UNIVERSITA' DEGLI STUDI DI MILANO
PROGRAMME DESCRIPTION - ACADEMIC YEAR 2025/26
BACHELOR
TOXICOLGY FOR THE HUMAN AND ENVIRONMENTAL SAFETY
(Classe L-29)
Enrolled in 2024/25 academic year

HEADING

Degree classification - Denomination and code:	L-29 Pharmacy
Degree title:	Dottore
Length of course:	3 years
Total number of credits required to complete programme:	180
Years of course currently available:	2nd
Access procedures:	Cap on student, student selection based on entrance test
Course code:	E18

PERSONS/ROLES

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Degree Course website

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Student Desks

Sedi e orari: https://www.unimi.it/it/node/360

Student Desks

Contatti: https://www.unimi.it/it/node/359

Web site

https://tops.cdl.unimi.it/

CHARACTERISTICS OF DEGREE PROGRAMME

General and specific learning objectives

The impact of human activities on the environment and the consequences of environmental conditions on human health are the central issues of the educational objectives of the bachelor's degree in Toxicology for the human and environmental Safety.

This bachelor's programme is designed to train professionals capable of contributing to the improvement of the quality of the environment, through the identification, quantification, monitoring, and prevention of conditions capable of causing damage to human health.

The bachelor's programme in Toxicology for the human and environmental Safety enables students to have knowledge of:

-the chemical-physical characteristics of inorganic and organic molecules and their reactivity, with reference to environmental and toxicological problems

- the cell biology, structure and function of biological molecules and organ pathophysiology
- the mechanism of action of toxic substances and drugs and their effects on human health
- the effect of human activities on the environment and human health
- the quantification of inorganic and organic pollutants in the environment through chemical-analytical methods
- the molecular basis of the main pathologic conditions, with particular attention to those related to environmental toxicity phenomena, including the workplace
- the risk assessment procedures aimed at protecting the health of the population and workers
- the analysis of nutrients, functional components and food contaminants
- the basic biological experimental models for microbiological and toxicological analyses
- the acquisition, analysis and interpretation of experimental data obtained from chemical or biological analyses
- the English language, to access scientific literature and draw up documents at an international level.

The bachelor's degree in Toxicology for the human and environmental Safety enables graduates to be directly employed in laboratories for chemical and biochemical analysis, organizations or companies dealing with workplace safety, environmental control and remediation, food product safety and control.

In addition, the bachelor's programme is also aimed at providing a solid interdisciplinary knowledge that allows graduates to attend to master's degrees in the biological, biotechnological, food and safety regulatory fields.

Expected learning outcomes

Knowledge and understanding

Through the courses included in the bachelor?s programme, students will acquire:

- basic theoretical knowledge in the chemical, mathematical and physical fields, preparatory to characterizing and professionalizing disciplines
- basic knowledge on structure and function of cells and molecular mechanisms of the main biological processes
- basic knowledge of the human anatomy and physiopathology
- knowledge of the main chemical pollutants of air, water and soil of anthropic origin
- knowledge of the methods and mechanisms underlying the action of drugs and the toxic effects of drugs and xenobiotics
- knowledge on the impact of anthropogenic pollutants on the environment and on the main environmental decontamination and purification strategies
- basic knowledge on obtaining and processing qualitative-quantitative experimental data produced in chemical and biological laboratories
- knowledge of the most used analytical techniques in the chemical, chemical-toxicological and food fields
- knowledge of technical, scientific and regulatory sources in the chemical-toxicological and food fields
- knowledge of technical, scientific and regulatory sources in the field of environmental and health safety

This knowledge will be acquired through lectures, seminars, laboratory exercises, classroom exercises in small groups and exercises with the support of videos, which will allow students to acquire basic, specialist and professional knowledge. Knowledge achievement will be verified through ongoing tests, classroom reports and presentations, written and oral exams.

Applying knowledge and understanding

Furthermore, both through lectures and practical exercises, students will acquire the ability to:

- operate in chemical and biological laboratories safely and in a technically correct manner;
- apply sample treatment methods and instrumental analyses for the identification and quantification of toxic or polluting compounds;
- apply quality and safety standards in chemical-toxicology and food analysis;
- apply basic experimental methodologies in the toxicological/microbiological field;
- find the technical, scientific and regulatory information required in the chemical-toxicological and food fields;
- find the technical, scientific and regulatory information required in the field of environmental and health safety

These skills will be acquired through a training course characterized by highly professionalizing activities which include laboratory exercises, classroom exercises in small groups and experimental internships. Abilities will be verified through ongoing tests, reports and presentations in the classroom, written and oral exams, and the drafting of the final report on the internship experience.

