**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: 1st, 2nd

Access procedures: Cap on student, student selection based on entrance test

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 https://informastudenti.unimi.it/saw/ess?AUTH=SAML

DSA and disability tutors
Mariangela Longhi Phone 0250314226 https://www.unimi.it/it/ugov/person/mariangela-longhi Email: mariangela.longhi@unimi.it

Entrance guidance tutors
Francesca Tessore Phone 0250314398 https://www.unimi.it/it/ugov/person/francesca-tessore Email: francesca.tessore@unimi.it

Erasmus and international mobility tutor
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Referent of the Quality Management System (QA) of The Bachelor's degree
Alessandra Puglisi Phone 0250314189 https://www.unimi.it/it/ugov/person/alessandra-puglisi Email: alessandra.puglisi@unimi.it

Student administration offices
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Study plan, transfer and credit recognition tutor
Pierluigi Mercandelli Phone 0250314447 Email: pierluigi.mercandelli@unimi.it

Tutor for teaching support
Alberto Vertova Phone 0250314232 Email: tutoring.chimica@unimi.it

**CHARACTERISTICS OF DEGREE PROGRAMME**

General and specific learning objectives
The course aims to achieve the following training objectives:
- provide adequate knowledge of the different sectors of chemistry, in the basic, theoretical, experimental and applicative
aspects and an adequate basic preparation in mathematical and physical disciplines;
- provide adequate mastery in the use of chemical knowledge in relation to other scientific and technical disciplines;
- provide a good knowledge of experimental laboratory methods;
- provide adequate basic knowledge of a chemical nature, useful for insertion in work activities that require familiarity with the scientific method;
- develop the ability 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 culturally contiguous professionals and to continue studies in Master's Degree courses.

Expected learning outcomes
- Acquisition of theoretical and operational skills with reference to the main sectors of chemistry and safety standards to be implemented in chemical laboratories.
- Ability to collect, analyze and process data obtained in the laboratory, to perform experimental procedures and to draw up reports in this regard, to safely use and dispose of chemicals correctly.
- Conscious autonomy of judgment: 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 sources of information, data and chemical literature.

Graduates in Chemistry must be able to communicate the results of their analyses and evaluations clearly and effectively using word processing systems and modern multimedia presentation techniques, even in the most widespread language in the international working contexts of reference (English), for the preparation of laboratory course reports and internship activities. They must also 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 with regard to bibliographic searches, databases and other information on the net, the acquisition of autonomy that allows to consult advanced textbooks and specialized journals in the research sectors of chemistry and scientific disciplines, and the ability to promptly enter the world of work.

Professional profile and employment opportunities
Graduates will possess knowledge suitable for carrying out professional activities and related functions in the following occupational areas:
- in chemical and pharmaceutical research
- in the fields of synthesis of new products and new materials, applying the disciplinary methods of investigation acquired
- in the realization, analysis and characterization of new products
- in the experimentation of new technologies
- in the study of solutions for product improvement, analysis, synthesis and characterization

Employment opportunities are in the chemical industry, with particular regard to fine chemicals, the pharmaceutical industry and research and development laboratories, both in the public and private sectors and in particular in public and private research institutions, analyze, control and quality certification laboratories and industries and work environments that require basic knowledge in the chemical sectors.

The course prepares for the professions of Chemist, Researcher in chemical and pharmaceutical sciences, Chemical laboratory graduate technician and scientific informant and popularizer.

For the graduate of this class is expected to enroll in the Register of the National Federation of the Orders of Chemists andPhysicists as Junior Chemist, after passing the State Exam.

Initial knowledge required
Requirements and knowledge required for access
Candidates in possession of a high school diploma or equivalent foreign qualification pursuant to Ministerial Decree 22 October 2004 n.270 may be admitted to the Bachelor's degree in Chemistry.
In addition, basic knowledge in mathematics, chemistry and the ability to operate simple logical deductions according to levels of competence not higher than those deriving from the preparation provided by the secondary school.

Methods of verification of knowledge and personal preparation
The degree course in Chemistry is at local programmed access in order to guarantee the quality of the teaching offer in relation to the available resources. 130 places are available for enrollment in the first year. The access test involves passing a TOLC (CISIA Online Test) that can be taken at the University of Milan or at any other University belonging to CISIA (Interuniversity Consortium Integrated Systems for Access). Registration for the TOLC must be made directly on the CISIA website (www.cisiaonline.it).

The TOLC valid for enrollment in the degree course in Chemistry is the TOLC-S, consisting of the following sections: Basic Mathematics (20 questions - 50 minutes), Reasoning and Problems (10 questions - 20 minutes), Text Comprehension (10 questions - 20 minutes), Basic Sciences (10 questions of chemistry, physics and geology - 20 minutes). Each question presents 5 possible answers, of which only one is correct.
Score: +1 for each correct answer, -0.25 for each wrong answer, 0 for each answer not given.

