study credits
Study load in hours	140 SBU
Study hours (contact hours)	Programmed contact hours: 7 teaching periods per week = 49 teaching periods per term, 5.3 hours per week = 36.8 hours per term. Scheduled teaching time for self-study. 103.2 hours Total: 140 hours
Course entry requirements	HAVO (higher general continued education)/VWO (pre-university) diploma with the profile Nature and Technology or Nature and Health, and participated in course units CHLS1, CHLS2a, CHLS2b and CHLS2c. 4th year MLO chemistry: MLO diploma chemistry transfer programme
Content and organisation	
General description	In this course unit, we introduce basic knowledge in organic and polymer chemistry. The subjects organic structures and bonds and polymer chemistry are offered.
Exit qualifications	
Professional tasks and products	Carrying out Life Science Research
Professional products	
Cohesion	This course follows CHLS2c and preparation for CH6, CH7, and CH8. CH3 is divided into three course units, each worth 5 study credits: CH3K (knowledge), CH3P (practical), CH3T (theme, project).
Mandatory participation	
Maximum number of participants	
Compensation possibilities	Kpk and Kosb may be compensated from ≥ 4.0 . Final grade CH3K ≥ 5.5
Activities and/or instructional formats	<p>Supporting subject Polymer Chemistry</p> <ul style="list-style-type: none"> - Plastics: what are plastics, how are they made, -The polymer chain, the most common polymers and their monomers, how to recognise a polymer, what happens to plastics after use. - Properties of polymers: states, crystalline polymers, stiffness and creep, strength, thermal softening, shaping <p style="text-align: center;"><i>Working methods: combined lectures/response classes</i></p> <p>Supporting subject Organic structures and bonds</p> <ul style="list-style-type: none"> - Molecule construction: chemical bonding, organic compound orbitals, functional groups, stereochemistry - Mechanisms: esters and amides <p style="text-align: center;"><i>Working methods: combined lectures/response classes</i></p> <p>Supporting subject Physics</p> <p>Electricity, light, forces and energy</p>

Required literature	<ul style="list-style-type: none"> - McMurry, J. Organic Chemistry Cengage Learning Inc, Belmont CA, current edition - new book or reader for polymers The book will be communicated via the book list. - Nivaldo. J Tro, Principles of chemistry, a molecular approach, latest ed., Person Global Edition -Giancoli, D. C. <i>Physics for Scientists & Engineers with Modern Physics</i> (latest ed. ,Harlow: Pearson
Required software/required materials	
Recommended literature	
Examinations	
	CH3K-Kpk
Name of examination or modular examination	Theory Exam Polymers
Examination or modular examination code	CH3K-Kpk
Assessment type(s):	Individual written open questions
Result	Grade
Minimum result	5.5
Weight factor of modular exam	2
Exam opportunities	Term 3, resit mid-term 4
Permitted resources	
Method of enrolment for exam / enrolment period	Registration for the modular exam through Alluris. The registration period is a few weeks prior to the assessment period or the resits. The period is published in the academic calendar of the ITBC on Insite-Roosters
Discussion and review	<ul style="list-style-type: none"> - the exam and resit periods, and inspection of exam results are indicated in the ITBC academic calendar. Inspection takes place under supervision- the post-exam discussion is rostered in the following teaching period. - for exams taken during resit periods, the post-exam discussions are planned at the end of the teaching period. - Contact the examiner/course coordinator (for exams taken during a resit period) if you would like to discuss the exam. With no interest, the post-exam discussion does not take place. Participation in the post-exam discussion is only allowed if you have taken the exam.
Number of examiners	2 examiners for the construction and the evaluation. Assessment by one examiner based on the answer key (theory lecturer).
Possibilities for compensation	Kpk and Kosb may be compensated from ≥ 4.0 .
Assessment dimensions	The student: <ul style="list-style-type: none"> - can describe what plastics are and which technical classification is usually applied; - can describe the following concepts relating to polymers: <ul style="list-style-type: none"> - composition and properties of chains - relationship between chain regularity and properties - can describe the concept of copolymers and name a number of general copolymers; name copolymers; - knows and can name the difference between amorphous and crystalline polymers;

	<ul style="list-style-type: none"> - with consideration for environmental aspects, name benefits of plastics. - describe a number of methods (with the advantages and disadvantages) of waste processing such as incineration, pyrolysis, dumping; knows definitions in the field of polymer chemistry; synthesis of polymers. - synthesis of polymers.
<p>Assessment criteria</p>	<p>Polymers: Introduction The student:</p> <ul style="list-style-type: none"> - can describe what plastics are and what technical classification is usually applied; - can describe unique aspects of polymers, advantages and disadvantages; - can describe how polymers and polymer networks are made (addition polymerisation, polycondensation); - can describe extra components of a plastic (auxillaries and fillers) and the aim of adding these components. Structure of the polymers in relation to the physical properties; - can describe the composition and properties of chains: main and side chains, chain flexibility, chain interaction; - can calculate the various molar mass averages and can indicate the practical usefulness of these averages; - describe what is meant by chain regularity and can give examples (isotactic, syndiotactic); - can describe the relationship between the chain regularity and a characteristic (shape stability, processing); - can describe the concept of copolymers and name a number of general copolymers; - knows and can name the difference between amorphous and crystalline polymers; - can draw the V(-T) diagram for amorphous and crystalline polymers; - draw a log (E) T-diagram for amorphous polymers and give an explanation (from the molecular behavior) for the course of the curve (T_g); - can indicate what the sec. glass transition is and the causes of it; - can state the influence of time on the elasticity modulus at constant temperature; - can indicate what mechanical energy dissipation is; - describe what is meant by entropy and energy elasticity; - knows the dependence of the time scale on the length of the rubber plateau (silly putty); - can state when a polymer can and cannot crystallize; - can indicate the influence of the chain stiffness and chain interaction on the melting point of crystalline polymers; - can indicate the relationship between T_g and T_m; - can indicate what the crystallization process involves (germination, speed); - knows the effect of crystallization on the properties; <ul style="list-style-type: none"> - can describe a number of properties of the liquid state: viscosity, melt elasticity, die-swell, melt fracture; - can indicate the influence of the molar mass distribution on the processibility. <p>Structure of polymers in relation to the mechanical properties</p> <ul style="list-style-type: none"> - can read the stress-strain diagram: modulus of elasticity, yield stress, yield stress, fracture stress, fracture strain, fracture energy; - can indicate the differences between the polymers in terms of stiffness (in relation to the structure), hardness;

	- can describe the concept of viscoelasticity, creep, stress relaxation; Recycling of plastics - knows a number of advantages of plastics with regard to the environment: - knows a number of methods (with advantages and disadvantages) of waste processing,
Exam matrix	~20% polymer synthesis ~60% relationship between structure and properties ~ 20% processing methods
	CH3K-Koc
Name of examination or modular examination	Supporting subject Organic structures and bonds
Examination or modular examination code	CH3K-Kosb
Assessment type(s):	Individual, Written Open Questions
Result	Grade
Minimum result	5.5
Weight factor of modular exam	3
Exam opportunities	Term 3, resit mid-term 4
Permitted resources	
Method of enrolment for exam / enrolment period	Registration for the modular exam through Alluris. The registration period is a few weeks prior to the assessment period or the resits. The period is published in the academic calendar of the ITBC on Insite-Roosters
Discussion and review	- the exam and resit periods, and inspection of exam results are indicated in the ITBC academic calendar. Review in the presence of a supervisor. Inspection takes place under supervision- the post-exam discussion is rostered during the following teaching period. For exams taken during resit periods, the post-exam discussions are planned at the end of the teaching period. - Contact the examiner/course coordinator (for exams taken during a resit period) if you would like to discuss the exam. With no interest, the post-exam discussion does not take place. Participation in the post-exam discussion is only allowed if you have taken the exam.
Number of examiners	2 examiners for the construction and the evaluation. Assessment by one examiner based on the answer key (theory lecturer).
Possibilities for compensation	Kpk and Kosb may be compensated from ≥ 4.0 .
Assessment dimensions	- Knowledge of aliphatic organic chemistry: spatial structure, chemical and physical-chemical properties. - Indicate in a molecule of formal and partial charges, free electron pairs, dipole moments, electronegativity. - To know and apply concepts such as polar, apolar, Lewis acid and base, carbocation, carbanion, radical. - Lewis structures of elements and multiple atom molecules and ions. - Recognition of structural isomers. - Being able to read and use different forms of representation of organic molecules (written out line structures). - Spatial signs of organic compounds in different projections (Newman, Fischer, spatial). Application of the VSEPR theory. - Use of chemical drawing programs. - Knowing and naming functional groups and classes. - Know trivial names of common org. substances and side groups.