Making judgements
The ability to acquire information and collect and interpret data useful to determine autonomous judgments translates into a correct management of toxicological problems, to protect the environment and guarantee the safety of the population.
Independence of judgment in the bachelor?s degree in Toxicology for the human and environmental Safety is acquired by the students through characterizing courses which include individual laboratory activities and through the analysis of scientific articles and technical documents on topics relating to the safety of the human health and the environment. A particularly important moment for the development of independent judgment is also that of the experimental internship.
Independence of judgment is verified through the drafting of reports, oral presentations and exams.

Communication skills
Both written and oral communication skills are stimulated over the three-year period through courses with laboratory activities which involve the preparation of written reports, or the oral presentation of the experimental results obtained, or courses with classroom exercises in which oral presentations are carried out by the students on current topics focused on environmental and health safety. The acquisition and evaluation of the achievement of communication skills are also foreseen through the presentation and defence of the thesis during the graduation session. The ability to communicate in English in the oral and written form (B1 level) on scientific-toxicological topics (scientific English) contributes to the achievement of these objectives.

Learning skills
Several courses of the bachelor?s programme aim to guide students in acquiring the awareness of the need for continuous updating on environmental and health safety issues, both in terms of advancement of knowledge and legislative/regulatory changes. Students are therefore encouraged to carry out bibliographic research and consult websites of regulatory bodies for the protection of the health and the environment. A further moment of growth in terms of learning ability is the experimental internship, in which the students test themselves in a working environment where they are expected to autonomously acquire new skills.
The students then acquire the ability to:
- learn new concepts through scientific articles, databases, technical or regulatory documents
- learn new concepts and/or methodologies and apply them in a working environment.
The achievement of these skills is verified through intermediate tests, discussion of scientific articles, oral and written exams, reports on laboratory exercises, and the drafting of the thesis following the experimental internship.

Professional profile and employment opportunities

Chemical analysts
Function in a work context:
The professionals included here cooperate with specialists in the analysis of solid, liquid and gaseous materials conducted in the context of chemical research; they are involved in the control of production quality, in the control and maintenance of environmental quality, operation and safety standards of equipment, systems and related technical systems. Graduates in Toxicology for the human and environmental Safety can enroll in the Register of Chemists with the professional title of Junior Chemist after passing the specific state exam required.
Skills associated with the function:
Chemical analysts know the main methods and instruments used to carry out analysis protocols. They are able to apply the procedures and protocols of chemical analysis, collaborate with specialists to control the quality of production, control and maintain the standards of environmental quality, operation and safety of the equipment, systems and related technical systems. They are also able to process and interpret the data obtained.
Employment opportunities:
Chemical analyst in laboratories of public and private facilities, universities and research institutions.

Experts in workplace safety
Function in a work context:
The professionals included in this category apply and execute procedures, regulations and technologies to adapt, modify, develop, control and verify the safety of working environments and workers, of machines and their operating procedures.
Skills associated with the function:
Experts in workplace safety are professionals capable of understanding, analysing, and applying knowledge in the field of safety of workplaces and workers.
Employment opportunities:
Prevention and protection service, even covering a managing position, in laboratories of public and private structures, universities, research institutions.

Experts in environmental control and remediation
Function in a work context:
The professionals included in this category assist specialists in the research and in the design, development and evaluation of systems for control, protection and conservation of the environment.
Skills associated with the function:
Experts in environmental control and remediation are professionals capable of applying procedures to control and detect information on types and methods of environmental pollution and on possible causes, adapting and operating with adequate instruments; they are trained to apply procedures, regulations and technologies to control and guarantee the efficiency of waste collection, selection, treatment and disposal processes; finally, they are able to evaluate and implement programs for the remediation of polluted areas.
Employment opportunities:
Environmental monitoring activities (water, air, soil) and environmental impact and safety assessment in industry. Environmental control and remediation, in laboratories of public and private structures, universities, research institutions and centres focused on toxicological and environmental safety detection.