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

In the TOLC there is an additional section of English, consisting of 30 questions to be carried out in 15 minutes. The
outcome of this section does not affect the ranking of merit, nor does it replace the assessment of the knowledge of the English language required by the degree course for the acquisition of the related credits (see the paragraph Language Tests), but constitutes a self-assessment for the student.

Students who have supported the TOLC-S intend to use it to access the Degree course in Chemistry of the University of Milan MUST ALSO enroll in the appropriate selection to be included in the ranking of merit, formulated on the basis of the score reported in the test. The winners will be able to register within the deadlines indicated in the selection notice. The selection is divided into several time windows with beginning in spring and ending in the first days of September. For more details on the calls, deadlines and methods of admission in the ranking it is recommended to consult the page https://www.unimi.it/it/studiare/frequentare-un-corso-di-laurea/iscriversi/iscriversi-una-prima-laurea

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 same must take the test and place himself in a useful position in the ranking.

Students admitted to years following the first will be able to enroll within the deadlines and in the manner specified in the call.

Students admitted to the first year will have to take the test and submit the application for admission, as indicated in the notice.

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

For students with OFA support activities will be organized in the period October-December, followed by a recovery test - to be carried out within the month of January of the calendar year following enrolment - with which the student will have to demonstrate that he has improved his preparation. In the absence of this evidence, the student will not be able to take any exam in the first year before having passed the exam of Mathematical Institutions, with the exclusion of the 3 ECTS relating to the knowledge of the English language.

For info: https://chimica.cdl.unimi.it/it/studiare/le-matricole

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
Upon completion of the internship, students will be required to write a short paper on their work, to be discussed before an examining board. The latter's assessment will count towards the degree mark. After the final interview, the board will deliver the end-of-internship report, countersigned by the supervisor(s), to the Didactic Office of the Department 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.

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/297/. 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, B2, 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 organizations.

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

Study and internships abroad
As part of the study plan, students can participate in Erasmus program projects activated for the Degree Course. In particular, under the Erasmus Plus programme, students can choose from 16 affiliated European universities. At these locations, students can obtain training credits by following the teachings and passing the relevant exams, or through the performance of part or all of the final internship. The acquisition of training credits is subject to the approval, by the Didactic College, of a specific study plan (the Learning Agreement) and the passing of exams at the foreign office. Interested students are requested to make an appointment in time with the Tutor for international mobility and Erasmus (Prof. Emma Gallo, Tel. 02503 14374; E-mail: emma.gallo@unimi.it) for the instruction of practices. Students can also participate in the numerous seminar meetings with foreign teachers.

How to participate in Erasmus mobility programs
How to participate in Erasmus+ mobility programmes
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 organizes 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).

Learn more at https://www.unimi.it/en/node/8/

For assistance, please contact:
International Mobility Office
Via Santa Sofia 9 (second floor)
Tel. 02 503 13501-12589-13495-13502
Contacts: InformaStudenti; mobility.out@unimi.it
Student Desk booking through InformaStudenti

1st COURSE YEAR Core/compulsory courses/activities common

<table>
<thead>
<tr>
<th>Learning activity</th>
<th>Ects</th>
<th>Sector</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analytical chemistry I with lab</td>
<td>12</td>
<td>CHIM/01</td>
</tr>
<tr>
<td>Complements of mathematics and calculus</td>
<td></td>
<td>MAT/09, MAT/01, MAT/02, MAT/03, MAT/04, MAT/05, MAT/06, MAT/07, MAT/08</td>
</tr>
<tr>
<td>English assessment B1 (3 ECTS)</td>
<td>3</td>
<td>ND</td>
</tr>
<tr>
<td>Fundamentals of mathematics</td>
<td></td>
<td>MAT/09, MAT/01, MAT/02, MAT/03, MAT/04, MAT/05, MAT/06, MAT/07, MAT/08</td>
</tr>
<tr>
<td>General and inorganic chemistry with lab</td>
<td>12</td>
<td>CHIM/03</td>
</tr>
<tr>
<td>General physics</td>
<td>9</td>
<td>FIS/08, FIS/07, FIS/06, FIS/05, FIS/04, FIS/03, FIS/02, FIS/01</td>
</tr>
<tr>
<td>Organic chemistry I</td>
<td>7</td>
<td>CHIM/06</td>
</tr>
<tr>
<td><strong>Total compulsory credits</strong></td>
<td>58</td>
<td></td>
</tr>
</tbody>
</table>

