

**CALL FOR APPLICATIONS FOR NON-EU CITIZENS NOT RESIDENT IN ITALY TO THE ONE-CYCLE DEGREE COURSE IN MEDICINE AND SURGERY WITH LIMITED ACCESS (Class LM-41) IN ENGLISH AT HUMANITAS UNIVERSITY CALLED MEDTEC SCHOOL.**

**Academic years 2024/2025 and 2025/2026**

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## **Art. 1 Number of places available**

For both the academic years 2024/2025 and 2025/2026, the number of places available for Non-EU citizens not resident in Italy (as reported in art. 2) is established as **10**.

The number of places available may change in accordance with a later Decree of the Ministry of University and Research (M.U.R.), pursuant to the provisions of Law n. 264, August 2, 1999. The Decree of MUR could confirm, increase or decrease the number of places available.

## **Art. 2 Admission requirements**

Only candidates holding citizenship and education requirements reported in this paragraph are entitled to apply.

Only candidates who have also taken and passed the Admission test (Art. 3) may be admitted to the one-cycle degree course in Medicine and Surgery - MEDTEC School.

### **Art. 2.1 Citizenship Requirements**

Only Non-EU citizens who are not resident in Italy are entitled to apply for the present call for application, on penalty of exclusion.

Candidates holding either an Italian or a European citizenship **may not apply as Non-EU students** since they belong to the EU category.

**Candidates applying and sitting the test without the citizenship requirements will not be considered for the ranking.**

### **Art. 2.2 Educational Requirements**

Candidates eligible to take part in the admission test are those who, on the date of the test:

- are in possession of a secondary school (High School) diploma or
- are attending the last year of secondary school (High School) and will be graduating in 2023 or
- are attending the second-to-last year of secondary school (High School) and will be graduating in 2024.

For candidates who have obtained/will obtain a High School diploma outside of Italy or in an international secondary school, the diploma is considered valid if obtained after at least 12 years of schooling, in addition to being accompanied by the Declaration of Value issued by the Italian diplomatic authorities.

If the local school system provides for 10 or 11 years of schooling, the title is valid when integrated with one or two years of university, having passed all the required exams for those academic years.

**Candidates not holding valid qualifications, according to the requirements of law, will lose the right to enroll. Furthermore, if already enrolled, the candidate's enrolment will be cancelled.**

For the validation of foreign qualifications, Humanitas University will follow guidelines set out by the Ministry of University and Research for the academic year 2023-24 available in English at:

[https://www.studiare-in-italia.it/studentistranieri/moduli/2023/Circolare\\_2023\\_2024\\_EN.pdf](https://www.studiare-in-italia.it/studentistranieri/moduli/2023/Circolare_2023_2024_EN.pdf)

### Art. 3 Admission Test

Only candidates who have taken and passed the admission test are admitted to the first year of the one-cycle degree course in Medicine and Surgery called MEDTEC School.

The test is delivered in two exam rounds per calendar year, with papers of equal difficulty.

**For the academic year 2024/2025**, each candidate can take up to a maximum of two tests, one during the exam round scheduled on April 5<sup>th</sup> 2024 and one during the exam round scheduled on April 19<sup>th</sup> 2024.

For candidates who have taken the admission test in the calendar year 2023, the scores obtained in the exam rounds scheduled on 31<sup>st</sup> March and 21<sup>st</sup> April 2023 are also considered.

**For the academic year 2025/2026**, each candidate can take up to a maximum of four tests, two during the exam rounds scheduled in April 2024, and further two tests in the calendar year 2025. The dates of 2025 exams will be communicated in the next call for applications.

The ranking lists will be drawn up as specified in Article 9.

The admission test for the Medicine and Surgery Course called MEDTEC School is conducted in English and consists of sixty (60) questions divided into five sections. Each of the questions has five answer options, of which only one is correct. The test will be held in **home-based** modality on the platform of Politecnico di Milano.

The duration of the test is 100 minutes. Table 1 shows the topics, number of questions and duration of each individual section.

