



UNIVERSITA' DEGLI STUDI DI MILANO
PROGRAMME DESCRIPTION - ACADEMIC YEAR 2025/26
BACHELOR

Chemistry (Classe L-27)

Students enrolled from the academic year 2022-2023 to a.y. 2024-2025

HEADING

Degree classification - Denomination and code:	L-27 Chemistry
Degree title:	Dottore
Length of course:	3 years
Total number of credits required to complete programme:	180
Years of course currently available:	2nd , 3rd
Access procedures:	Open, subject to completion of self-assessment test prior to enrolment
Course code:	F5X

PERSONS/ROLES

Head of Study Programme

Prof. Luigi Falciola

Degree Course website

<https://chimica.cdl.unimi.it>

Department of Chemistry

Via Golgi, 19 - 20133 MILANO <http://www.chimica.unimi.it>

Department of chemistry teaching office

Via Golgi, 19 - 20133 MILANO Phone 02 50314419 Ricevimento in presenza dal lunedì al venerdì ore 10.00-12.00, in altri orari su appuntamento. Puoi chiederci le informazioni di cui hai bisogno scrivendo allo sportello online InformaStudenti:

<https://www.unimi.it/it/node/359/>

DSA and disability tutors

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CHARACTERISTICS OF DEGREE PROGRAMME

General and specific learning objectives

The first specific objective of the degree program in Chemistry is to enable the student to continue with higher studies or to immediately enter a professional activity.

The course aims to provide students with an adequate command of the basic scientific methods and contents in the main fields of Chemical Sciences to facilitate easy integration into the world of work and/ or to access a subsequent Master's Degree.

The training course allows you to learn the necessary experimental techniques for chemical synthesis, the determination of chemical and chemical-physical properties of matter, methods of analysis and calculation tools.

In particular, the course aims to achieve the following educational objectives:

- provide adequate knowledge of the different fields of chemistry, in the basic, theoretical, experimental and applicative aspects, and adequate basic preparation in the mathematical and physical disciplines;
- to provide adequate mastery of the use of chemical knowledge in relations with other scientific and technical disciplines;
- to provide a good knowledge of the experimental laboratory methods,
- to provide adequate basic knowledge of chemistry, useful for entering into work activities requiring familiarity with the scientific method;
- develop the capacity to apply innovative methods and techniques and to use complex equipment;
- develop the ability to adapt to the evolution of the discipline, to interact with the culturally contiguous skills and to continue studies in Master's Degree courses*.

The specific educational objective of the degree programme in Chemistry is the training of a graduate who possesses the skills and knowledge suitable for carrying out professional activities in the field of chemical research, contributing to activities such as the application of chemical procedures and protocols; the development and characterisation of new products and materials; the testing of new technologies; the implementation, based on product specifications; chemical analysis and quality control, which require the mastery of chemical and instrumental techniques and the subsequent preparation of reports on the results of the analyses; the execution, within a predetermined programme, tests and laboratory tests for the development of new products.

* Eurobachelor®

The degree course in Chemistry of the University of Milan is among the first in Italy to have received - in December 2009 - the Eurobachelor Label. The Eurobachelor accreditation is awarded by a special commission designated by the European Thematic Association, which brings together European universities and chemical companies. The Eurobachelor Label qualifies the degree, provided by the Bachelor's degree in Chemistry, as a degree recognized by other European university institutions and gives the right of automatic access to the Master's degree courses of chemistry in Europe.

Expected learning outcomes

- Acquisition of theoretical and operational skills in the four main areas of chemistry, namely general and inorganic chemistry, analytical chemistry, physical chemistry and organic chemistry, and biological chemistry, and safety standards to be implemented in chemical laboratories.
- Ability to collect, analyse and process laboratory data, with particular reference to: stoichiometric calculations, analysis of solutions, chemical and physical analysis. Ability to perform experimental procedures and to report on them with regard to: synthesis, isolation, purification and characterization of chemical compounds, ability to safely use and properly dispose of chemicals; etodologic and instrumental procedures.
- Independent judgement: ability to interpret experimental laboratory data, conduct experiments, propose solutions to analytical problems, place specific chemical knowledge in their relations with other disciplines, Retrieval and screening of information sources, data and chemical literature.