Biochemical analysts
Function in a work context:
The professionals included in this category select and apply protocols and procedures in production or service activities. They assist specialists in the scientific, healthcare, humanistic, economic and social fields, relating to the quantitative physical, chemical, engineering and natural sciences, life and health sciences.
Skills associated with the function:
Ability to apply and execute scientific protocols relating to the human health care, as well as the diagnosis of animal and plant pathologies. Ability to verify and control the application of safety regulations in public and work environments. Assistance to veterinarians and agronomists in animal and plant care and production, ability to apply and execute scientific protocols in medical analysis laboratories and in agronomic and veterinary laboratories.
Employment opportunities:
Evaluation of the chemical, physical and biological composition of water, natural substances or industrial products, diagnosis of animal/plant pathologies and research in the agronomic and zootechnical fields, in laboratories of public and private facilities, universities, research institutions and in the National Health Service.

Experts in food safety and control
Function in a work context:
The professionals included in this category select and apply defined and predetermined protocols and procedures in production or service activities. Their tasks consist of assisting specialists in the scientific and healthcare fields and in supervising, controlling, planning, and ensuring the correct functioning of production processes.
Skills associated with the function:
Assistance to specialists, in conducting tests and analyses on the quality of products intended for human and animal consumption, to certify their quality, genetic derivation and production technology, to improve the food processing and production chains.
Employment opportunities:
Employment in the field of plant and animal biotechnology, oenology, merchandise, in the food and bio-food sector, and in the quality control of the food industry.

Initial knowledge required

Admission requirements
To be admitted to the bachelor’s programme in Toxicology for the human and environmental Safety, a secondary school diploma or other qualification obtained abroad and recognized as suitable are required.
The degree course has local programmed access in accordance with Article 2 of Law 264 of 1999. The number of students admitted is decided from year to year by the relevant academic bodies, following an assessment of the resources available for the operation of the course.
Admission requires the possession of adequate knowledge and skills to be able to successfully follow the bachelor’s programme. This knowledge includes fundamentals of mathematical calculation, physics, cell biology and general chemistry, logical skills, ability to express himself in oral and written form without hesitations and errors, a fair general culture and adequate language skills at B1 level. Fulfilment of these requirements will be verified through a mandatory selection test. The test consists of an entrance test, selective, consisting of questions in Basic Mathematics, Reasoning and Problems, Text Comprehension, and Basic Science. Any training obligations resulting from gaps in the aforementioned knowledge must be filled within the first year of the course, according to the modality indicated in the course teaching regulations.

Admission assessment
The bachelor’s degree in Toxicology for the human and environmental Safety welcomes the admission of a maximum of 60 students plus 5 foreign students not resident in Italy.
Access to the degree course is subject to passing the TOLC-S, an online test provided by CISIA (https://www.cisiaonline.it/), Consorzio Interuniversitario Sistemi Integrati per l'Accesso, which must be taken prior to matriculation.

The TOLC-S is made up of questions divided into four sections: Basic Mathematics, Reasoning and Problems, Reading Comprehension, Basic Sciences. The questions are compatible with a level of in-depth analysis matching a secondary school preparation. For further details, please see:
Structure and topics of the test: https://www.cisiaonline.it/area-tematica-tolc-scienze/struttura-della-prova-e-syllabus/.

The TOLC-S includes an additional English section whose outcome does not influence the merit ranking, but it constitutes exclusively a self-assessment for the student.
The TOLC-S can be taken at the University of Milan or any other location among those indicated in the calendar available on the page https://testcisia.it/calendario.php
Registration procedures and deadlines will be indicated in the competition notice which will be published on the University website at https://www.unimi.it/it/studiare/immatricolarsi-e-iscriversi.
The merit ranking will be calculated based on the result obtained in the TOLC-S test. All candidates scoring less than 40% of the available points in the test will be excluded from the ranking.

Additional learning requirements (OFA) and remedial activities

Mathematics OFA
Students admitted to the bachelor's programme, but who have achieved a score of 10 or less in the TOLC-S section of Basic Mathematics, will be assigned Additional Educational Obligations (OFA). OFA will consist of online activities provided in the October-December period, followed by a remedial test by which the student must show evidence of improved preparation. In the absence of this evidence, the student will not be able to take any second-year exams before passing the Mathematics and Statistics exam.
Information on the page https://tops.cdl.unimi.it/it/studiare/le-matricole

Additional Learning Requirements (OFA) B1
In order to fulfil the Additional Learning Requirement (Obbligo Formativo Aggiuntivo ? OFA) for English and sit the English-language exam required by the study plan, students must achieve B1 proficiency per 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 in order to fulfil the OFA and sit the English exam.