The contents of the sections are specified in Annex A to this Call.

**Table 1**

Section	Number of Questions	Time Allotted
Mathematics	20	40 minutes
Comprehension and Critical Reasoning	10	25 minutes
Chemistry and Physics	10	20 minutes
Biology	10	10 minutes
Technical and Scientific Knowledge	10	5 minutes
<b>Total</b>	<b>60</b>	<b>100 minutes</b>

When a test section ends, the candidate can no longer access it.

Candidates with learning disabilities defined under Law L104/1992 are entitled to additional time as specified in Article 8 of this document.

#### **Art. 4 Dates of the Admission Test**

The Admission Test will be home-based and will take place on Friday **April 5<sup>th</sup> 2024 at 14:30 CEST** (first exam round) and on **Friday April 19<sup>th</sup> at 14.30 CEST** (second exam round).

All candidates are required to follow the instructions described in articles 6 and 7 in order to write the entrance exam.

#### **Art. 5 Application for the Admission test: deadlines and modalities**

Registration for the test will take place between January 10<sup>th</sup> 2024 to March 27<sup>th</sup> 2024 , **by 17:00 CET**, to write both the first (April 5<sup>th</sup> 2024) and the second (April 19<sup>th</sup> 2024) exam rounds. Upon expiry of that period, candidates who register until **April 11<sup>th</sup> 2024, by 17:00 CEST**, can exclusively take the exam on the second round on April 19<sup>th</sup> 2024.

#### **Registration procedure involves the following steps:**

1. **On-line registration to the Humanitas University Registration Portal (<https://humanitas-admission.ilmiotest.it>)**: the candidate must register to the web portal by entering his/her name, surname and e-mail address. After receiving the first e-mail of the Microsoft authentication process, it is necessary to click on "Accept invitation" and complete the registration by requesting the single-use access code.

**N.B.** candidates have to request a single-use access code for each access;

2. **Application for the Admission Test**: after completing the registration to the portal, the candidate must register for the admission test by the deadline mentioned above. The candidate must log in, enter the required data in the "Personal Details" section, click on the menu item "Apply" and select the MEDTEC Admission Test;

3. **Choice of sessions and payment of the registration fee**: the candidate selects the sessions, one for each round, in which they prefer to take the test, indicates whether they require accommodations for special education needs as specified in Article 8 of this document and completes the payment of the registration fee – € 170,00 – to secure their place.

The payment must be completed **exclusively via credit card** within 15 minutes from the initial registration, otherwise the process lapses and candidates have to start the procedure all over again.

Candidates who complete the payment in time to book the test in the first round will book the test in the second round free of charge. The system will automatically show the registration for the second round.

For candidates who took the test in the calendar year 2023, registration for the admission test has a cost of € 45.00, valid for taking a maximum of two tests. The above terms and conditions are also applied in this case.

The registration fee for the tests which will take place in the calendar year 2025 is € 45,00 for all candidates who registered for the test in the calendar year 2024.

**The registration fee is not refundable under any circumstances.**

4. **Completion of registration on the Politecnico Milano website:** upon clicking "**Complete your MEDTEC application**", the candidate will be redirected to the Politecnico Milano website, where registration must be completed. When candidates complete the registration, they will receive a personal code and password necessary to carry out the test. The personal code and password received by Politecnico Milano are different from those of Humanitas University and the candidate must use them to access the test;

5. **Confirmation Email:** at the end of the registration procedure, the candidate will receive an e-mail containing proof of registration.

For candidates registered by the date of March 27<sup>th</sup> 2024 at 17:00 CET, the receipt shows confirmation of the first exam round of April 5<sup>th</sup> 2024 only.

Following the first exam round on April 5<sup>th</sup> 2024 and by April 11<sup>th</sup> 2024, all candidates, those registered for both exam rounds and those registered for the exam round on April 19<sup>th</sup> 2024 only, will be sent confirmation of the second date.