Graduates in Chemistry should be able to communicate the results of their analysis and evaluation in a clear and effective way using word processing systems and modern multimedia presentation techniques, also in the most common language in the international working contexts of reference (English), for the preparation of the reports of laboratory courses and internship activities. They will also need to be able to work in groups and to operate independently.

The expected learning outcomes are: the acquisition of adequate skills for the development and updating of skills in bibliographical research, databases and other information on the network, the acquisition of an autonomy that allows to consult advanced textbooks and journals specialized in the fields of chemistry research and scientific disciplines, and the ability to be ready for employment.

Professional profile and employment opportunities

Chemist

- Function in a work context

The Chemist is in possession of suitable knowledge to carry out professional activities in the fields of synthesis and characterization of new products and new materials, health, nutrition, cosmetics applying the disciplinary methods of investigation acquired. The Chemist designs and synthesizes new products in the industrial field. It can take care of quality control and environmental control, treatment processes and waste disposal. He knows the strategies and procedures for the synthesis, transformation and purification of chemical compounds, the techniques for chemical and physical analysis, the scientific method of investigation and data management.

- Skills associated with the function

Chemists must possess, in addition to a thorough knowledge of science and chemical technology, also the rigor necessary to

apply the scientific method punctually. This profession requires a fundamental knowledge of chemical synthesis issues as well as safety regulations. In addition, he must possess considerable competence in methods of chemical analysis, have aptitude for the use of current computer technology and know at least English.

- Employment opportunities -

In the chemical industry, with particular regard to fine chemistry, the pharmaceutical industry and research laboratories. The job opportunities are in public and private research institutions, laboratories of analysis, quality control and certification and industries and working environments that require basic knowledge in the fields of chemistry. In the public sphere, chemists can work in technical and ecological offices of local authorities, in customs laboratories, in provincial hygiene and prophylaxis laboratories and analysis or in services for the prevention of occupational accidents. The liberal profession is generally carried out in quality control and analysis laboratories or as a consultant for design, plant management, environmental authorisation practices and risk analysis as well as in court assignments.

Graduate chemical laboratory technician

- Function in a work context

The chemical laboratory technician is an operator capable of correctly synthesizing and analyzing samples of all types, from water, air, earth or industrial waste, to food products, cosmetics in order to determine, through chemical and physical parameters, the presence of pollutants and/or harmful substances. He can work in environmental control laboratories or chemical analysis, in analysis laboratories with control tasks in the chemical, product, biochemical, pharmaceutical, cosmetic sectors, The European Commission's Green Paper on the Environment, Public Health and Consumer Protection contains a series of recommendations for action in this field.

- Skills associated with the function

The chemical laboratory technician is required, in addition to a knowledge of analytical and laboratory techniques, also precision and scientific rigor.

- Employment opportunities -

The job opportunities are in public and private research institutions, laboratories of analysis, quality control and certification and industries and working environments that require basic knowledge in the fields of chemistry.

Researcher in Chemical and Pharmaceutical Sciences

- Function in a work context

This graduate designs and develops new products, mainly in the pharmaceutical field and can also deal with quality control, certification and storage of such products.

- Skills associated with the function

Researcher in the chemical and pharmaceutical sciences is able to carry out the synthesis of drugs, knows the techniques and laboratory tools for the production and chemical and physical analysis, the pharmacological and toxicological properties, the regulations in force on the subject. It must also have skills in the use of computer tools.

- Employment opportunities -

Employment opportunities are in public and private research institutions, in pharmaceutical, cosmetic and food companies, at ASL or university research institutes.

Scientific informant and popularizer

- Function in a work context

This graduate increases scientific knowledge in the field, uses and transfers this knowledge to industry, medicine, pharmacology and other areas of production. It introduces industrial operators to the characteristics and properties of its products. The function of the informant and scientific popularizer is to propose the adoption of specific products, develop the activity of scientific information at the companies concerned to ensure the correct use. The practice of the profession of scientific informant of the drug is regulated by the laws of the State.

- Skills associated with the function

The skills necessary for the Scientific Informant to carry out his work are not only scientific knowledge, but also commercial skills. In particular, must have good basic knowledge in chemistry, knowledge of pharmaceuticals, cosmetics, food and their proper use. The knowledge of technical English and computer science, the possession of a driving license, the willingness to travel, the ability to communicate and resourcefulness complete this professional profile.