For computer science teaching, it should be noted that no credits are recognized for possession of the ECDL certificate.

Compulsory attendance

Attendance at lessons is strongly recommended. Attendance at classroom and laboratory exercises is mandatory. By agreement with the teachers, students enrolled in possession of a chemical expert diploma can be exempted from the General chemistry laboratory.

Working students
Working students can take advantage of the possibility of part-time enrolment offered by the University. For information, consult https://www.unimi.it/en/node/113/
Working students adopting the part-time enrolment offered by the University must agree with the teachers on their relative path attendance at workshops. For those students working in laboratories in which techniques covered by the degree course laboratories are used, a partial/total exemption from laboratory attendance is provided, in agreement with the teacher. To take advantage of these benefits, the student must send at the beginning of the year, via InformaStudenti, in the "Lesson times/locations and teaching organization" section, a certification on company letterhead certifying the contract and working hours.

Internship criteria

To complete the established cultural and professional training, every student must carry out a 6-month practical internship period in companies, public entities and public or private research laboratories, which will account for 9 credits (ECTS). The start of the internship is possible after the acquisition of 118 credits (ECTS). The degree programme, through the COSP, stipulates specific agreements with the external facilities that host the interns. The internship can be carried out abroad as part of the Erasmus program (see section Experience of study abroad as part of the training program) and the written report in this case will be written in English.
Specific procedures for activating the internship can be found at the link: https://tops.cdl.unimi.it/it/studiare/stage-e-tirocini .

Degree programme final exams

The bachelor's degree in Toxicology for the human and environmental Safety is awarded after passing a final examination,

which constitutes an individual formative moment to complete the training. To access the final examination, the student must have acquired 177 CFU. The final examination consists in the preparation of a written report that contextualizes and describes the results of the internship activity carried out by the student, in the field of chemical and biological sciences and more specifically in health and environmental safety. Then, the student orally presents the results described in the report to the Graduate Committee. The written report and the oral presentation may be in English as well as in Italian.
Supervisors and tutors of the internship activity of each student, enter the Graduate Committee with the role of Rapporteur and Correlator, respectively. Rapporteurs may be Full or Associate Professors, Researchers and Contract Lecturers of the Faculty of Scienze del Farmaco, to which the bachelor's degree belongs. If the internship is carried out at companies, universities or research centers outside the Università degli Studi di Milano, the tutors who supervised the students play the role of Correlator.
The final grade is defined from the base score calculated by the student secretaries on the grades of the proficiency exams (weighted average of grades obtained multiplied by 11/3). To this score can be added:
(a) up to 10% of the base score;
(b) 1 point for graduation within three years;
(c) up to 2 points for internship conducted as part of institutionalized mobility abroad projects.
Students who meet both of the following criteria may be considered eligible for the award of honors:
(i) a base score of at least 99.0000 (not rounded up) derived from the weighted average of the grades of the proficiency examinations alone as processed by the student secretariats, and (ii) a score of at least 102.0000 (not rounded up) by cumulating to the weighted average derived from (i) the additional grade in (b) and (c).

Notes

Additional Learning Requirements (OFA) B1
In order to fulfil the Additional Learning Requirement (Obbligo Formativo Aggiuntivo ? OFA) for English and sit the English-language exam required by the study plan, students must achieve B1 proficiency per 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 in order to fulfil the OFA and sit the English exam.

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

Students are encouraged to carry out periods of study abroad, based on conventional exchange agreements with foreign universities.
Each student can take advantage of Erasmus mobility, for periods of 3 or 6 months. To be eligible for the annual mobility programs, students regularly enrolled at the University of Milan must participate in a public selection procedure that is published on the University's website.
More information is available at https://www.unimi.it/en/node/274/ and for selection procedure you can consult the link https://www.unimi.it/en/node/277/

Each student, depending on the period spent abroad must propose a Learning Agreement that includes educational activities for an appropriate number of CFUs:
- one academic year: 60 CFUs;
- one academic semester: 30 CFUs
- one academic trimester: 20 CFU.