	<ul style="list-style-type: none"> - Knowing and applying nomenclature for alkanes. - Knowing and applying nomenclature for aromatic compounds. - Knowing and applying nomenclature rules for aliphatic compounds (halogen alkanes, alcohols, ethers, aldehydes, ketones, carboxylic acids and carboxylic acid derivatives). - Calculating molar mass a.d.h.v. gross formula (vv), degree of unsaturation (DBE), performing calculations based on reaction comparisons. - Knowing and recognizing the hybridization state of C, N and O atoms in a compound. - Is able to describe/draw the shape of atomic and molecular orbitals (bonding and anti-bonding orbitals). - intermolecular forces and phases. - Drawing resonance (boundary structures) of a connection (including electron relocations) and indicate which is (are) the most important. - Knowing concepts such as chirality, diastereomers, enantiomers, epimers. - Recognize double bond isomers and determine the stereochemistry (Z / E). - Recognize chiral compounds and chiral centers in organic molecules and determine their stereochemistry (R / S). - Drawing of chair and boat conformations of cyclohexanes (including Newman projections) and estimate relative importance. - Predict whether substituents on cyclohexanes have axial or equatorial position. - Surface tension, viscosity and capillary action.
<p>Assessment criteria</p>	<p>Organic Chemistry: The student:</p> <ul style="list-style-type: none"> - Knows the terms: charges, partial charge, free electron pairs, dipole moments and can indicate where they are located in the molecule; - recognizes polar and non-polar (parts of) molecules; knows what is meant by Lewis acids, Lewis bases, carbocations, carbanions and functional groups and recognizes these and can name them; - knows what is meant by constitutional isomers, and can draw these on the basis of a gross formula; - knows and recognizes groups of organic compounds; - knows the principle of naming simple org. compounds (nomenclature); - knows trivial names of common organic compounds and side groups; - can write down gross formulas a.d.h.v. structural formulas; - can a.d.h.v. a gross formula calculate the number of double-bond equivalents and arrive at a structural proposal; - recognizes hybridization states of C, N and O; - can determine stereochemistry of chiral C atoms (R / S) and of double bonds (Z / E); - can draw the spatial structure of organic connections (incl. Newman projections) of both linear and cyclic connections; - can indicate whether groups are axially or equatorially in six-membered rings and can draw them correctly; - can draw boundary structures (incl. electron relocations) of organic compounds; - can represent the mechanism of amide formation and hydrolysis; - can draw the mechanism of ester formation and hydrolysis; - knows what is meant by Lewis formula, Lewis symbol, octet rule and valencies; - can draw a Lewis structure of simple single and multiple bonds; - can calculate formal charges of the different resonance structures of poly atoms;

	<ul style="list-style-type: none"> - can establish a relationship between properties of molecules and geometry (VSEPR theory); - can make a proposal for the geometry of a molecule based on Lewis structures; - can explain the Valence Bond (VB) model; - can establish a relationship between in the intermolecular forces and the phase of a connection; - knows various intermolecular forces.
Exam matrix	<ul style="list-style-type: none"> - ~20% charges, partial charges, free electron pairs, dipole moments polar apolar, Lewis acids, Lewis bases, carbocation cations, carbanion functional groups - ~5% constitutional isomers incl., nomenclature - ~5% double bond equivalents, calculate gross formulas etc. - ~10% hybridization states - ~20% stereochemistry (chiral C-atoms, alkenes) - ~20% boundary structures + reaction mechanism - ~10% VSEPR theory and geometry - ~10% intermolecular forces
	CH3K-Nk
Name of examination or modular examination	Assignment Physics
Examination or modular examination code	CH3K-Nk
Assessment type(s):	Individual, Written
Result	Satisfactory/unsatisfactory
Minimum result	Satisfactory
Weight factor of modular exam	0
Exam opportunities	Term 3, resit mid-term 4.
Permitted resources	
Method of enrolment for exam / enrolment period	Participation in Course CH3K gives automatic registration for CH3K-Knat.
Discussion and review	There is no plenary review/discussion. The student can make an appointment to receive explanation about the questions.
Number of examiners	2 Examiners for construction and evaluation Assessment by one examiner based on the answer key (theory lecturer).
Possibilities for compensation	-
Assessment dimensions	Basic Physics
Assessment criteria	The student knows the basis physics of <ul style="list-style-type: none"> - Electricity - Optics - forces - Magnetism - Energy
Exam matrix	<ul style="list-style-type: none"> - ~30% electricity - ~30% forces - ~20% Optics - ~20% energy and magnetism

Course unit 3P: CH3P (5 study credits)

		CH3P
General information		
Target group	Full-time students foundation year Chemistry / Full-time students of the MLO-transfer programme.	
Name of unit of study	ECU 3P: Separation and purification: Organic and Polymer Chemistry Practical	
Unit of study code	CH3P	
Teaching Term	Term 3. If there are sufficient student numbers, the curriculum will be mirrored in Term 4.	
ECTS credits	5 study credits	
Study load in hours	140 SBU	
Study hours (contact hours)	Programmed contact hours: 10 teaching periods per week = 70 teaching periods per term, 7.5 hours per week = 52.5 hours per term. Scheduled teaching time for self-study. 87.5 hours Total: 140 hours	
Course entry requirements	HAVO /VWO diploma with the Nature and Technology or Nature and Health profile and participated in OWE CHLS1, CHLS2a, CHLS2b and CHLS2c. 4th year MLO chemistry: transfer programme MLO Chemistry diploma programme	
Content and organisation		
General description	Title: Separation and Purification. In this course unit, the basic skills in organic and polymer chemistry experiments are learned. The students learn how an organic/polymer chemistry lab journal and measurement report is made. They do this by working on, for example, synthesis of organic molecules and polymers with the relevant analyses.	
Exit qualifications	<ul style="list-style-type: none"> - Design - Experimenting - Results analysis - Quality control - Management and administration - Reporting and presenting - Planning and project-based working - Team work - Advising - Professional development The competencies in bold are those which are emphasized in this course.	
Professional task(s)	Carrying out Life Science Research	
Professional products		
Cohesion	This course follows CHLS2c and preparation for CH6, CH7, and CH8. CH3 is divided into three course units, each worth 5 study credits: CH3K (knowledge), CH3P (practical), CH3T (theme, project).	
Mandatory participation	Attendance at the practicals is a prerequisite for participation in the modular examination Pi.	
Maximum number of participants		
Compensation possibilities		

Activities and/or instructional formats	<p>Organic Chemistry and Polymer Chemistry Practical Extraction, Isolation and Synthesis of Painkillers Thin layer chromatography Synthesis and characterization of different polymers Separation and purification of an unknown mixture <i>Teaching methods: lab practicals</i></p> <p>Theory for the practical The background theory of the chemistry practical is explained. <i>Working methods: lecture</i></p>
Required literature	The latest edition of: - Holmes, D.A., Reed, R., Jones, A.M., Dean, J. Practical Skills in Chemistry, New York NY: Pearson Education Ltd.
Required software/required materials	LabArchives
Recommended literature	
Examinations	
	CH3P-Pi
Name of examination or modular examination	Practical performance
Examination or modular examination code	CH3P-Pi
Assessment types(s):	Individual Practical
Result	Grade
Minimum result	5.5
Weight factor of modular exam	1
Exam opportunities	Term 3, there is only one opportunity per academic year for the modular exam Pi (EER paragraph 8.5)
Permitted resources	
Method of enrolment for exam / enrolment period	Participation in Course CH3P gives automatic registration for CH3P-Pi.
Discussion and review	Returning the completed assessment form to the student and any feedback on the form or in the professional product serves as inspection and discussion of this partial examination.
Number of examiners	One examiner (practical teacher) for the assessment (assessment form)
Possibilities for compensation	
Assessment dimensions	<p>Competence 1: Design 1.1.4. Forms a hypothesis based on the research question.</p> <p>Competence 2: Experimenting 2.1.1. Reads and understand the practical guide; understands the theoretical background of the main steps of the methods. 2.1.2. Performs calculations prior to beginning lab work. 2.1.3. Ensures that all requirements are present before beginning the experiment. 2.1.4. Carries out experiments accurately according to the protocol. 2.1.5. Carries out the experiments within the given time frame.</p> <p>Competence 3: Results analysis 3.1.1. Carries out results analysis according to the prescribed methods; performs error analysis in the correct manner (if applicable).</p>

	<p>3.1.2. Evaluates the obtained results based on their accuracy and reliability.</p> <p>3.1.3. Makes conclusions relating to the initial research question (if possible).</p> <p>3.1.4. Discusses the execution of the experiment and results.</p> <p>Competence 4: Quality control</p> <p>4.1.1. Is aware of the health and safety rules and works according to these rules.</p> <p>4.1.2. Uses materials and equipment correctly.</p> <p>4.1.3. Uses controls, and uses these to assess the reliability of the results.</p> <p>Competence 5: Management and administration</p> <p>5.1.1. Encodes chemicals and samples; stores these in the prescribed manner.</p> <p>5.1.2. Leaves the work space tidy and clean.</p> <p>5.1.3. Manages and archives data in lab journal (aim, experiment description, alterations, results, conclusion) and if relevant, other ways of storing data.</p> <p>Competence 6: Reporting and presenting</p> <p>6.1.1. Reports their research according to the product criteria for lab journal and reports; level 1: uses correct spelling and grammar; is aware of the scientific style; uses simple and logical structure; describes results so the reader can understand; uses clearly labelled figures and tables.</p> <p>Competence 7: Working in a planned and project-based manner</p> <p>7.1.2. Plans the study tasks.</p> <p>Competence 11: Professional development</p> <p>11.1.3. Reflects critically on own performance and learning process; learns from mistakes</p> <p>11.1.5. Has study skills required by higher professional education; is motivated and determined.</p>
Assessment criteria	See assessment form for Practical with Lab Journal for the assessment of Chemistry Practical on #OnderwijsOnline - General Information
Exam matrix	See assessment form for Practical with lab journal level 1 for the assessment of Chemistry Practical on #OnderwijsOnline - General Information
	CH3P-Pm
Name of examination or modular examination	Measurement reports
Examination or modular examination code	CH3P-Pm
Assessment type(s):	Written, individual
Result	Grade
Minimum result	5.5
Weight factor of modular exam	1
Exam opportunities	Term 3, resit mid-term 4
Permitted resources	

Method of enrolment for exam / enrolment period	Participation in Course C3P gives automatic registration for CH3P-Pi.
Discussion and review	Returning the completed assessment form to the student and any feedback on the form or in the professional product serves as inspection and discussion of this partial examination.
Number of examiners	One examiner (practical teacher) for the assessment (assessment form)
Possibilities for compensation	
Assessment dimensions	<p>Competence 1: Question clarification 1.1.4. Forms a hypothesis based on the research question.</p> <p>Competence 2: Experimenting 2.1.1. Reads and understand the practical guide; understands the theoretical background of the main steps of the methods. 2.1.2. Performs calculations prior to beginning lab work. 2.1.3. Ensures that all requirements are present before beginning the experiment.</p> <p>Competence 3: Results analysis 3.1.1. Carries out results analysis according to the prescribed methods; performs error analysis in the correct manner (if applicable). 3.1.2. Evaluates the obtained results based on their accuracy and reliability. 3.1.3. Makes conclusions relating to the initial research question (if possible). 3.1.4. Discusses the execution of the experiment and results.</p> <p>Competence 6 Reporting and presenting 6.1.1. Reports their research according to the product criteria for lab journal and reports; level 1: uses correct spelling and grammar; is aware of the scientific style; uses simple and logical structure; describes results so the reader can understand; uses clearly labelled figures and tables.</p>
Assessment criteria	See Measurement Report Assessment Form on OnderwijsOnline - General Information
Exam matrix	See Assessment form on #OnderwijsOnline - General Information