#### **Art. 6 - Hardware and Software Requirements**

For the test, candidates must have access to:

- A computer or laptop with a camera, microphone, and speakers, running Windows 8.1, 10, 11 or MAC-OS 14, 13, 12, 11, 10.15, 10.14, 10.13, and 120 MB of free memory available on a hard disk
- A mobile device (mobile phone or tablet) equipped with a camera and microphone
- A Wi-Fi network with a minimum upload and download speed of 1 Mbps on their PC and access to at least a 4G data network on their mobile device

Candidates must install the *Safe Exam Browser* software on the computer or laptop that will be used during the test.

The *Safe Exam Browser* software can only be downloaded from the Politecnico Online Services portal beginning March 15, 2024.

Before that date, candidates will be required to also install *ZOOM Cloud Meetings videoconferencing* software app on their mobile device.

Candidates must verify the compliance of their mobile device (mobile phone or tablet) to the technical requirements of Zoom, which can be found at the following address: <https://support.zoom.us/hc/en-us/articles/201179966-System-requirements-for-iOS-iPadOS-and-Android>.

All the technical details concerning how to use the software to be installed will be found in a technical guide downloadable from the Online Services portal of the Politecnico di Milano. The technical guide will be available in February 2024.

## Art 6.1 - Security Measures to Ensure Transparency and Fairness of Test Results

The *Safe Exam Browser* software will block the candidate's web browser during the test itself, excluding the possibility of loading other web pages, inhibiting the use of certain keyboard functions (e.g. copy-paste or screen capture) as well as recording the candidate through the computer's camera for the entire duration of the test.

The virtual classroom which the student will access through the Zoom link on the Online Services Portal of the Politecnico di Milano will allow the Classroom Manager to supervise the proper conduct of the candidates during the test.

## Art. 7 - Procedure for Carrying Out the Admission Test

On the day of the test, the candidate must access the Online Services portal of Politecnico di Milano by 13.30 CEST both via their computer/laptop and mobile device.

On the Online Services portal of Politecnico di Milano there will be 2 links:

1. A link to access ZOOM virtually
2. A link to the test

The candidate will then carry out the following procedure:

1. With their mobile device, the candidate must access the virtual classroom through a special link. Access to the Zoom application must take place exclusively through the credentials used for access to the Online Services of the Politecnico di Milano
2. In the virtual classroom, the candidate must show their identification document to the classroom supervisor (identity card, driver's license, passport)
3. The candidate will have to access the test from their PC once the supervisor indicates it is time to do so.

The link to access the test will be activated at the scheduled time for the start of the test. With the start of the test, *Safe Exam Browser* will be automatically activated. **It must have been previously installed on the computer.**

Candidates who do not enter the virtual classroom by the start time will not be admitted and will not be able to take the recovery test scheduled for April 24<sup>th</sup>, 2024, 14:30 CEST.

At the end of the test, the candidate must click on the appropriate button. In any case, the system will automatically save the candidate's answers.

## Art 7.1 - Computer Station Preparation

From **March 15<sup>th</sup> until April 4<sup>th</sup>, 2024**, and from **April 8<sup>th</sup> until April 18<sup>th</sup> 2024**, from **14:00 to 23:59**, in order to help candidates prepare their computer station and in order to familiarize themselves with the system, a **demo session** will be available on the Online Services portal of Politecnico di Milano.

During the above-mentioned periods, it will be also possible to use a **live chat** for any assistance needed, from Monday to Friday, from 14:00 to 18:00 (except for the days when admission tests for Politecnico di Milano Degree Courses are scheduled, during which the live chat and the demo will be

available from 16:30).

In this phase, the candidate can download the *Safe Exam Browser* application through a special link on the Online Services portal of Politecnico di Milano.

### **Art 7.2 - Rules of Conduct for Candidates During the Admission Test**

Candidates must take the test in a bright room and must be alone. It is forbidden to use the bathroom or leave their station.

During the test, candidates can only use their computer/laptop without the help of additional screens, keyboards or mice.

**The computer/laptop used on the day of the test must be the same one used for the simulation.** It will therefore already be correctly configured.