2nd COURSE YEAR Core/compulsory courses/activities common

<table>
<thead>
<tr>
<th>Learning activity</th>
<th>Ects</th>
<th>Sector</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analytical chemistry II with lab</td>
<td>12</td>
<td>CHIM/01</td>
</tr>
<tr>
<td>Biological chemistry</td>
<td>6</td>
<td>BIO/10</td>
</tr>
<tr>
<td>Inorganic Chemistry</td>
<td>8</td>
<td>CHIM/03</td>
</tr>
<tr>
<td>Organic chemistry II</td>
<td>7</td>
<td>CHIM/06</td>
</tr>
<tr>
<td>Organic chemistry lab</td>
<td>10</td>
<td>CHIM/06</td>
</tr>
<tr>
<td>Physical Chemistry I with Lab</td>
<td>12</td>
<td>CHIM/02</td>
</tr>
<tr>
<td>Physical chemistry of matter and fundamentals of spectroscopy</td>
<td>6</td>
<td>CHIM/02</td>
</tr>
<tr>
<td><strong>Total compulsory credits</strong></td>
<td>61</td>
<td></td>
</tr>
</tbody>
</table>

Elective courses
In the second year of the course the student must acquire 6 CFU by freely choosing among all the courses activated by the
University that are functional to the training course of the LT in Chemistry.
Students are advised to choose from the list of 6 CFU teachings of the LM in Chemical Science and Industrial Chemistry.

### 3rd COURSE YEAR (available as of academic year 2024/25) Core/compulsory courses/activities common

<table>
<thead>
<tr>
<th>Learning activity</th>
<th>Ects</th>
<th>Sector</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemistry of coordination compounds with laboratory</td>
<td>10</td>
<td>CHIM/03</td>
</tr>
<tr>
<td>Instrumental analytical chemistry applications</td>
<td>6</td>
<td>CHIM/01</td>
</tr>
<tr>
<td>Organic chemistry advanced</td>
<td>6</td>
<td>CHIM/06</td>
</tr>
<tr>
<td>Physical chemistry II with Lab</td>
<td>6</td>
<td>CHIM/02</td>
</tr>
<tr>
<td>Physical chemistry III</td>
<td>6</td>
<td>CHIM/02</td>
</tr>
<tr>
<td>Training</td>
<td>12</td>
<td>NA</td>
</tr>
<tr>
<td><strong>Total compulsory credits</strong></td>
<td><strong>46</strong></td>
<td></td>
</tr>
</tbody>
</table>

### Elective courses

In the third year of the course the student must acquire 6 CFU by freely choosing among all the courses activated by the University that are functional to the training course of the LT in Chemistry.
Students are advised to choose from the 6 CFU teachings of the LM in Chemical Science and Industrial Chemistry.

### End of course requirements

<table>
<thead>
<tr>
<th>Learning activity</th>
<th>Ects</th>
<th>Sector</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Final exam</strong></td>
<td><strong>3</strong></td>
<td><strong>NA</strong></td>
</tr>
<tr>
<td><strong>Total compulsory credits</strong></td>
<td><strong>3</strong></td>
<td></td>
</tr>
</tbody>
</table>

### COURSE PROGRESSION REQUIREMENTS

- 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”.
- 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.

It is advisable, however, to take the exams of each semester before taking those of the following semesters.
<table>
<thead>
<tr>
<th>Instrumental analytical chemistry applications</th>
<th>Core/compulsory</th>
</tr>
</thead>
<tbody>
<tr>
<td>General physics</td>
<td>Core/compulsory</td>
</tr>
<tr>
<td>General and inorganic chemistry with lab</td>
<td>Core/compulsory</td>
</tr>
<tr>
<td>Complements of mathematics and calculus</td>
<td>Core/compulsory</td>
</tr>
<tr>
<td>Fundamentals of mathematics</td>
<td>Core/compulsory</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Physical chemistry III</th>
<th>Core/compulsory</th>
</tr>
</thead>
<tbody>
<tr>
<td>General physics</td>
<td>Core/compulsory</td>
</tr>
<tr>
<td>Physical chemistry II with Lab</td>
<td>Core/compulsory</td>
</tr>
<tr>
<td>Physical Chemistry I with Lab</td>
<td>Core/compulsory</td>
</tr>
<tr>
<td>General and inorganic chemistry with lab</td>
<td>Core/compulsory</td>
</tr>
<tr>
<td>Complements of mathematics and calculus</td>
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<tr>
<td>Fundamentals of mathematics</td>
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<table>
<thead>
<tr>
<th>Inorganic Chemistry</th>
<th>Core/compulsory</th>
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</thead>
<tbody>
<tr>
<td>General and inorganic chemistry with lab</td>
<td>Core/compulsory</td>
</tr>
<tr>
<td>Fundamentals of mathematics</td>
<td>Core/compulsory</td>
</tr>
</tbody>
</table>