Course unit 3T: CH3T (5 study credits)

CH3T	
General information	
Target group	Full-time students foundation year Chemistry / Full-time students of the MLO-transfer programme.
Name of unit of study	ECU 3T: Separation and purification: Organic and Polymer Chemistry Theme
Course unit code	CH3T
Teaching Term	Term 3. If there are sufficient student numbers, the curriculum will be mirrored in Term 4.
ECTS credits	5 study credits
Study load in hours	140 SBU
Study hours (contact hours)	Programmed contact hours: 6,1 teaching periods per week = 43 teaching periods per term, 4.4 hours per week = 30.7 hours per term. Scheduled teaching time for self-study. 109.3 hours Total: 140 hours
Course entry requirements	HAVO /VWO diploma with the Nature and Technology or Nature and Health profile and participated in CHLS1, CHLS2a, CHLS2b and CHLS2c. 4th year MLO chemistry: transfer programme MLO Chemistry diploma programme
Content and organisation	
General description	Title: Separation and purification: The central task of this course is to design a step-by-step plan in which a mixture can be purified using various techniques such as acid-base separation, for example. In addition, the student must ultimately write a short advice report on how to best deal with the purification of an unknown mixture.
Exit qualifications	<ul style="list-style-type: none"> - Design - Experimenting - Results analysis - Quality control - Management and administration - Reporting and presenting - Planning and project-based working - Team work - Advising - Professional development The competencies in bold are those which are emphasized in this course.
Professional task(s)	Carrying out Life Science Research
Professional products	
Cohesion	This course follows CHLS2c and preparation for CH6, CH7, and CH8. CH3 is divided into three course units, each worth 5 study credits: CH3K (knowledge), CH3P (practical), CH3T (theme, project).
Mandatory participation	Attendance at the tutor meetings is a prerequisite for participation in the modular examination IPS.
Maximum number of participants	
Compensation possibilities	
Activities and/or instructional formats	Tutor Pre and post discussion of assignments. <i>Method: Tutor</i>

	<p>Personal tutoring</p> <p>Expert Extra information is given with relation to the week tasks, practical and the central assignment. <i>Working methods: lecture</i></p> <p>Workshop chem-sketch Using chemistry drawing programmes <i>Method: workshop</i></p> <p>Workshop scientific writing, report structure, and design. Searching for reliable scientific information Developing an experimental plan <i>Method: workshop</i></p> <p>Workshop Professional Skills 3 Professional attitude Communication Cooperation <i>Method: workshop</i></p>
Required literature	<ul style="list-style-type: none"> - McMurry, J. Organic Chemistry Cengage Learning Inc, Belmont CA, latest edition - Nivaldo. J Tro, Principles of chemistry, a molecular approach, latest ed., Person Global Edition
Required software/required materials	chem-sketch (free download)
Recommended literature	
Examinations	
	CH3T-T
Name of examination or modular examination	Theme test
Examination or modular examination code	CH3T-T
Assessment type(s):	Individual, Written
Result	Grade
Minimum result	5.5
Weight factor of modular exam	2
Exam opportunities	Term 3, resit Term 4
Permitted resources	Non-graphical calculator, molecular model building box, periodical table
Method of enrolment for exam / enrolment period	Registration for the modular exam through Alluris. The registration period is a few weeks prior to the assessment period or the resits. The period is published in the academic calendar of the ITBC on Insite-Roosters
Discussion and review	<ul style="list-style-type: none"> - The exam and resit periods, and inspection of exam results are indicated in the ITBC academic calendar. Review in the presence of a supervisor. - Inspection takes place under supervision- the post-exam discussion is rostered during the following teaching period. For exams taken during resit periods, the post-exam discussions are planned at the end of the teaching period. - Contact the examiner/course coordinator if you would like to discuss the exam. With no interest, the post-exam discussion does not take place. - Participation in the post-exam discussion is only allowed if you have taken the exam.

Number of examiners	2 examiners for the construction and the evaluation. Assessment by one examiner based on the answer key (theory lecturer).
Possibilities for compensation	
Assessment dimensions	<p>Competence 2: Experimenting 2.1.1. Reads and understand the practical guide; understands the theoretical background of the main steps of the methods.</p> <p>Competence 3: Results analysis 3.1.1. Carries out results analysis according to the prescribed methods; performs error analysis in the correct manner (if applicable). 3.1.3. Makes conclusions relating to the initial research question (if possible).</p> <p>Competence 4: Quality control 4.1.1. Is aware of the health and safety rules and works according to these rules.</p> <p>In the theme test, the subjects covered in the week tasks and practical experiments are included.</p> <p>In the context of: - Polymer chemistry - Organic Chemistry - Separation and purification of an unknown mixture</p>
Assessment criteria	<p>The student knows or can, in relation to the week tasks:</p> <ul style="list-style-type: none"> - derive the structural formula of a substance from the mass percentages found with elemental analysis; - write down the reaction equation of different polymers - write down the reaction mechanism of different polymerizations <p>- preparing the reaction mechanism of an acid with an alcohol; - explain the different ways to perform a separation. - explain what happens chemically during an acid-base extraction.</p> <p>The student knows or can, in relation to practical work:</p> <ul style="list-style-type: none"> - indicate how a reflux arrangement can be made and what all components are for; - explain the principle of DSC; explain how a thermogram is created and explain the thermogram; - explain the principle behind TLC; calculate the R_f value of a substance by using a TLC plate and determining which substance is present in the sample; - calculations on reactions; - set up reaction mechanisms for radical polymerization, ester formation and amide formation; - the theory of organic chemistry and polymer chemistry in relation to practice; - the theoretical and practical backgrounds of separating and purifying a mixture.
Exam matrix	<p>The theme test is comprised of questions about practical work and about the week tasks in relation to the theory of organic and polymer chemistry:</p> <ul style="list-style-type: none"> - ~40% Organic Chemistry - ~40% Polymer chemistry - ~20% Separation and purification mixtures
	CH3T-IPV
Name of examination or modular examination	IPS

Examination or modular examination code	CH3T-IPV
Assessment type(s):	Oral, Individual
Result	Satisfactory/unsatisfactory
Minimum result	Satisfactory
Weight factor of modular exam	0
Exam opportunities	Term 3 Participation in modular exam IPV is only possible once per academic year (EER paragraph 8.5).
Permitted resources	
Method of enrolment for exam / enrolment period	Participation in Course CH3T gives automatic registration for CH3T-IPV.
Discussion and review	For questions about assessment, contact the examiner.
Number of examiners	One examiner for the assessment based on participation and effort (tutor)
Possibilities for compensation	
Assessment dimensions	<p>Competence 7: Working in a planned and project-based manner 7.1.2. Plans the study tasks.</p> <p>Competence 8: Teamwork Functioning in a group 8.1.1. Adheres to rules. 8.1.2. Makes a valuable contribution to the group</p> <p>Communication Communicates his task to fellow students and teacher according to the basic rules of communication; if needed, with teacher supervision: 8.1.6. Maintains eye contact with conversation partner. 8.1.7. Gives others opportunity to speak. 8.1.8. Verbally expresses their opinion/message.</p> <p>Competence 11: Professional development 11.1.5. Has study skills required by higher professional education; is motivated and determined.</p>
Assessment criteria	<p>The student can:</p> <ul style="list-style-type: none"> - the student has prepared for the meeting by completing the assignment to be discussed, and also completed the required reading for the following assignment to be discussed. - the student is able to show weekly assignments to the tutor (according to agreement, in writing or as a presentation); all required aspects are complete in all assignments; - Fulfils his/her roles (Chair, secretary etc.); - the student adheres to the rules agreed upon; - the student asks questions and shares knowledge regarding the assignment during tutor meetings; verbalises these clearly and audibly, maintains eye contact; - Allows others to finish speaking - the student offers feedback to group- and class members and is open to receiving feedback. - Participates in tutor lessons that are (partially) carried out in English.
	CH3T-Ad
Name of examination or modular examination	Advice Report
Examination or modular examination code	CH3T-Ad

Assessment type(s):	Written, individual
Result	Grade
Minimum result	5.5
Weight factor of modular exam	1
Exam opportunities	Term 3, resit Term 4
Permitted resources	
Method of enrolment for exam / enrolment period	Participation in Course CH3T gives automatic registration for CH3T-Ad.
Discussion and review	Returning the completed assessment form to the student and any feedback on the form or in the professional product serves as inspection and discussion of this partial examination.
Number of examiners	One examiner (practical teacher) for the assessment (assessment form)
Possibilities for compensation	
Assessment dimensions	<p>Competence 6: Reporting and presenting</p> <p>6.1.1. Reports their research according to the product criteria for lab journal and reports; level 1: uses correct spelling and grammar; is aware of the scientific style; uses simple and logical structure; describes results so the reader can understand; uses clearly labelled figures and tables.</p> <p>6.1.3. Is familiar with the international conventions of scientific and academic writing.</p> <p>Competence 10: Advising Advises on the purchase and use of materials, equipment: 10.1.1. Understands the needs and practical requirements. 10.1.2. Advises about purchase of reagents on the basis of product specifications and sales conditions.</p>
Assessment criteria	See assessment form Advice report on #OnderwijsOnline General Information
Exam matrix	See assessment form Advice report on #OnderwijsOnline General Information
	CH3T-PS3
Name of examination or modular examination	LPO Professional Skills 3
Examination or modular examination code	CH3T-PS3
Assessment type(s):	Individual, Written
Result	Satisfactory/unsatisfactory
Minimum result	Satisfactory
Weight factor of modular exam	0
Exam opportunities	Term 3. Resit assignment mid-term 4. For participation in the workshop there is only one opportunity per academic year (EER paragraph. 8.5)
Permitted resources	
Method of enrolment for exam / enrolment period	Participation in Course CH3T gives automatic registration for CH3T-LPO-PS3.
Discussion and review	For questions about assessment, contact the examiner.