During the test, candidates must not turn off their camera or microphone. Candidates may not use earphones or earplugs or talk to anyone else. The use of calculators, books, or notes is prohibited.

Communication with classroom managers may only happen through written communication, exclusively using the technical support chat, which must be carried out using the same personal computer used for the test.

The use of two sheets of white paper and a pen to perform calculations will be allowed, subject to verification by the supervisor during identification.

Tests of candidates who do not comply with the rules described above will be invalidated.

The Commission will ensure that the rules are respected and act accordingly in the event of a breach.

### **Art 7.3 - Disconnection from the Test: Conditions of a Second Test**

In case of disconnections of the exam on-line platform, candidates may be granted the opportunity to retake the test, after a preliminary investigation by the relevant Supervision Committee.

**In order to do so, the candidate should write an email to [admissions@hunimed.eu](mailto:admissions@hunimed.eu) by 23.59.CEST on the same day of the exam session.**

The email should include documentation and evidence for the disruption. The Supervision Committee will decide on this matter and candidates will be informed of the decision via e-mail by Tuesday, April 9<sup>th</sup>, 2024, 18:00 CEST (first exam round) and by Monday, April 22<sup>nd</sup> 2024, 14:00 CEST (second exam round).

In case a candidate does not finish the test due to disconnection from the exam platform, not attributable to the test provider, he/she **will be assigned the test score acquired at the time of disconnection.**

Possible examples of disconnection include but are not limited to: interruption of the Wi-Fi

connection; power outage; technical problems related to candidates' laptop/computer. In case of video disconnection from the virtual classroom, the Commission will assess whether the candidate can continue the test or whether the test is invalidated.

Authorized candidates will retake the Admission test on **April 24<sup>th</sup> 2024 at 14:30 CEST** with the same modality as described in this document at art. 7. The exam paper will be of the same level of difficulty. The retake of the Admission test will lead to the cancellation of the result obtained **during the exam round when the candidate experienced disconnection problems. It will be considered only the result obtained on April 24<sup>th</sup> 2024.**

### **Art. 8 - Support for Candidates with Disabilities or Special Education Needs**

Candidates with disabilities or special education needs (SEN), in relation to the specific difficulties attested by medical certification, may make an explicit request for aids and/or additional times compared to those established for the general candidates, as well as additional measures to ensure equal opportunities in carrying out the admission test.

Candidates with disabilities may include: candidates who are blind, with absolute blindness or a visual residue not exceeding one tenth in both eyes; candidates suffering from deafness from birth or before learning the spoken language; candidates with a percentage of civil disability of 66% or more; and/or candidates with a handicap certification provided for by Law 104/92 as amended by Law 17/99. These states must result from a special medical certification issued by the competent health authorities. Certifications will be accepted only if they are no older than three years and produced in Italian or English.

Candidates with SEN may include: candidates diagnosed with dyslexia, dysgraphia, dyscalculia, or dysgraphia, with specific clinical certification, issued no more than three years prior by the National Health Service, specialists or accredited facilities. The additional time awarded to candidates with DSA will be 30% more than that defined for the admission tests, pursuant to DM 5669/2011.

During the online procedure, candidates must indicate the need to receive and use accommodations and attach the relevant medical certification where required.

### **Art. 9 - Evaluation of the Test and Ranking**

According to the number of available places, the right to enrol in the one-cycle degree course in Medicine and Surgery called MEDTEC School is granted on the basis of candidates' position in the ranking list drawn up in descending order of points.

For **admission to the 2024/2025 academic year**, the highest score obtained during the exam rounds taken in the calendar years 2023 and 2024 will be submitted.

For **admission to the 2025/2026 academic year**, the highest score obtained during the exam rounds



taken in the calendar years 2024 and 2025 will be submitted.

**The ranking list will be anonymous and candidates can consult their exam results through the link which will be available on the website [www.hunimed.eu](http://www.hunimed.eu).**

The maximum score that can be achieved is 1000 points.