- Employment opportunities -

The scientific informant works for cosmetic, pharmaceutical, food, plastics, dyes, detergents, glues or environmental companies, in general for all companies in the chemical industry and/ or specialized magazines.

For the graduate of this class is required registration in the Register of the National Federation of Orders of Chemists and Physicists as Chemist Iunior, after passing the State Examination.

Initial knowledge required

Requirements and knowledge required for access

Candidates holding a high school diploma or other qualification obtained abroad, recognised as eligible, may be admitted to the Bachelor's degree programme in Chemistry.

In addition, basic knowledge in mathematics is needed, in scientific disciplines and ability to make simple logical deductions and comprehension of the text according to levels of competence not higher than those resulting from the preparation

provided by secondary school.

Methods of testing knowledge and personal preparation

The degree program in Chemistry is free access.

Admission to the degree program provides for a compulsory, but not selective, test to be carried out before matriculation, aimed at ascertaining the initial preparation of students, in terms of minimum knowledge requirements of basic scientific disciplines. The non-selective access test involves the TOLC test (CISIA On Line Test) that can be taken at the University of Milan or at any other University participating in the CISIA (Inter-university Consortium of Integrated Access Systems). Registrations to the TOLC must be made directly on the CISIA website (www.cisiaonline.it).

The TOLC valid for enrolment in the Chemistry degree course is the TOLC-S, composed of the following sections:

Basic mathematics (20 questions - 50 minutes), Reasoning and Problems (10 questions - 20 minutes), Understanding the text (10 questions - 20 minutes), Basic sciences (10 questions on chemistry, physics and geology - 20 minutes), English (30 questions - 15 minutes). Each question presents 5 possible answers, of which only one is correct. Score: +1 for every correct answer, -0.25 for every wrong answer, 0 for every wrong answer.

Further information on the structure and topics of the test can be found at the following link: <https://www.cisiaonline.it/area-thematica-tolc-scienze/struttura-della-prova-e-syllabus/>

The outcome of the English section does not replace the assessment of the English language required by the degree course for the acquisition of the relevant credits (see the paragraph Language tests), but constitutes a self-assessment for the student. Students who having supported the obligatory (but not selective) TOLC-S intend to use it to access the Bachelor of Science in Chemistry of the University of Milan MUST enroll on the site of the cds to enrol within the deadlines indicated in the notice.

For more details on the call for applications, deadlines and admission/registration procedures see <https://www.unimi.it/en/node/84/>

Transfer or graduate student access

Students already enrolled in a Degree Course of the University of Milan, of another University or already graduated, can be exempted from the test only if they meet the requirements necessary to be admitted to years following the first, or at least 30 credits attributable to exams in the first year of the course, of which 9 can be validated for the purpose of examining Mathematical Institutions.

To this end, a specific request for prior career evaluation must be submitted by accessing the online service indicated in the admission notice. The interested parties must declare all the exams taken with related sectors, credits and grades and attach the programs of the courses. For more details on the procedure, please refer to the announcement.

The practice will be examined by the CD Transfer Commission. In the event that the applicant is not eligible for years following the first, the student have to take the initial preparation assessment test.

The requests for evaluation, accompanied by the programs of the exams taken, must be submitted without exception by the date that will be published in the notice and the outcome of the evaluation will be communicated via e-mail.

Students admitted to years subsequent to the first will be able to enroll within the deadlines and with the methods specified in the announcement.

Students admitted to the first year, in addition to taking the aforementioned test to verify initial preparation, will have to submit the application for admission, as indicated in the announcement.

Similarly, to speed up the procedure, all requests for equivalence of exams taken and/or recognition of previous careers must be accompanied by the programs of the exams taken.

Additional training obligations (OFA) and modalities for OFA recovery

For freshmen who in the TOLC-S Basic Mathematics module will not have achieved a score greater than or equal to 10, will be assigned Additional Educational Obligations (OFA).

For students with OFA will be organized support activities in the period October-December, followed by a recovery test (to be carried out within the month of January of the calendar year following matriculation?) with which the student must demonstrate that he has improved his preparation. In the absence of this evidence, the student will not be able to take any exam of the first year before passing the exam of Mathematical Institutions.

Compulsory attendance

Attendance is mandatory for laboratory activities, and strongly recommended in all other cases.