Number of examiners	One examiner for the assessment based on participation and submission of reflection assignment (workshop lecturer)
Possibilities for compensation	
Assessment dimensions	Competence 8: Team work / communication 8.1.1. Adheres to rules. 8.1.2. Makes a valuable contribution to the group. 8.1.6. Maintains eye contact with conversation partner. 8.1.7. Gives others opportunity to speak. 8.1.8. Verbally expresses their opinion/message. 8.1.9. Is active in conflict resolution. Competence 11: Professional development 11.1.3. Reflects critically on own performance and learning process; learns from mistakes.
Assessment criteria	Participation in the workshop and submission of the reflection assignment is required for a satisfactory grade.
	CH3T-Op
Name of examination or modular examination	Research plan
Examination or modular examination code	CH3T-Op
Assessment type(s):	Written, Group
Result	Grade
Minimum result	5.5
Weight factor of modular exam	1
Exam opportunities	Term 3, resit mid-term 4
Permitted resources	
Method of enrolment for exam / enrolment period	Participation in Course CH3T gives automatic registration for CH3T-Op.
Discussion and review	Returning the completed assessment form to the student and any feedback on the form or in the professional product serves as inspection and discussion of this partial examination.
Number of examiners	One examiner (practical teacher) for the assessment (assessment form)
Possibilities for compensation	
Assessment dimensions	Competence 1: Design Question clarification 1.1.1. Identifies relevant background information required to answer the research question. 1.1.2. Knows the criteria defining reliable sources of information in scientific research. 1.1.3. Consults simple and relevant sources of scientific information. These sources are presented in the assignment. 1.1.4. Forms a hypothesis based on the research question. 1.1.5. Integrates information into a simple research plan. 1.1.6. Understands and applies simple English literature relevant to the given context. Competence 2: Experimenting: 2.1.1. Reads and understand the practical guide; understands the theoretical background of the main steps of the methods. 2.1.2. Performs calculations prior to beginning lab work.

	<p>2.1.3. Ensures that all requirements are present before beginning the experiment.</p> <p>Competence 3: Results analysis: 3.1.3. Makes conclusions relating to the initial research question (if possible).</p> <p>Competence 4: Quality control 4.1.1. Is aware of the health and safety rules and works according to these rules. 4.1.3. Uses controls, and uses these to assess the reliability of the results.</p> <p>Competence 6: Reporting and presenting 6.1.1. Reports their research according to the product criteria for lab journal and reports; level 1: uses correct spelling and grammar; is aware of the scientific style; uses simple and logical structure; describes results so the reader can understand; uses clearly labelled figures and tables. 6.1.3. Is familiar with the international conventions of scientific and academic writing.</p> <p>Competence 7: Working in a planned and project-based manner 7.1.1. Plans and organises activities in a simple work plan 7.1.3. Plans the study tasks</p> <p>Controlled dispensation medicines</p>
Assessment criteria	See assessment form research report on #OnderwijsOnline - General Information
Exam matrix	See assessment form research report on #OnderwijsOnline - General Information

Course unit 4K: CH4K (5 study credits)

		CH4K
General information		
Target group	Full-time students foundation year Chemistry / Full-time students of the MLO-transfer programme.	
Name of unit of study	ECU 4K: General Chemistry: Knowledge Chemical Equilibria and Analytical Chemistry	
Course unit code	CH4K	
Teaching Term	Term 4. If there are sufficient student numbers, the curriculum will be mirrored in Term 3.	
ECTS credits	5 study credits	
Study load in hours	140 SBU	
Study hours (contact hours)	Programmed contact hours: 6 periods (lesson hours) per week= 42 periods per term = 4.3 clock hours per term Planned time for self-study: 110 hours Total: 140 hours	
Course entry requirements	HAVO (higher general continued education)/VWO (pre-university) diploma with the profile Nature and Technology or Nature and Health, and participated in course units CHLS1, CHLS2a, CHLS2b and CHLS2c. 4th year MLO chemistry: transfer programme participant. MLO Chemistry diploma programme.	
Content and organization		
General description	This course unit is an introduction to analytical chemistry. Students receive general chemistry, thermodynamics and mathematics subjects.	
Exit qualifications	-	
Professional tasks and products	Carrying out Life Science Research	
Professional products		
Cohesion	This course follows CHLS2c and preparation for CH5 and CH7. CH4 is divided into three course units, each worth 5 study credits: CH4K (knowledge), CH4P (practical), CH4T (theme, project).	
Mandatory participation		
Maximum number of participants		
Compensation possibilities	Kthermo, Kwis and Kchemie can be compensated from 4.0. C4K end grade must be at least 5.5.	
Activities and/or instructional formats	<p>Supporting subjects General Chemistry Weak acids and bases, polyprotic acids, titrations Buffers Equilibrium constants Electrochemistry (redox reactions, Nernst equation) <i>Working methods: combined lectures/response classes</i></p> <p>Supporting subject: Thermodynamics Systems, states and energy Enthalpy The enthalpy of physical and chemical changes Entropy Changes in entropy Free Enthalpy <i>Working methods: lecture</i></p> <p>Supporting subject Mathematics</p>	

	Differentiating Trigonometry Logarithms <i>Working methods: lecture</i>
Required literature	The latest edition of: - Tro, N.J., Principles of chemistry, a molecular approach, Prentice Hall / Pearson Education. - Harris, D.C., Quantitative Chemical Analysis, W.H. Freeman & Company. - Douwes D. J. et al, Basisvaardigheden Wiskunde, Groningen: Wolters-Noordhoff.
Required software/required materials	
Recommended literature	
Examinations	
	CH4K-Kthermo
Name of examination or modular examination	Theory Exam Thermodynamics
Examination or modular examination code	CH4K-Kthermo
Assessment type(s):	Individual, Written Open Questions
Result	Grade
Minimum result	5.5
Weight factor of modular exam	2
Exam opportunities	Term 4, end term 4
Permitted resources	non-graphic calculator
Method of enrolment for exam / enrolment period	Registration for the modular exam through Alluris. The registration period is a few weeks prior to the assessment period or the resits. The period is published in the academic calendar of the ITBC on Insite-Roosters
Discussion and review	<ul style="list-style-type: none"> - The exam and resit periods, and inspection of exam results are indicated in the ITBC academic calendar. Review in the presence of a supervisor. - At the end of term 4, the post-exam discussion will be held before the start of the resit period of term 4. - Contact the examiner/course coordinator if you would like to discuss the exam. With no interest, the post-exam discussion does not take place. - Participation in the post-exam discussion is only allowed if you have taken the exam.
Number of examiners	2 examiners for the construction and the evaluation. Assessment by one examiner based on the answer key (theory lecturer).
Possibilities for compensation	Kthermo, Kwis and Kchemie can be compensated from 4.0.
Assessment dimensions	Thermodynamics <ul style="list-style-type: none"> - Ideal gas wet, volume-work - the first law of thermodynamics - the second law of thermodynamics - Chemical equilibria of thermodynamics

Assessment criteria	<p>The aim is to introduce the student to a broad range of thermodynamic concepts. The student knows the following concepts and subjects: the ideal gas law</p> <p>the first law - systems, energy and labor, heat, state functions, calorimetry; - enthalpy, phase transition enthalpy, reaction enthalpy, relationship between ΔH and ΔU, standard reaction enthalpy, Hess' law, standard enthalpy of formation.</p> <p>the second law spontaneous changes, entropy and disorder, change in entropy, standard molar entropy, standard reaction entropy; - environment, total entropy change, equilibrium, Gibbs' free energy, reaction free energy, change of free energy in biological systems. Chemical equilibria - thermodynamics of the chemical equilibrium, equilibrium constants, heterogeneous equilibrium, progress of the reaction, direction of the reaction: adding / removing a substance, compressing a reaction mixture, temperature and equilibrium; - equilibrium constants and equilibrium calculations, derivation of the Nernst Equation.</p>
Exam matrix	<p>~ 40-60% Ideal gas law and first law of thermodynamics ~ 40-60% The second law of thermodynamics and chemical equilibria</p>
	CH4K-Kchemie
Name of examination or modular examination	General Chemistry Theory Exam
Examination or modular examination code	CH4K-Kchemie
Assessment type(s):	Individual, Written Open Questions
Result	Grade
Minimum result	5.5
Weight factor of modular exam	2
Exam opportunities	Term 4, resit end term 4
Permitted resources	non-graphic calculator
Method of enrolment for exam / enrolment period	Registration for the modular exam through Alluris. The registration period is a few weeks prior to the assessment period or the resits. The period is published in the academic calendar of the ITBC on Insite-Roosters
Discussion and review	<ul style="list-style-type: none"> - The exam and resit periods, and inspection of exam results are indicated in the ITBC academic calendar. Review in the presence of a supervisor. - At the end of term 4, the post-exam discussion will be held before the start of the resit period of term 4. - Contact the examiner/course coordinator (for exams taken during a resit period) if you would like to discuss the exam. With no interest, the post-exam discussion does not take place. - Participation in the post-exam discussion is only allowed if you have taken the exam.
Number of examiners	2 examiners for the construction and the evaluation. Assessment by one examiner based on the answer key (theory lecturer).
Possibilities for compensation	Kthermo, Kwis and Kchemie can be compensated from 4.0.