Table 2 indicates, for each section of the test, the points that will be assigned in case of a correct answer or subtracted in case of incorrect answer. Unanswered questions will be assigned a score of zero.

**Table 2**

<b>Sections</b>	<b>Correct Answer</b>	<b>Wrong Answer</b>	<b>Answer Not Given</b>
Mathematics	Plus 16 points	Minus 4 points	Zero points
Text Comprehension and Critical Reasoning	Plus 24 points	Minus 6 points	Zero points
Chemistry and Physics	Plus 16 points	Minus 4 points	Zero points
Biology	Plus 16 points	Minus 4 points	Zero points
Technical and Scientific Knowledge	Plus 12 points	Minus 3 points	Zero points

The right to enroll in the course in Medicine and Surgery called MEDTEC School will be established on the basis of the ranking list. The minimum score to qualify for enrollment is 400 points.

In the event of a tie between two or more candidates, the following criteria apply:

- a) The higher-ranking position will be assigned to the candidate who scores higher in the following sections, in the following order:
  - Mathematics
  - Text comprehension and critical reasoning
  - Chemistry and physics
  - Biology
  - Technical and scientific knowledge
- b) in the event of further equality, the higher-ranking position will be assigned to the younger student.

### **9.1 Submission of the test score to be included in the ranking list**

Between **May 2<sup>nd</sup> and May 6<sup>th</sup>, 2024**, candidates will visualise in the Humanitas University Registration Portal the scores obtained during any tests taken in the calendar years 2023 and 2024. Within this time window **each candidate is required to select and submit the highest score** in order to access the final ranking for admission to the Degree Course in Medicine and Surgery called MEDTEC School for the academic year 2024/2025.

**Candidates who do not complete this procedure by May 6<sup>th</sup>, 2024, are preemptorily excluded from the final ranking.**

## **Art. 10 - Publication of the Ranking List**

The ranking lists are drawn up in accordance with Article 9.

Each candidate may visualize their own ranking position and relative status (admitted/not admitted/rejected) through the University web portal MyPORTAL, by accessing the reserved area and clicking on the menu item "Admission tests" from the "Student Office" section.

For the 2024/2025 academic year, the ranking list is published by Humanitas University **on May 10<sup>th</sup> 2024** on the web portal [www.hunimed.eu](http://www.hunimed.eu), guaranteeing the anonymity of candidates.

## **Art. 11 – Online Enrolment and Scrolling Procedure a.y. 2024/2025**

Candidates who are invited to enroll are required to complete the registration procedure on the University's web portal **from May 10<sup>th</sup> 2024 to May 17<sup>th</sup> 2024 by 17:00 CEST**.

During this period:

1. Candidates from position 1 to position 10, who are eligible for one of the scholarships made available by the University, will be automatically considered pre-enrolled pending publication of the scholarship ranking<sup>1</sup>
2. Candidates from position 11 to position 15 of the ranking list can register with reserve. Registrations with reserve will be confirmed on Monday, May 20<sup>th</sup>, 2024, by e-mail if available places remain due to the non-registration of some of the applications classified from position 1 to position 10 of the ranking.

By 17:00 CEST on Friday, May 17<sup>th</sup> 2024, those admitted with reserve (from position 11 to position 15) are required to pay the first instalment and the regional tax; an amount equal to 5.156,00 € (euro five thousand one hundred fifty-six).

Any places not covered by position 16 will be managed according to the following scrolling procedure:

- Publication on the University's website of the number of places available (reopening of the rankinglist).
- Sending candidates an email confirming admission by scrolling through the ranking list by the University.
- Those admitted by scrolling of the ranking list must proceed with the online registration and with the payment of the first instalment within the peremptory deadline indicated in the e-mail in which the admission is communicated.
- The "scrolling" procedure shall be repeated until the 10 available posts are covered, subject to paragraph 1.

**Candidates who do not meet the above deadlines will lose the right to register.**

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<sup>1</sup> For further details, please see the "MEDTEC Scholarships Regulation 2024/2025" which will be published on Humanitas University's website in January 2024.