Internship criteria

At the end of the course of study, a compulsory internship (12 ECTS) will be carried out in the following ways. The internship activity is distinguished in:

1) Internal internship, consisting of a chemical activity carried out by the student at the Department of Chemistry of the University of Milan or the Departments connected to the Faculty of Science and Technology of the University of Milan under the guidance of a Supervisor, possibly assisted by a Co-rapporteur.

2) External internship, consisting of a chemical activity carried out by the student at the Departments connected to other Faculties of the University of Milan, or at public or private institutions or companies, under the guidance of a Manager

(External Speaker) and the supervision of a Tutor (Internal Speaker).

To start the internship, the student must have earned at least 126 ECTS.

The submission of the application can take place until the 1st day of each month for entry into the internship - unless approved by the Didactic College - on the 20th day of the same month, with the sole exception of the month of August.

The application for admission must be sent to the Teaching Office of the Department of Chemistry following the instructions and on the appropriate form available on the site <https://chimicaindustriale.cdl.unimi.it/it/studiare/stage-e-tirocini>

In the case of external internships with Institutions or companies, students must contact the Thesis and Internships Commission in time to start the authorization procedure. In this regard, please consult the relevant regulations, which can be found on the CDs website.

Students who are eligible to carry out the internship under the Erasmus project must apply before departure for the destination university. In this case, the CFU requirement is disregarded as long as the students have reached, on return, the 126 CFU through exams taken abroad. Otherwise, the internship will not be valid for the purpose of obtaining the degree.

The Supervisor is the guarantor of the activity assigned to the student in his internship and of its correct performance.

All professors and researchers, who carry out chemical teaching activities, belonging to the Didactic College or the Department of Chemistry or belonging to the Departments connected to the Faculty of Science and Technology, can be Speakers. The Rapporteur may be assisted by a Co-rapporteur.

They can be Internship Co-Rapporteurs, in addition to all Teachers included in the category of Official Speakers:

- the Official Teachers of other Universities and Polytechnics also foreign,
- graduates declared to be lovers of the subject,
- the employees of the University of Milan, framed in the role of non-teaching staff with a level equal to or higher than D and declared lovers of the subject;
- C. N. R. researchers working within the Department of Chemistry;
- the experts designated by the structures hosting the external internships.

Special cases may be taken into account by the CD, if people of particular scientific and technical importance are involved. In this case, the Rapporteur must briefly document in writing the specific competence of the proposed Co-Rapporteur on the subject of thesis research.

In the case of an external internship, in addition to the Internal Supervisor, there is an External Supervisor (or Tutor) who is the didactic-organizational manager of the internship activity and is identified by the host company of the internship.

Any abnormal cases will be examined by the Thesis and Internship Commission, which will formulate its decisions and submit them to the approval of the Teaching Board.

Degree programme final exams

The final test, which allows you to acquire the last 3 credits, consists in the discussion before a special Commission of a written report, prepared by the student under the guidance of the rapporteur, related to the activity carried out in the internship. This paper will describe the activity carried out by the student in research groups or companies during the internship, and will document the fundamental aspects of the activity carried out in relation to the current state of knowledge in the field of chemistry.

For the student to be admitted to the graduation session, they must have passed all the exams required by the study plan (including the English language proficiency test) and obtained internship approval, for a total of 177 CFU.

Campus

Course location

Department of Chemistry - Via Golgi, 19 - 20133 Milan (Città Studi District)

Notes

In order to obtain their degree, students must be proficient in English at a B1 level under the Common European Framework of Reference for Languages (CEFR). This proficiency level may be certified as follows:

- By submitting a language certificate attesting B1 or higher level in English and issued no more than three years before the date of submission. You will find the list of language certificates recognized by the University at: <https://www.unimi.it/en/node/39322>). The certificate must be uploaded during the enrolment procedure, or subsequently to the portal <http://studente.unimi.it/uploadCertificazioniLingue>;
- By taking a placement test offered by the University Language Centre (SLAM) between October and December of the first year. Students who fail the test will be required to take a SLAM course.

The placement test is mandatory for all those who do not hold a valid certificate attesting to B1 or higher level.

Those who have not taken the placement test by the end of December or fail the end-of-course exam six times must obtain the necessary certification privately before graduating.