Assessment dimensions	Chemistry: - Chemical equilibria; - pH calculations, acids and bases; - Electrochemistry
Assessment criteria	Chemistry: Chemical equilibria; The student: - knows what is meant by homogeneous and heterogeneous balances and can define the equilibrium constant (K) for both types and formulate them in formula, based on a balanced reaction comparison; - knows what is meant by K and KC; - can calculate K on the basis of equilibrium concentrations; - can calculate the equilibrium concentrations based on K; - knows the concept of Q and can predict which side a reaction increases if the concentrations and K are known; - understands the Le Chatelier principle and can predict which direction a reaction will go if reactants / products are added / removed; if the temperature is raised / lowered; if the pressure is changed. - pH calculations, acids and bases The student: - knows what is meant by a "proton transfer reaction": understands what a Bronsted acid/base is; can write acid/base reactions; - know what is meant by strong and weak acids and bases; what conjugated acids and bases are; - knows what is meant by Lewis acids and bases; - know that the autoprotolysis of water ($K_W = [H_3O^+] [OH^-] = 10^{-14}$) is central to pH calculations; know that $pH + pOH = 14$; - knows how the pH scale works and what is meant by acid and alkaline; - can calculate the pH of strong and weak acids and bases ; - know that for basic solutions the pH is calculated via the pOH; - know what is meant by acid and base constants (K_A , K_B); - know that many nitrogen compounds react as bases; can write down the reaction equation for the basic reaction; knows these molecules globally; - know what is meant by the "conjugate seesaw"; the stronger the weak acid, the weaker the conjugated base; - know that salts of strong acids and bases react neutrally; that salts of weak acids react basically and salts of weak bases react as acids; - can calculate the pH of such (salt) solutions; - know what is meant by polyprotic acids and can calculate the pH of polyprotic acids; know what is meant by buffer solutions; knows the buffer formula and can calculate the pH of buffer solutions; - can calculate the buffer capacity of buffer solutions and know what this means; - can calculate the pH in acid / base titrations (of both strong and weak acids/bases) at every point of the titration. Electrochemistry The student: - know what is meant by reduction and oxidation; what redox reactions and half reactions are; - can write redox responses (balancing redox equations); - knows what galvanic cells are; knows the structure and notation; can calculate (standard) potentials thereof;

	<p>- knows the meaning of standard potentials; knows what is meant by a redox table (electrochemical series) and has insight into and understanding of these;</p> <p>- knows the meaning of Nernst Equation and can perform simple calculations on it.</p>
Exam matrix	<p>~ 60% Equilibria and pH calculations ~ 40% Electrochemistry</p>
	CH4K-Kwis
Name of examination or modular examination	Theory Exam Mathematics
Examination or modular examination code	CH4K-Kwis
Assessment type(s):	Individual, Written Open Questions
Result	Grade
Minimum result	5.5
Weight factor of modular exam	1
Exam opportunities	Term 4, resit end term 4.
Permitted resources	non-graphic calculator
Method of enrolment for exam / enrolment period	Registration for the modular exam through Alluris. The registration period is a few weeks prior to the assessment period or the resits. The period is published in the academic calendar of the ITBC on Insite-Roosters
Discussion and review	<p>-The exam and resit periods, and inspection of exam results are indicated in the ITBC academic calendar. Review in the presence of a supervisor.</p> <p>-At the end of term 4, the post-exam discussion will be held before the start of the resit period of term 4.</p> <p>-Contact the examiner/course coordinator (for exams taken during a resit period) if you would like to discuss the exam. With no interest, the post-exam discussion does not take place.</p> <p>-Participation in the post-exam discussion is only allowed if you have taken the exam.</p>
Number of examiners	2 examiners for the construction and the evaluation. Assessment by one examiner based on the answer key (theory lecturer).
Possibilities for compensation	Kthermo, Kwis and Kchemie can be compensated from 4.0.
Assessment dimensions	<p>Mathematics</p> <ul style="list-style-type: none"> - Differentiation, advanced - Integration, simple
Assessment criteria	<p>The student can apply the following rules with differentiation:</p> <ul style="list-style-type: none"> - Chain rule; - Product rule; - Quotient rule. <p>The student can:</p> <ul style="list-style-type: none"> - determine primitives; - calculate standard integrals.
Exam matrix	<p>~60% Differentiation ~40% Integration</p>

Course unit 4P: CH4P (5 study credits)

CH4P	
General information	
Target group	Full-time students foundation year Chemistry / Full-time students of the MLO-transfer programme.
Name of unit of study	ECU 4P General Chemistry: Practical Chemical Equilibria and Analytical Chemistry.
Course unit code	CH4P
Teaching period	Term 4. If there are sufficient student numbers, the curriculum will be mirrored in Term 3.
ECTS credits	5 study credits
Study load in hours	140 SBU
Study hours (contact hours)	Planned contact time: 8.4 lesson periods per week = 59 teaching hours per term, 6.3 hours per week = 44.25 hours per term. Scheduled teaching time for self-study. Planned time for self-study: 95.75 hours Total: 140 hours
Course entry requirements	HAVO (higher general continued education)/VWO (pre-university) diploma with the profile Nature and Technology or Nature and Health, and participated in course units CHLS1, CHLS2a, CHLS2b and CHLS2c. 4th year MLO chemistry: transfer programme MLO Chemistry diploma programme
Content and organisation	
General description	Title: Chemistry in Equilibrium The main theme of this course unit involves chemical equilibria and gaining experience with spectrophotometric and titration techniques. The emphasis lies on analysing and assessing the results acquired from experiments using these techniques. In addition to this, the analytical chemistry practical skills are developed further.
Exit qualifications	Experimenting Results analysis Quality assurance Management and administration Reporting/presenting Planning and project-based working Cooperation Leadership/Coaching Professional development The competencies in bold are those which are emphasized in this course.
Professional tasks and products	Carrying out Life Science Research
Professional products	
Cohesion	This course follows CHLS2c and preparation for CH5 and CH7. CH4 is divided into three course units, each worth 5 study credits: CH4K (knowledge), CH4P (practical), CH4T (theme, project).
Mandatory participation	Attendance in the practical lessons is a prerequisite for participation in the modular examination Pi. The student may not miss more than 1 practical lesson. More than one lesson missed will result in having to resit in the following academic year.
Maximum number of participants	

Compensation possibilities	
Activities and/or instructional formats	<p>Analytical Chemistry Practical - Analyses of different samples using UV/VIS spectrophotometry, GC, AAS, pH electrodes, redox electrodes. - comparison of different measurement methods. <i>Teaching methods: lab practicals</i></p> <p>Theory for the practical lessons - Theoretical background for the practical <i>Working methods: lecture</i></p>
Required literature	The latest edition of: - Jones, A.M., Dean, J.R., et al. Practical skills in Chemistry, New York, NY: Pearson Education.
Required software/required materials	
Recommended literature	
Examinations	
	CH4P-Pi
Name of examination or modular examination	Teaching skills
Code of examination or modular examination	CH4P-Pi
Assessment type(s):	Individual Practical
Result	Grade
Minimum result	5.5
Weight factor of modular exam	1
Exam opportunities	Term 4 There is only one opportunity per academic year for the modular exams Pi (EER paragraph 8.5)
Permitted resources	
Method of enrolment for exam / enrolment period	Participation in Course CH4P gives automatic registration for CH4P-Pi.
Discussion and review	The filled-in assessment form with any feedback is considered the discussion and review of this interim assessment.
Number of examiners	Assessment by one examiner based on the assessment form (study career coach).
Possibilities for compensation	
Assessment dimensions	<p>Competence 1: Design 1.1.4. Forms a hypothesis based on the research question.</p> <p>Competence 2: Experimenting 2.1.1. Reads and understand the practical guide; understands the theoretical background of the main steps of the methods. 2.1.2. Performs calculations prior to beginning lab work. 2.1.3. Ensures that all requirements are present before beginning the experiment. 2.1.4. Carries out experiments accurately according to the protocol. 2.1.5. Carries out the experiments within the given time frame.</p> <p>Competence 3: Results analysis 3.1.1. Carries out results analysis according to the prescribed methods; performs error analysis in the correct manner (if applicable).</p>

	<p>3.1.2. Evaluates the obtained results based on their accuracy and reliability.</p> <p>3.1.3. Makes conclusions relating to the initial research question (if possible).</p> <p>3.1.4. Discusses the execution of the experiment and results.</p> <p>Competence 4: Quality control</p> <p>4.1.1. Is aware of the health and safety rules and works according to these rules.</p> <p>4.1.2. Uses materials and equipment correctly.</p> <p>Competence 5: Management and administration</p> <p>5.1.1. Encodes chemicals and samples; stores these in the prescribed manner.</p> <p>5.1.2. Leaves the work space tidy and clean.</p> <p>5.1.3. Manages and archives data in lab journal (aim, experiment description, alterations, results, conclusion) and if relevant, other ways of storing data.</p> <p>Competence 6: Reporting and presenting</p> <p>6.1.1. Reports their research according to the product criteria for lab journal and reports; level 1: uses correct spelling and grammar; is aware of the scientific style; uses simple and logical structure; describes results so the reader can understand; uses clearly labelled figures and tables.</p> <p>Competence 7: Working in a planned and project-based manner</p> <p>7.1.2. Plans the study tasks.</p> <p>Competence 11: Professional development</p> <p>11.1.3. Reflects critically on own performance and learning process; learns from mistakes.</p> <p>In the context of: acid-base, polyprotic acid buffers, equilibrium constant pH calculations, electrochemistry, electricity</p>
Assessment criteria	See assessment form for Practical with Lab Journal for the Chemistry Practical on #OnderwijsOnline under Algemene Informatie (General Information)
Exam matrix	See assessment form for Practical with Lab Journal for the Chemistry Practical on #OnderwijsOnline under Algemene Informatie (General Information).
	CH4P-Pm
Name of examination or modular examination	Measurement Report
Code of examination or modular examination	CH4P-Pm
Assessment type(s):	Written, individual
Result	Grade
Minimum result	5.5
Weight factor of modular exam	1
Exam opportunities	Term 4, resit term 4.
Permitted resources	

Method of enrolment for exam / enrolment period	Participation in Course CH4P gives automatic registration for CH4P-Pm.
Discussion and review	The filled-in assessment form with any feedback is considered the discussion and review of this interim assessment.
Number of examiners	Assessment by one examiner based on the assessment form (study career coach).
Possibilities for compensation	
Assessment dimensions	<p>Competence 1: Question clarification 1.1.4. Forms a hypothesis based on the research question.</p> <p>Competence 2: Experimenting 2.1.1. Reads and understand the practical guide; understands the theoretical background of the main steps of the methods. 2.1.2. Performs calculations prior to beginning lab work.</p> <p>Competence 3: Results analysis Data processing 3.1.1. Carries out results analysis according to the prescribed methods; performs error analysis in the correct manner (if applicable). 3.1.2. Evaluates the obtained results based on their accuracy and reliability. 3.1.3. Makes conclusions relating to the initial research question (if possible). 3.1.4. Discusses the execution of the experiment and results.</p> <p>Competence 4: Quality control 4.1.1. Is aware of the health and safety rules and works according to these rules.</p> <p>Competence 6: Reporting and presenting 6.1.1. Reports their research according to the product criteria for lab journal and reports; level 1: uses correct spelling and grammar; is aware of the scientific style; uses simple and logical structure; describes results so the reader can understand; uses clearly labelled figures and tables.</p>
Assessment criteria	See Measurement Report Assessment Form on OnderwijsOnline - General Information.
Exam matrix	See assessment form on #OnderwijsOnline - General Information.