### **Art. 12 – Reimbursement of the First Instalment**

The first instalment, which is € 5,156.00, can only be reimbursed to those candidates registered with reserve for whom registration cannot be confirmed because of a lack of available places.

#### **In no other cases or conditions will the first installment be reimbursed.**

The regional tax (amounting to €140,00) will be reimbursed only to candidates transferring from an Italian University, having passed the Humanitas University admissions test and already paid the regional tax to the incoming University for year 2024-25.

### **Art. 13 – Procedure for Enrolment in the First Year of the Course**

Candidates who have acquired the right to enroll in the first year of the course must complete the online procedure on MyPortal - the portal of Humanitas University. To complete the procedure, they are required to:

a) Enter the following documents on the university's web portal:

- A scan of the ID card or passport.
- A scan of the tax code (if available).
- A formal ID photograph.

b) Submit a self-declaration of the secondary education qualification obtained at the latest in the school year 2023/2024;

c) Accept the privacy regulations and economic conditions provided for in this document and in the Fees and Academic Contributions Regulation.

The conclusion of the online procedure, together with the payment of the first instalment, are necessary conditions to complete the enrolment process in Medicine and Surgery called MEDTEC School of Humanitas University.

Italian and foreign students with degrees obtained abroad must submit the official Italian translation of the complete degrees and Declaration of Value to the Student Office of Humanitas University. The Declaration of Value is issued by the Italian diplomatic-consular representation in the country where the title was issued. For further clarification, please contact the International Office at [international.office@hunimed.eu](mailto:international.office@hunimed.eu).

After enrolling in the first year of the course, the student may request any recognition of the previous university courses taken which will be evaluated by Humanitas University.

### **Art. 14 – Supervision Committee**

To ensure the fairness of the Admissions Test procedure, Humanitas University will appoint a committee, to be formed of at least three members. University and external personnel will help the commission in the candidate identification and test supervision.

The person in charge of the procedure is Dr. Massimiliano Laganà (Managing Director of Humanitas University), email [info@hunimed.eu](mailto:info@hunimed.eu). For further information, candidates can contact the Student Office by phone at +39 02 8224 3777.

### Art. 15 – Summary Table of Deadlines Table 3

Start of registration for the admission test	<b>10/01/2024</b>
Registration deadline for the admission test	<b>First and second exam round: 27/03/2024 17:00 CET</b> <b>Second exam round only: 11/04/2024 17:00 CEST</b>
Admission test	<b>First exam round: 5/04/2024 14:30 CEST</b> <b>Second exam round: 19/04/2024 14:30 CEST</b>
Recovery Test	<b>24/04/2024 14:30 CEST</b>
Submission of scores and entry into the ranking list	<b>From May 2<sup>nd</sup> to May 6<sup>th</sup> 2024</b>
Publication of the ranking list	<b>10/05/2024</b>
Start of enrollments	<b>10/05/2024</b>
Time limit for enrollments and payment first installment	<b>17/05/2024 17:00 CEST</b>
Start of scrolling	<b>20/05/2024</b>

### Art. 16 – Data Processing

The processing of personal data will take place in accordance with the provisions of EU Regulation No 679/2016 on the protection of personal data.

All the data provided will be processed for institutional purposes only in accordance with and instrumental to the procedure of participation in the admission test to the Medicine and Surgery course hosted by MEDTECSchool.

The full information for applicants is published at: <https://www.hunimed.eu/it/informativa-privacy/>

### Art. 17 – Additional Training Obligations

The results of the admission test will be analyzed to verify the need to assign Additional Educational Obligations (OFA). This will be in relation to the level of average skills of the individual student classes in the so-called basic disciplines (biology, chemistry, physics and mathematics). Any OFAs assigned are considered to have been completed in taking the courses which are provided during the first two years of the degree. For the recovery of any OFA, training support initiatives will be organized to achieve an adequate degree of homogeneity of the class in relation to the training programs.