Students must acquire at least 70% of the CFUs indicated in the Learning Agreement. For thesis/internship activities, fulfillment implies that the student has acquired all the CFUs indicated in the Learning Agreement.
For students who have satisfactorily completed the educational program, incentives are provided to be paid in additional score to the graduation grade. This score ranges from a minimum of 1 to a maximum of 3 points (depending on the duration

of the study period, the amount of CFUs achieved and the overall result obtained), which, upon the proposal of the responsible Lecturer will be awarded by the Graduation Committee

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 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).
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; mobility.out@unimi.it
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	6	CHIM/01
Calculus and Statistics	6	MAT/07
General Chemistry	8	CHIM/03
Human Anatomy and General Biology	12	(4) BIO/16, (8) BIO/13
Organic Chemistry	8	CHIM/06
Physics and Informatics	6	(3) FIS/07, (3) INF/01
Physiology	6	BIO/09
Scientific English	3	L-LIN/12
Total compulsory credits	55	

2nd COURSE YEAR Core/compulsory courses/activities common

Learning activity	Ects	Sector
Biochemistry	8	BIO/10
Chemical and Toxicological Analysis	11	CHIM/08
Environmental chemistry	8	CHIM/06
General Pathology	6	MED/04
Microbiology and Hygiene	8	BIO/19
Pharmacology 1 and Pharmacology 2	8	BIO/14
Toxicology 1	8	BIO/14
Total compulsory credits	57	

3rd COURSE YEAR (available as of academic year 2026/27) Core/compulsory courses/activities common

Learning activity	Ects	Sector
Biotechnology 1 and Biotechnology 2	8	BIO/14
Food Chemistry	10	CHIM/10

Safety in the manufacture of health products and Applied chemical-toxicological analysis		14	(3) CHIM/09, (11) CHIM/08
Toxicology 2		12	BIO/14
	Total compulsory credits	44	

Further elective courses

The student must acquire 12 ECTS in elective educational activities. For this purpose, the degree program makes available the teachings listed below. Any semester changes will be promptly communicated. The recommended year of the course to successfully follow the teaching and take the exam is specified next to each course. Upon approval of the study plan, students may include, among the elective educational activities, teachings related to transversal skills, provided by other degree programs of the University. See also the paragraph Structure of the course - Presentation of the study plan.

Biochemical-molecular mechanisms of action of pollutants on human health	6	BIO/10
Detection of contaminants in food matrices: methodological and regulatory aspects	6	CHIM/10
Effect of pollutants on developmental anatomy and physiology	6	(3) BIO/09, (3) BIO/16
Effects of environmental pollutants and endocrine disruptors on the health of living beings	6	(3) MED/13, (3) BIO/14
Environmental impact analysis and procedures of anthropogenic pollutants	6	(3) ICAR/03, (3) BIO/14
Environmental toxicology	6	BIO/14
Experimental methodologies and models in occupational toxicology	6	BIO/14
Pharmacological and toxicological activities of naturally occurring substances	6	BIO/14

End of course requirements

Final exam		3	NA
Stage		9	NA
	Total compulsory credits	12	

COURSE PROGRESSION REQUIREMENTS

The acquisition of credits related to Analytical Chemistry is a prerequisite to the practical activities (laboratory) of Chemical and Toxicological Analysis.

The acquisition of credits related to Organic Chemistry is a prerequisite to the practical activities (laboratory) of Applied Chemical-Toxicological Analysis.

Learning activity	Prescribed foundation courses	O/S
Biochemistry	Human Anatomy and General Biology	Core/compulsory
	Organic Chemistry	Core/compulsory
General Pathology	Physiology	Core/compulsory
Toxicology 1	Physiology	Core/compulsory
Chemical and Toxicological Analysis	Analytical chemistry	Core/compulsory
	Physics and Informatics	Core/compulsory
Environmental chemistry	Organic Chemistry	Core/compulsory
	Physics and Informatics	Core/compulsory
Microbiology and Hygiene	Human Anatomy and General Biology	Core/compulsory
	General Chemistry	Core/compulsory
Safety in the manufacture of health products and Applied chemical-toxicological analysis	Chemical and Toxicological Analysis	Core/compulsory
	Organic Chemistry	Core/compulsory
Food Chemistry	Biochemistry	Core/compulsory
	Chemical and Toxicological Analysis	Core/compulsory
Toxicology 2	Toxicology 1	Core/compulsory
Biotechnology 1 and Biotechnology 2	Biochemistry	Core/compulsory
	Pharmacology 1 and Pharmacology 2	Core/compulsory
Analytical chemistry	General Chemistry	Core/compulsory
Organic Chemistry	General Chemistry	Core/compulsory
Physiology	Human Anatomy and General Biology	Core/compulsory
Pharmacology 1 and Pharmacology 2	Physiology	Core/compulsory