Course unit 4T: CH4T (5 study credits)

		CH4T
General information		
Target group	Full-time students foundation year Chemistry / Full-time students of the MLO-transfer programme.	
Name of unit of study	ECU 4T General Chemistry: Project Chemical Equilibria and Analytical Chemistry	
Course unit code	CH4T	
Teaching Term	Term 4. If there are sufficient student numbers, the curriculum will be mirrored in Term 3.	
ECTS credits	5 study credits	
Study load in hours	140 SBU	
Study hours (contact hours)	Programmed contact hours: 5.3 teaching periods per week = 37 teaching periods per term, 3.8 hours per week = 26.4 hours per term. Scheduled teaching time for self-study: 113.6 hours Total: 140 hours	
Course entry requirements	HAVO (higher general continued education)/VWO (pre-university) diploma with the profile Nature and Technology or Nature and Health, and participated in course units CHLS1, CHLS2a, CHLS2b and CHLS2c. 4th year MLO chemistry: transfer programme MLO Chemistry diploma programme	
Content and organisation		
General description	The main theme of this course unit involves chemical equilibria. The emphasis lies on analysing and assessing the results acquired from experiments using these techniques. For the central theme, the results of different analytical methods are compared statistically and with the reference value.	
Exit qualifications	<ul style="list-style-type: none"> - Experimenting - Results analysis - Quality assurance - Management and administration - Reporting/presenting - Planning and project-based working - Teamwork - Leadership/Coaching - Professional development The competencies in bold are those which are emphasized in this course.	
Professional tasks and products	Carrying out Life Science Research	
Professional products	Results analysis and a poster	
Cohesion	This course follows CHLS2c and preparation for CH5 and CH7. CH4 is divided into three course units, each worth 5 study credits: CH4K (knowledge), CH4P (practical), CH4T (theme, project).	
Mandatory participation	Attendance at the tutor meetings is a prerequisite for participation in the modular examination IPS.	
Maximum number of participants		
Compensation possibilities		

<p>Activities and/or instructional formats</p>	<p>Tutor Pre and post discussion of assignments. <i>Method: Tutor</i></p> <p>Expert Extra information is given in relation to the week tasks, practical and the central assignment. <i>Working methods: lecture</i></p> <p>Supporting subject: Chromatography Introduction to Chromatography This subject is assessed in the theme test. <i>Working methods: combined lectures/response classes</i></p> <p>Supporting subject Mathematics Typing errors, calculation errors, outliers, standard deviation, confidence interval, t-test, comparison of results with reference value. This subject is assessed in the theme test. <i>Working methods: lecture</i></p> <p>Supporting subject: Scientific writing Results analysis <i>Method: workshop</i></p>
<p>Required literature</p>	<p>The latest edition of: - Tro, N.J., Principles of chemistry, a molecular approach, Prentice Hall / Pearson Education. - Harris, D.C., Quantitative Chemical Analysis, W.H. Freeman & Company. - Giancoli, D.C., Physics for Scientists & Engineers, Indianapolis: Pearson Education Informit. - Douwes D. J. et al, Basisvaardigheden Wiskunde, Groningen: Wolters-Noordhoff. - Jones, A.M., Dean, J.R., et al. Practical skills in Chemistry, New York, NY: Pearson Education.</p>
<p>Required software/required materials</p>	
<p>Recommended literature</p>	
Examinations	
	CH4T-T
<p>Name of examination or modular examination</p>	<p>Theme test</p>
<p>Examination or modular examination code</p>	<p>CH4T-T</p>
<p>Assessment type(s):</p>	<p>Individual, Written Open Questions</p>
<p>Result</p>	<p>Grade</p>
<p>Minimum result</p>	<p>5.5</p>
<p>Weight factor of modular exam</p>	<p>3</p>
<p>Exam opportunities</p>	<p>Term 4, resit period 4</p>
<p>Permitted resources</p>	<p>non-graphic calculator</p>
<p>Method of enrolment for exam / enrolment period</p>	<p>Registration for the modular exam through Alluris. The registration period is a few weeks prior to the assessment period or the resits. The period is published in the academic calendar of the ITBC on Insite-Roosters</p>

Discussion and review	<ul style="list-style-type: none"> - The exam and resit periods, and inspection of exam results are indicated in the ITBC academic calendar. Review in the presence of a supervisor. - At the end of term 4, the post-exam discussion will be held before the start of the resit period of term 4. - Contact the examiner/course coordinator if you would like to discuss the exam. With no interest, the post-exam discussion does not take place. - Participation in the post-exam discussion is only allowed if you have taken the exam.
Number of examiners	2 examiners for the construction and the evaluation. Assessment by one examiner based on the answer key (theory lecturer).
Possibilities for compensation	
Assessment dimensions	<p>Competence 2: Experimenting</p> <p>2.1.1. Reads and understand the practical guide; understands the theoretical background of the main steps of the methods.</p> <p>2.1.2. Performs calculations prior to beginning lab work.</p> <p>Competence 3: Results analysis</p> <p>3.1.1. Carries out results analysis according to the prescribed methods; performs error analysis in the correct manner (if applicable).</p> <p>3.1.3. Makes conclusions relating to the initial research question (if possible).</p> <p>Competence 4: Quality control</p> <p>4.1.1. Is aware of the health and safety rules and works according to these rules.</p> <p>In the context of:</p> <ul style="list-style-type: none"> - Chromatography - Acid-Base, polyprotic acids - Buffers - Equilibrium constant - pH calculations - Electrochemistry - statistics <p>Chromatography Chromatography general Liquid Chromatography Gas Chromatography Chromatogram and quantification</p> <p>The student can discuss and explain the following terms and subjects:</p> <ul style="list-style-type: none"> - Principle and applications of chromatography - Thin layer chromatography - Column Chromatography - Ion chromatography - Stationary phases - Mobile phases <p>Principle and application of gas chromatography:</p> <ul style="list-style-type: none"> - Drawing a block scheme - Naming and describing components - Injection methods - Columns - Detectors <p>Interpretation of chromatograms</p>

	<ul style="list-style-type: none"> - Retention time - Relative retention time - Run time - Resolution - Peak shape - Troubleshooting
<p>Assessment criteria</p>	<p>In the theme test, the subjects covered in the week tasks and practical experiments are included. In the theme test it is assumed that the student has mastery of the relevant theory.</p> <p>Week task aims The student can:</p> <ul style="list-style-type: none"> - can prepare literature references with the correct notation method of the articles; - knows the components of a gas chromatograph (GC) and an HPLC; - knows the properties of the components by which separation takes place in a gas chromatograph; - knows terms from chromatography such as: chromatogram, retention time, fixed and mobile phase; - can interpret a chromatogram; - can link a structure to the retention time; - knows the complex formation of hemoglobin with oxygen and its balance; - knows how the balance of this equilibrium is disturbed and why; - knows what the equilibrium constant is and can use it for calculations; - can balance a redox reaction; - From half reactions, write a net reaction - can complete the Nernst equation correctly; - can perform calculations with the Nernst equation and the Lambert-Beer Law; - knows oxidation and reduction - perform calculations using the Henderson-Hasselbalch buffer formula. - know the buffering of blood and can perform related calculations - can plot a titration curve of a buffer system with various titration solutions. - Knows the cause and effects of antifreeze poisoning. - knows what the anode and cathode and which reactions take place - knows different types of rechargeable batteries and alternatives; - knows the dangers of batteries. Experimental aims: <p>The student can:</p> <ul style="list-style-type: none"> - can draw a standard curve with standards; - knows the formula of the calibration line and can perform calculations with it; - can calculate the content of a component in the sample; - knows the principle of distillation; - knows the influence of temperature and concentration on the reaction speed; - can interpret a TLC plate; - knows what R_f values are on a TLC plate and can interpret them. <p>The student knows / can use the following concepts of statistics:</p> <ul style="list-style-type: none"> - prepare nul and alternative hypotheses; - apply a t-test; - confidence interval and can apply it; - error discussion based on data.