EXPERIENCE OF STUDY ABROAD AS PART OF THE TRAINING PROGRAM

The University of Milan supports international mobility by providing its students with the opportunity to spend study and internship periods abroad. It is a unique chance to enrich your educational path in a new exciting environment.

The agreements entered into by the University with over 300 universities from the 27 EU member countries under the European Erasmus+ programme allow regularly enrolled students to carry out part of their studies at one of the partner universities or to undertake internships at companies, training and research centres and other organisations.

Similar international mobility opportunities are provided outside Europe, through agreements with a number of prestigious institutions.

The University of Milan is a member of the 4EU+ European University Alliance that brings together eight public multidisciplinary universities: University of Milan, Charles University of Prague, Heidelberg University, Paris-Panthéon-Assas University, Sorbonne University of Paris, University of Copenhagen, University of Geneva, and University of Warsaw. The 4EU+ Alliance offers integrated educational pathways and programmes to promote the international mobility of students (physical, blended and virtual).

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How to participate in Erasmus mobility programs

The students of the University of Milan can participate in mobility programmes, through a public selection procedure.

Ad hoc commissions will evaluate:

- Academic career
- the candidate's proposed study programme abroad
- his/her foreign language proficiency
- the reasons behind his/her application

Call for applications and informative meetings

The public selection for Erasmus+ mobility for study generally begins around February each year with the publication of a call for applications specifying destinations and requirements. Regarding the Erasmus+ Mobility for Traineeship, the University of Milan usually publishes two calls a year enabling students to choose a destination defined by an inter-institutional agreement or to find a traineeship position on their own.

The University organises informative meetings to illustrate mobility opportunities and rules for participation.

Erasmus+ scholarship

The European Union grants the winners of the Erasmus+ programme selection a scholarship to contribute to their mobility costs, which may be supplemented by the University funding for disadvantaged students.

Language courses

Students who pass the selections for mobility programmes can benefit from intensive foreign language courses offered each year by the University Language Centre (SLAM).

<https://www.unimi.it/en/node/8/>

Learn more at <https://www.unimi.it/en/node/274/>

For assistance, please contact:

International Mobility Office

Via Santa Sofia 9 (second floor)

Tel. 02 503 13501-12589-13495-13502

Contacts: InformaStudenti;

Student Desk booking through InformaStudenti

1st COURSE YEAR (disactivated from academic year 2025/26) Core/compulsory courses/activities common			
Learning activity		Ects	Sector
Analytical chemistry I with lab		12	CHIM/01
Complements of mathematics and calculus		6	MAT/09, MAT/01, MAT/02, MAT/03, MAT/04, MAT/05, MAT/06, MAT/07, MAT/08
English assessment B1 (3 ECTS)		3	ND
Fundamentals of mathematics		9	MAT/09, MAT/01, MAT/02, MAT/03, MAT/04, MAT/05, MAT/06, MAT/07, MAT/08
General and inorganic chemistry with lab		12	CHIM/03
General physics		9	FIS/08, FIS/07, FIS/06, FIS/05, FIS/04, FIS/03, FIS/02, FIS/01
Organic chemistry I		7	CHIM/06
Total compulsory credits		58	
2nd COURSE YEAR Core/compulsory courses/activities common			
Learning activity		Ects	Sector
Analytical chemistry II with lab		12	CHIM/01
Inorganic Chemistry		8	CHIM/03
Organic chemistry II		7	CHIM/06
Organic chemistry lab		10	CHIM/06
Physical Chemistry I with Lab		12	CHIM/02
Physical chemistry of matter and fundamentals of spectroscopy		6	CHIM/02
Total compulsory credits		55	
Elective courses			
In the second year of the course, students must acquire 6 CFU by freely choosing among all the activities and courses activated by the University that are functional to the training path of the LT in Chemistry. Students are advised to take the 6 ECTS courses specifically designed for the degree course (see table below).			
3rd COURSE YEAR Core/compulsory courses/activities common			
Learning activity		Ects	Sector
Biological chemistry		6	BIO/10
Chemistry of coordination compounds with laboratory		10	CHIM/03
Instrumental analytical chemistry applications		6	CHIM/01
Organic chemistry advanced		6	CHIM/06
Physical chemistry II with Lab		6	CHIM/02
Physical chemistry III		6	CHIM/02
Training		12	NA
Total compulsory credits		52	
Elective courses			
In the third year of the course, students must acquire 6 CFU by freely choosing among all the activities and courses activated by the University that are functional to the training path of the LT in Chemistry. Students are advised to take the 6 ECTS courses specifically designed for the degree course (see table below).			
Further elective courses			
In the second and third year of the course, students must acquire 12 CFU by freely choosing among all the activities and courses activated by the University that are functional to the training path of the LT in Chemistry. Students are advised to take advantage of this list of 6 ECTS courses designed specifically for the degree course.			
Analytical Chemistry for the Excellence of the Territory		6	CHIM/01
Chemistry of Heterocyclic Compounds		6	CHIM/06
Physical Chemistry of Materials		6	CHIM/02
Structural Chemistry		6	CHIM/03
Synthetic and biobased polymers		6	CHIM/04
End of course requirements			
Final exam		3	NA
Total compulsory credits		3	