During enrolment, foreign students will be evaluated in the level of Italian language. If the level of knowledge of the Italian written and spoken language is lower than a B2 level, the student is assigned additional OFAs to be done during the third year of the course. These additional OFAs are considered fulfilled with the passing of a test. For the recovery of Italian-speaking OFAs, appropriate courses and teaching materials are offered to students.

## **Annex A**

### **Programs relating to the admission test to the MEDTEC School Medical and Surgery degree course.**

#### **Mathematics**

Understanding and basics of the following topics are required:

##### **Arithmetic and Algebra**

Number sets: Natural, Integer, Rational (decimal, fraction), Irrational, Real. Properties and operations on algebraic numbers and expressions. Percentages, absolute value, powers, and roots. Operations on polynomials, factorization of polynomials. Solving algebraic equations and inequalities. Operations on rational expressions, resolution of equations and rational inequalities.

##### **Functions**

The Cartesian plane; graph of a function, graph symmetries. Properties, graph, resolution of equations and inequalities of powers, exponential and logarithmic functions, trigonometric functions.

##### **Logic**

Calculation of propositions: propositions, connectives, tables of truth, laws concerning connectives.

Predicate calculation: predicates, quantifiers, quantifier laws.

Evaluating logical expressions. Rules of inference. Demonstration by contrast, Demonstration for absurdity.

##### **Geometry**

Flat and solid Euclidean geometry: angles and their measurement, conversion of degrees- radians; perpendicular lines, parallel lines, geometric transformations, similarities. Properties and main theorems concerning triangles, quadrilaterals, parallelograms, regular polygons, circumferences, and their area and perimeters; spheres, cones, cylinders, prisms, parallelepipeds, pyramids, and their volumes and surface areas.

Flat analytic geometry: straight equations, circumferences, conical sections. Resolution of right triangles by means of trigonometric formulas.

##### **Statistics**

Description of a set of data: absolute, relative, relative cumulative frequencies; histograms, bar charts, pie charts; median, mode, range, variance, standard deviation.

Counting techniques: permutations and combinations. Calculation of probabilities using combinatorial calculation.

##### **Text comprehension and critical reasoning**

The purpose of the Section is to ascertain the skills of the candidate

- a. To use the English language correctly

- b. To be able to logically complete an argument, in a manner consistent with the premises.

Type 1 questions ("Verbal Understanding") will focus on texts of scientific or narrative non-fiction by classical or contemporary authors, or on current texts that have appeared in newspapers or in general or specialist journals.

Type 2 questions ("Critical reasoning") will be stated in a symbolic or verbal form, and among the proposed answers must be discarded those containing the wrong, arbitrary, or less probable conclusions.

## **Chemistry**

The understanding and basic knowledge of the following topics are required.

### **Structure of matter**

Atoms, isotopes and molecules, elements and compounds. Atomic theory of matter, chemical periodicity, quantum numbers and atomic orbitals. Electronic structure and atoms properties: Pauli exclusion principle, Hund's rule, "aufbau" principle. The periodic table and dependence of atomic properties on the electronic structure: atomic and ionic radius, ionization energy and electron affinity. Chemical bonding: structure and properties of the substances. Ionic bond. Covalent bond and molecular geometry, VSEPR theory. Hybrid orbitals and steric number. Electronegativity according to Pauling and molecular polarity.

Intermolecular attractions, interactions and the properties of liquids and solids. Hydrogen bonding. Metallic solids, ionic solids, covalent solids and molecular solids. Inorganic chemical nomenclature.

### **Stoichiometry**

Atomic and molecular mass. Mole and number of molecules: Avogadro's constant and molar mass. Chemical reactions and equations: types of chemical reactions, balanced chemical equations and stoichiometric calculations.

Ideal gases and ideal gas mixtures. The laws of: Boyle, Charles, Gay-Lussac, Avogadro, Dalton. Concentrations and stoichiometry of the reactions in aqueous solutions.

### **Oxidation-Reduction**

Oxidation numbers and redox reactions: oxidizing and reducing agents.