	<p>Chromatography</p> <p>The student can:</p> <ul style="list-style-type: none">- The student can discuss and explain the following terms and subjects:- Thin layer chromatography- Column Chromatography- Chromatogram- Stationary phase- Mobile phase- Can determine from the distribution coefficient K how quickly a component comes out of the column.- TLC, can state the advantages and disadvantages- Column Chromatography- Plate and plate number- Retention time- Run time- Resolution- Peak form- Can explain and discuss the following types of chromatography: - Reversed phase and normal phase (partition chromatography)- Adsorption- Ion exchange- Size exclusion chromatography- Affinity- Gas chromatography, gas chromatograph (reproduce scheme and parts) <p>The student can:</p> <ul style="list-style-type: none">- can reproduce different carrier gases or carrier gases and the influence on the chromatogram;- can describe the liner, injector and injection;- can describe the following GC columns and reproduce the differences:- Packed- Capillary (fused silica,- Stationary phases capillary column:- Liquid- Solid support liquid- Solid <p>Can describe the influence of the column diameter and length and the film layer thickness on the separation;</p> <ul style="list-style-type: none">- Can explain the following topics of gas chromatography: - Polarity of the stationary phase- Analysis temperature- Temperature gradient- Can reproduce HPLC (schematic and components):- Pump- Injection- Column- Can explain the influence of high pressure on the analysis;- Can explain the influence of particle size and dish height (band widening):- Dead volume- Can describe the different stationary phases:- silica- Polystyrene- Reversed phase and normal phase- Can explain the influence of the eluent and modifier on the elution;
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	- Can describe the difference between isocratic and gradient elution; - Can explain the influence of the column temperature on the chromatography.
Exam matrix	~ 40% week tasks ~ 25% Experiments ~ 10% statistics 25% Chromatography Distribution of the Theme Test questions: ~35% Experimenting ~ 50% results analysis ~ 15% reporting
	CH4T-IPV
Name of examination or modular examination	IPS
Examination or modular examination code	CH4T-IPV
Assessment type(s):	Oral, Individual
Result	Satisfactory/unsatisfactory
Minimum result	Satisfactory
Weight factor of modular exam	0
Exam opportunities	Term 4 There is only one opportunity per academic year for the modular exam IPS (EER paragraph 8.5)
Permitted resources	
Method of enrolment for exam / enrolment period	Participation in Course CH4T gives automatic registration for CH4T-IPV.
Discussion and review	For questions about the assessment, contact the examiner.
Number of examiners	One examiner for the assessment based on participation and effort (tutor)
Possibilities for compensation	
Assessment dimensions	Competence 6: Presentation

	<p>6.1.6. In English: can communicate in simple and routine tasks requiring a simple and direct exchange of information on familiar and routine matters.</p> <p>Competence 7: Working in a planned and project-based manner 7.1.2. Plans the study tasks.</p> <p>Competence 8: Teamwork Functioning in a group 8.1.1. Adheres to rules. 8.1.2. Makes a valuable contribution to the group</p> <p>Communication Communicates his task to fellow students and lecturer according to the basic rules of communication; if needed, supervised by the lecturer. 8.1.6. Maintains eye contact with conversation partner. 8.1.7. Gives others opportunity to speak. 8.1.8. Verbally expresses their opinion/message.</p> <p>Competence 11: Professional development 11.1.5. Has study skills required by higher professional education; is motivated and determined. 11.1.6. Is aware of internationally accepted codes of scientific conduct.</p>
Assessment criteria	<p>The student can:</p> <ul style="list-style-type: none"> - the student has prepared for the meeting by completing the assignment to be discussed - and also completed the required reading for the following assignment to be discussed; - the student is able to show weekly assignments to the tutor (according to agreement, in writing or as a presentation); all required aspects are complete in all assignments; - Fulfils his/her roles (Chair, secretary etc.); - the student adheres to the rules agreed upon; - the student asks questions and shares knowledge regarding the assignment during tutor meetings; verbalizes these clearly and audibly, maintains eye contact; - Allows others to finish speaking; - the student offers feedback to group- and class members and is open to receiving feedback.
	CH4T-R
Name of examination or modular examination	Central assignment results analysis
Examination or modular examination code	CH4T-R
Assessment type(s):	Written, Group
Result	Grade
Minimum result	5.5
Weight factor of modular exam	2
Exam opportunities	Term 4, resit term 4
Permitted resources	
Method of enrolment for exam / enrolment period	Participation in Course CH4T gives automatic registration for CH4T-R.

Discussion and review	The filled-in assessment form with any feedback is considered the discussion and review of this interim assessment.
Number of examiners	One examiner for the assessment based on the assessment form (subject expert)
Possibilities for compensation	
Assessment dimensions	<p>Competence 2: Experimenting 2.1.2. Performs calculations prior to beginning lab work.</p> <p>Competence 3: Results analysis Data processing 3.1.1. Carries out results analysis according to the prescribed methods; performs error analysis in the correct manner (if applicable). 3.1.2. Evaluates the obtained results based on their accuracy and reliability. 3.1.3. Makes conclusions relating to the initial research question (if possible). 3.1.4. Discusses the execution of the experiment and results.</p> <p>Competence 6: Reporting and presenting 6.1.1. Reports their research according to the product criteria for lab journal and reports; level 1: uses correct spelling and grammar; is aware of the scientific style; uses simple and logical structure; describes results so the reader can understand; uses clearly labelled figures and tables. 6.1.3. Is familiar with the international conventions of scientific and academic writing.</p> <p>Competence 8: Cooperation Communication Communicates his task to fellow students and lecturer according to the basic rules of communication; if needed, supervised by the lecturer. 8.1.6. Maintains eye contact with conversation partner. 8.1.7. Gives others opportunity to speak. 8.1.8. Verbally expresses their opinion/message.</p> <p>In the context of: Comparison of analysis methods.</p>
Assessment criteria	<p>Results analysis</p> <ul style="list-style-type: none"> - The results are clearly displayed in tables and graphs. - All raw data is in the appendices. - The formulas used for the calculations with example calculations are detailed under a separate section. - The statistical operations are applied correctly. - The conclusions are written down concisely and clearly. - The discussion clearly explains why the conclusions were drawn with statistical justification. <p>See assessment form: Central Theme on #OnderwijsOnline - General Information</p>
Exam matrix	See assessment form: Central Theme on #OnderwijsOnline - General Information
	CH4T-P
Name of examination or modular examination	Central Theme Poster

Examination or modular examination code	CH4T-P
Assessment type(s):	Written, Group
Result	Grade
Minimum result	5.5
Weight factor of modular exam	1
Exam opportunities	Term 4, resit in consultation with lecturer
Permitted resources	
Method of enrolment for exam / enrolment period	Participation in Course CH4T gives automatic registration for CH4T-P.
Discussion and review	The filled-in assessment form with any feedback is considered the discussion and review of this interim assessment.
Number of examiners	One examiner for the assessment based on the assessment form (subject expert)
Possibilities for compensation	
Assessment dimensions	<p>Competence 1: Question clarification 1.1.2. Knows the criteria defining reliable sources of information in scientific research.</p> <p>Competence 6: Reporting and presenting 6.1.1. Reports their research according to the product criteria for lab journal and reports; level 1: uses correct spelling and grammar; is aware of the scientific style; uses simple and logical structure; describes results so the reader can understand; uses clearly labelled figures and tables. 6.1.3. Is familiar with the international conventions of scientific and academic writing. 6.1.5. Presents research to a target audience with similar knowledge background, applies general presentation techniques and answers questions: uses correct spelling and grammar; describes results so that the reader can understand, uses clearly labelled figures and tables; there is an introduction-body-conclusion structure to the presentation; speaks clearly and coherently; has upright posture and hands are freely used; makes eye contact with the audience; makes organized and clear slides or other visual products</p> <p>Competence 8: Teamwork Communication Communicates his task to fellow students and lecturer according to the basic rules of communication; if needed, supervised by the lecturer. 8.1.6. Maintains eye contact with conversation partner. 8.1.7. Gives others opportunity to speak. 8.1.8. Verbally expresses their opinion/message.</p> <p>In the context of: Comparison of analysis methods.</p>

Assessment criteria	<p>Poster See <i>Poster assessment form on #OnderwijsOnline under Algemene Informatie (General Information)</i> Structure Title Authors Research Aim Introduction: Identify analytical methods with a short explanation and a short explanation about the analysis of the results Results: in table form and graph, possibly short explanation Apply statistics to the results: Comparison of the measured values with each other. Determine according to own insight whether the measured values differ significantly from each other by using confidence intervals. Conclusion: State which method gives the best results and the actual results found.</p>
Exam matrix	See Poster assessment form on #OnderwijsOnline - General Information
	CH4T-HBO
Name of examination or modular examination	Competency card
Examination or modular examination code	CH4T-HBO
Assessment type(s):	Written, Oral, Individual
Result	Satisfactory/unsatisfactory
Minimum result	Satisfactory
Weight factor of modular exam	0
Exam opportunities	1st year
Permitted resources	
Method of enrolment for exam / enrolment period	Participation in Course CH4T gives automatic registration for CH4T-HBO.
Discussion and review	For questions about the assessment, contact the examiner.
Number of examiners	One examiner (tutor) for the assessment (using assessment form)
Possibilities for compensation	
Assessment dimensions	<p>Competence 6: Reporting and presenting 6.1.2. Takes minutes of meetings according to product criteria for meeting minutes; level 1 6.1.5. Presents research to a target audience with similar knowledge background, applies general presentation techniques and answers questions: uses correct spelling and grammar; describes results so that the reader can understand, uses clearly labelled figures and tables; there is an introduction-body-conclusion structure to the presentation; speaks clearly and coherently; has upright posture and hands are freely used; makes eye contact with the audience; makes organized and clear slides or other visual products</p> <p>Competence 8: Team work / communication 8.1.6. Maintains eye contact with conversation partner. 8.1.7. Gives others opportunity to speak. 8.1.8. Verbally expresses their opinion/message.</p>

	<p>8.1.12. Is aware of the international character of the professional community.</p> <p>Competence 9: Coaching / supervising 9.1.1. Composes an agenda in a standard format and uses it to chair a meeting.</p> <p>Competence 11: Professional development 11.1.2. Works on learning aims as described in the PDP and collated competency assessment products. 11.1.5. Has study skills required by higher professional education; is motivated and determined. 11.1.6. Is aware of internationally accepted codes of scientific conduct.</p>
Assessment criteria	<p>See Assessment form Meeting Minutes Level 1 - 2 signatures (=satisfactory) on the competency card are required See assessment form below 'Theme presentation level I' - 2 signatures (=satisfactory) on the competency card are required See assessment form below 'Agenda/Chairperson, level I' - 2 signatures (=satisfactory) for 'Agenda' and 2 signatures (=satisfactory) for 'Chairing tutor-group' on the HBO competency card are required.</p> <p>For the assessment forms, see #OnderwijsOnline by Algemene Informatie (General Information)</p> <p>Internationalisation The student - actively participates in a tutor class held in English in course CHLS2 - actively participates in a tutor class held in English in course CHLS3 - explains a practical guide, in English, in course CHLS4</p>
	CH4T-Stage
Name of examination or modular examination	Mini-internship
Examination or modular examination code	CH4T-Stage
Assessment type(s):	Individual, Written
Result	Satisfactory/unsatisfactory
Minimum result	Satisfactory
Weight factor of modular exam	0
Exam opportunities	Term 3 or 4, resit in consultation with lecturer
Permitted resources	
Method of enrolment for exam / enrolment period	Participation in Course CH4T gives automatic registration for CH4T-Stage.
Discussion and review	For questions about the assessment, contact the examiner.
Number of examiners	1 Examiner for assessment (study coach).
Possibilities for compensation	
Assessment dimensions	<p>Competence 8: Internationalisation 8.1.12. Is aware of the international character of the professional community.</p> <p>Competence 11: Professional development 11.1.2. Works on learning aims as described in the PDP and collated competency assessment products.</p>