COURSE PROGRESSION REQUIREMENTS

- The exams indicated as Course I must be taken before the corresponding exams indicated as Course II, which in turn must

be taken before the corresponding exams indicated as Course III.

- The exams of "Fundamentals of mathematics" and "General and inorganic chemistry with lab" must be taken before the 2nd and 3rd year exams.
- The "General physics" exams and "Complements of mathematics and calculus" must be taken before the 3rd year exams.
- The exams of "Organic chemistry I" must be supported before those of "Organic chemistry lab", of "Biological chemistry" and "Organic chemistry advanced".
- The exams of "Organic chemistry II" must be supported before the one in "Organic chemistry advanced".

It is advisable, however, to take the exams of each semester before taking those of the following semesters.

Learning activity	Prescribed foundation courses	O/S
Chemistry of coordination compounds with laboratory	General physics	Core/compulsory
	General and inorganic chemistry with lab	Core/compulsory
	Complements of mathematics and calculus	Core/compulsory
	Fundamentals of mathematics	Core/compulsory
Organic chemistry II	General and inorganic chemistry with lab	Core/compulsory
	Organic chemistry I	Core/compulsory
	Fundamentals of mathematics	Core/compulsory
Organic chemistry lab	General and inorganic chemistry with lab	Core/compulsory
	Organic chemistry I	Core/compulsory
	Fundamentals of mathematics	Core/compulsory
Organic chemistry advanced	Organic chemistry II	Core/compulsory
	General physics	Core/compulsory
	General and inorganic chemistry with lab	Core/compulsory
	Organic chemistry I	Core/compulsory
	Complements of mathematics and calculus	Core/compulsory
	Fundamentals of mathematics	Core/compulsory
Physical chemistry II with Lab	General physics	Core/compulsory
	Physical Chemistry I with Lab	Core/compulsory
	General and inorganic chemistry with lab	Core/compulsory
	Complements of mathematics and calculus	Core/compulsory
	Fundamentals of mathematics	Core/compulsory
Physical chemistry of matter and fundamentals of spectroscopy	General and inorganic chemistry with lab	Core/compulsory
	Fundamentals of mathematics	Core/compulsory
Physical Chemistry I with Lab	General and inorganic chemistry with lab	Core/compulsory
	Fundamentals of mathematics	Core/compulsory
Biological chemistry	General physics	Core/compulsory
	General and inorganic chemistry with lab	Core/compulsory
	Organic chemistry I	Core/compulsory
	Complements of mathematics and calculus	Core/compulsory
	Fundamentals of mathematics	Core/compulsory
Analytical chemistry II with lab	General and inorganic chemistry with lab	Core/compulsory
	Analytical chemistry I with lab	Core/compulsory
	Fundamentals of mathematics	Core/compulsory
Instrumental analytical chemistry applications	General physics	Core/compulsory
	General and inorganic chemistry with lab	Core/compulsory
	Complements of mathematics and calculus	Core/compulsory
	Fundamentals of mathematics	Core/compulsory
Physical chemistry III	General physics	Core/compulsory
	Physical chemistry II with Lab	Core/compulsory
	Physical Chemistry I with Lab	Core/compulsory
	General and inorganic chemistry with lab	Core/compulsory
	Complements of mathematics and calculus	Core/compulsory
	Fundamentals of mathematics	Core/compulsory
Inorganic Chemistry	General and inorganic chemistry with lab	Core/compulsory
	Fundamentals of mathematics	Core/compulsory