Electrochemistry: balancing redox equations, using standard reduction potentials, cell voltage. Electrolysis and Faraday's law.

### **Solutions**

Acids and bases: Arrhenius, Brønsted and Lewis definitions. Water and the pH scale: strong acids and strong bases, weak acids and weak bases. Acid-base neutralization and acid-base titrations. Dissolution.

### **Organic chemistry**

Classification, nomenclature, empirical, molecular and structure formula, isomerism, physical and biological properties of organic compounds: alkanes and cycloalkanes, alkenes and cycloalkenes, alkynes, benzene and its derivatives, alcohols and phenols, ethers and epoxides, thiols and sulfides, aldehydes and ketones, amines, carboxylic acids and derivatives (salts,

anhydrides, esters, amides, acid halides, and nitriles). Oxidation and reduction of organic compounds.

## **Physics**

Understanding and basics of the following topics are required:

### **Mechanical**

The International System of Units; conversion of units of measurement. Scalars and vectors.

Linear and angular motion of a particle (position, displacement, velocity, acceleration); acceleration of gravity, motion of a bullet, uniform circular motion.

Strength, mass, Newton's laws. Linear momentum; preservation of linear momentum. Angular momentum; conservation of angular momentum.

Friction. Work; work done by gravitational force and an elastic force. Kinetic energy and potential energy, conservation of mechanical energy. The simple pendulum.

Particle systems (center of mass, linear momentum, angular momentum; shocks). Newton's law of universal gravitation. Kepler's laws.

### **Fluids**

Density, pressure. Pascal's principle. Archimedes principle. Bernoulli equation.

### **Electromagnetism**

Electric charge; conductors and insulating agents. Coulomb law, electric field, Gauss law, electrical potential, and electrical potential. Capacities, capacitors in series and in parallel.

Electric current, resistance, Ohm's law. Circuits, electromotor force. Lorentz force and magnetic field. Ampère's law. Electromagnetic waves: wavelength, frequency, energy.

### **Optics**

Fermat principle; reflection, refraction and Snell's law. Prisms; mirrors and lenses; interference; Diffraction.

### **Thermodynamics**

Temperature; Celsius, Fahrenheit and absolute scales. Heat, specific heat, expansion. Avogadro number, ideal gases. The laws of Thermodynamics; Entropy. Thermodynamic cycles; efficiency of a thermal machine

## **Biology**

Understanding and basics of the following topics are required:

### **The Chemistry of the Living**

Weak bonds in biological systems. Organic molecules present in living organisms and their functions. The role of enzymes.

### **Bioenergetics**

The energy evaluation of cells: ATP. Oxide reduction reactions in the living. Energy processes: photosynthesis, glycolysis, aerobic breathing and fermentation.

### **Reproduction and Inheritance**

Life cycles. Sexual and asexual reproduction. Mendelian genetics. Basic laws and applications. Classical genetics: chromosomal theory of inheritance; inheritance models. Molecular genetics: structure and duplication of DNA, genetics, protein synthesis. The DNA of prokaryotes. The structure of the eukaryotic chromatin. Genes and the regulation of gene expression. Human genetics:

transmission of mono and polyfactorial characters; autosomal hereditary diseases linked to the X chromosome. Biotechnology: recombinant DNA technology and its applications. Inheritance and environment. Cell cycle and cell reproduction: mitosis and meiosis – runs chromosomal and chromosomal maps. Mutations. Natural and artificial selection. Evolutionary theories. The genetic basis of evolution.

### **Organisms**

The cell as the basis of life. Cell theory. Cell size. The prokaryote and eukaryotic cell, animal and vegetable. Viruses. The cell membrane.: structure and functions – transport through the membrane. Cell structures and their specific functions. Animal tissues. Anatomy and physiology of systems and apparatuses in humans and their interactions. Homeostasis.

### **Technical and scientific knowledge**

The questions of this Section will focus on basic technical-scientific knowledge, to ascertain the cultural level acquired by the candidate in the pre-university training course, together with the candidate's personal interest in the study of scientific and technical subjects.