	11.1.3. Reflects critically on own performance and learning process; learns from mistakes. 11.1.5. Has study skills required by higher professional education; is motivated and determined. 11.1.6. Is aware of internationally accepted codes of scientific conduct.
Assessment criteria	Participation in the mini-internship. Describing the experience in a report.
	CH4T-FG2 / CH4T-FG3
Name of examination or modular examination	Performance Review 2/3
Examination or modular examination code	CH4T-FG2 / CH4T-FG3
Assessment type(s):	Individual oral
Result	Satisfactory/unsatisfactory
Minimum result	Satisfactory
Weight factor of modular exam	0
Exam opportunities	Term 3 or 4, resit in consultation with lecturer (SLB).
Permitted resources	
Method of enrolment for exam / enrolment period	Participation in Course CH4T gives automatic registration for CH4T-FG2 / CH4T-FG3.
Discussion and review	For questions about assessment, contact the examiner.
Number of examiners	1 Examiner for assessment (study coach).
Possibilities for compensation	
Assessment dimensions	Competence 8: Teamwork/ communication Functioning in a group 8.1.1. Adheres to rules. Competence 11: Professional development 11.1.2. Works on learning aims as described in the PDP and collated competency assessment products. 11.1.3. Reflects critically on own performance and learning process; learns from mistakes. 11.1.5. Has study skills required by higher professional education; is motivated and determined.
Assessment criteria	The student - meets agreements, is punctual, and has completed the preparatory assignment (e.g. DPF is orderly). - can demonstrate that he has actively worked on the learning outcomes that are described in the PDP. - critically takes a critical look at his/her learning process, identifies what went well, and what didn't go well, identifies the causes of these, and links it to his/her own actions. A plan for improvement in the future is formulated. - demonstrates a pro-active attitude and is motivated. - shows determination in his study.
	CH4T-POP
Name of examination or modular examination	PDP

Examination or modular examination code	CH4T-POP
Assessment type(s):	Individual, Written
Result	Satisfactory/unsatisfactory
Minimum result	Satisfactory
Weight factor of modular exam	0
Exam opportunities	Term 3 or 4, resit in consultation with lecturer
Permitted resources	
Method of enrolment for exam / enrolment period	Participation in Course CH4T gives automatic registration for CH4T-POP.
Discussion and review	For questions about the assessment, contact the examiner.
Number of examiners	One examiner for assessment (study coach).
Possibilities for compensation	
Assessment dimensions	Competence 11: Professional development 11.1.1. Formulates PDP according to guidelines.
Assessment criteria	See PDP assessment form on #OnderwijsOnline - General Information
Exam matrix	See PDP assessment form on #OnderwijsOnline - General Information

9.2 Units of study and modules of the post-propaedeutic phase, including elective units.

The postpropaedeutical phase of the study degree programme includes the following educational units with the associated studyload. There are no elective units.

A. Post-propaedeutical phase Full-time Chemistry (Dutch)

Level 2, Graduation level

- a. OWE 7K: C7K (5 studiepunten)
- b. OWE 7T: C7T (5 studiepunten)
- c. OWE 5K: C5K (5 studiepunten)
- d. OWE 5T: C5T (5 studiepunten)
- e. OWE 5-7Pa: C5-7Pa (5 studiepunten)
- f. OWE 5-7Po: C5-7Po (5 studiepunten)
- g. OWE 6K: C6K (5 studiepunten)
- h. OWE 6T: C6T (5 studiepunten)
- i. OWE 8K: C8K (5 studiepunten)
- j. OWE 8T: C8T (5 studiepunten)
- k. OWE 6-8Pa: C6-8Pa (5 studiepunten)
- l. OWE 6-8Po: C6-8Po (5 studiepunten)

Level 3, Professional level

Graduation specialisation Organic Chemistry:

- m. OWE 9: C9 (15 studiepunten)
- n. OWE 10: C10 (15 studiepunten)

Graduation specialisation Analytische chemie:

- o. OWE 11: C11 (15 studiepunten)
- p. OWE 12: C12 (15 studiepunten)

- q. OWE 13: C13 (30 studiepunten)
- r. OWE 14: C14 (30 studiepunten)

B: pocreditsropedeutical fase fulltime English variant Chemistry

Not applicable.

The English variant of the Chemistry program will start with the postpropaedeutical phase in the academic year 2020-2021.

The Dutch EEU descriptions can be found in the Onderwijs en Examenregeling of the study program Chemie.

9.3 Minors of the degree course

In this academic year, the degree course offers the following minors:

- a. Bio-Nano introductie in de Bio-Nanotechnologie (30 studiepunten) (Dutch)
- b. BioRefinery (30 studiepunten)
- c. Scientific Research (30 studiepunten)

The EEU descriptions can be found in the Onderwijs en Examenregeling of the study program Chemie.

You can also choose a minor from another HAN degree course. You can find the overview of HAN minors and their entry requirements here: www.minoren-han.nl.

9.4 Graduation specialisations

The study program Chemie has the following graduation specialisations: Organical Chemistry and Analytical Chemistry. These include the following educational units with the associated study load.

The EEU descriptions can be found in section 9.2 of the Onderwijs en Examenregeling of the study program Chemie.

Graduation specialisation Organical Chemistry

- OWE 9: C9 (15 studiepunten)
- OWE 10: C10 (15 studiepunten)
- OWE 13: C13 (30 studiepunten)
- OWE 14: C14 (30 studiepunten)

Graduation subject Analytical Chemistry:

- OWE 11: C11 (15 studiepunten)
- OWE 12: C12 (15 studiepunten)
- OWE 13: C13 (30 studiepunten)
- OWE 14: C14 (30 studiepunten)

9.5 Honours, talent and bridging programmes

9.5.1 Honours programmes

Not applicable

9.5.2 Talent programmes

Not applicable

The degree programme has an extra-curricular Analytical Sciences Talent Programme (ASTP) in the area of analytical chemistry. The ASTP-program is offered by the Centre of Expertise Analytical Sciences, a partnership between HAN and COAST. The three-year ASTP program is not a part of the curriculum. The programme is concluded with a COAST certificate; there is no mention of the ASTP-programme on the HAN Bachelor Diploma.

9.5.3 Bridging programmes

The bridging programs (EER Chapter 5) offered by a university can be followed as part of a free minor.

9.6 Structure of study load for fast-track programme

Not applicable

9.7 Abridged programme and Associate Degree transfer programmes

For some well-defined target groups it is possible on the basis of exemptions to follow an abridged version of the degree programme.

1. Composition of the abridged version of the degree programme for Biology and Medical Laboratory Research, Life Sciences and Chemistry.

1.1

The following certificates lead to an abridged programme:

- a. Students with a **MLO-4 diploma** who enroll in the BML, Life Sciences Degree or Chemistry receive exemption based on their MLO-4 diploma for Course CHLS2a (Basic practical skills) Course CHLS2b (Basic Biology theory) and Course CHLS2c (Basic Chemistry theory) and the mini-internship (C4T-st).
- b. Students with a **VWO diploma** including the profile subjects Maths A or B and Chemistry who enroll in the study programme Biology and Medical Laboratoryresearch can enroll in the shortened programme. They obtain exemption for the modular exam labcalculation (CHLS1-Klab) with a qualification 7 or higher for Chemistry on the VWO-diploma and exemption for the modular exam Maths (CHLS1-Kwis) with a qualification 7 or higher for Maths A or B on the VWO-diploma.
- c. Students with a HBO or WO certificate or a certificate of related HBO or WO examinations on the basis of which exemptions can be granted for OWE CHLS2a, CHLS2b and CHLS2c. A foreign certificate of related examinations should be at least equivalent to HBO-level.

Students are not required to take the abridged programme, they are free to choose for the regular 4-year degree programme.

1.2

The Examination Committee will grant students with a VWO or MLO diploma as referred to in 1.1, that wish to enroll in the BML, Life Sciences or Chemistry Degree access to the taking of one or more components of the final examination before the foundation year examination has been successfully completed.

1.3

Students referred to in paragraph 1.1 meet the requirements for the foundation year exam if it can be shown that course CHLS1 has been completed and the professional tasks of Course 3 and Course 4, including General Higher Vocational Education competences are mastered at level 1 by passing the exams associated with:

- a. Course unit C3KPT and Course unit C4KPT (Level 1) including the Higher Professional Education competences Level 1.

or

- b. OWE C6K, C6-8Po (or C5-7Po), C6T (or C8T) and OWE C5K, C5-7Pa (or C6-8Pa), C5T from the second year of the study program Chemie (level 2) and the Higher Professional Education competences Level 1. OWE C6K gives exemption for C3K. C6-8Po (or C5-7Po) gives exemption for C3P. C6T (or C8T) gives exemption for C3T. OWE C5K gives exemption for C4K. C5-7Pa (or C6-8Pa) gives exemption for C4P. C5T and the Higher Professional Education Competences gives exemption for C4T.

or

- c. Module A (level 2), the Higher Professional Education competences Level 1, and BHCK (or BMC1) of the part-time study program Chemie.

After passing Course 3 and Course 4, exemption is granted for Course 2a, 2b and 2c when these exemptions were not granted earlier (based on the MLO-4 diploma).

1.5

- a. In case of 1.3 and 1.4, if the student can prove, as referred to in 1.1 that he has passed a (modular) exam associated with a course at a higher level, he has also passed thus this (modular) examination associated with an course at a lower level (see course descriptions). This rule does not apply if the student participates in the course at the lower level.
- b. For all other students, the examination committee decides whether the student that demonstrates components at a higher level also has mastered the components at a lower level.

9.8 Structure of work-study format

Not applicable

9.9 D track education and exams

Not applicable