

**CALL FOR APPLICATIONS FOR EU AND EU-EQUATED CITIZENS TO THE ONE-CYCLE DEGREE COURSE IN MEDICINE AND SURGERY IN ENGLISH WITH LIMITED ACCESS (Class LM-41) AT HUMANITAS UNIVERSITY MEDTEC SCHOOL.**

**SUMMARY OF THE CALL IN ENGLISH**

**Academic year 2021/2022**

**Foreword**

**The official source of the Call for Applications for EU and EU-equated citizens is “BANDO DI CONCORSO, RISERVATO AI CITTADINI COMUNITARI ED EQUIPARATI, PER L’AMMISSIONE AL CORSO DI LAUREA MAGISTRALE A CICLO UNICO IN MEDICINA E CHIRURGIA (Classe LM-41) IN LINGUA INGLESE DI HUMANITAS UNIVERSITY DENOMINATO MEDTEC SCHOOL” in Italian. This document represents a summary of the call.**

**This document is provided for the convenience of international students. In the event of disputes, the parties should refer only to the document in Italian.**

Admittance to the Degree Course is subject to selection through the University’s admissions test.

**Art. 1 Number of places available**

**Art. 2 Admission requirements**

**Art. 3 Admission Test**

**Art. 4 Application procedure**

**Art. 5 Date and Time of the Admission Test**

**Art. 6 Hardware and Software Requirements**

Art. 6.1 Security Measures to Ensure Transparency and Fairness of Results

**Art. 7 Procedures for Carrying out the Admission Test**

Art. 7.1 Computer Station Preparation and General Simulation

Art 7.2 Rules of Conduct for Candidates During the Admission Test

Art 7.3 Disconnection from the Test: Conditions for a Second Test

**Art. 8 Support for Candidates with Disabilities or Specific Learning Disabilities**

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

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

**Art. 11 Online Enrollment and Scrolling Procedure**

**Art. 12 Reimbursement of the First Installment**

**Art. 13 Procedure for Enrollment to the First Year of the Course**

**Art. 14 Supervision Committee**

**Art. 15 Summary Table of Deadlines**

**Art. 16 Data Processing**

**Art. 17 Additional Training Obligations**

**Annex A: Contents of the Admission Test**

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

For the academic year 2021/22, the number of places available for EU citizens and EU-equated citizens (as reported in art. 2) is established as **60**.

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.

#### **Citizenship Requirements**

Candidates must meet one of the following requirements:

- Citizens of Italy or of European Union member states.
- Citizens holding a European citizenship together with a citizenship of a country not belonging to the European Union.
- Citizens of UK, Norway, Iceland, Liechtenstein, Switzerland, the Republic of San Marino.
- Non-EU citizens holding a residence permit in Italy for employment or self-employment, for family reasons, political asylum, asylum for humanitarian or religious reasons (ex art. 26 of L. n.189/2002);
- Non-EU citizens legally resident in Italy for at least one year in possession of a Secondary School Diploma obtained in Italy.
- Non-EU citizens, resident anywhere who hold diplomas from Italian schools abroad or foreign or international schools having bilateral agreements or special regulations for the recognition of qualifications and who satisfy the general conditions required to be admitted to study in Italy.
- Refugees
- Diplomatic personnel accredited to International Organizations in Italy, Italian State, Vatican State and their dependent family members.

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

#### **Education Requirements**

To write the admissions test, candidates must either be in possession of a Secondary School Diploma or attending the last year of their secondary education (high school).

For students who attended high school outside of Italy, a diploma is considered valid if obtained after at least 12 years of education, 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 qualification, according to the requirements of the law, will lose the right to enroll. If the candidate is 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 "Procedures for the entry, stay and enrolment of foreign/international students to higher education courses in Italy for the academic year 2020-2021 (Updated June 16, 2020)

<http://www.studiare-in-italia.it/studentistranieri>

### Art. 3 Admission Test

The admission test for the Medicine and Surgery Course called MedTec School is conducted in English and consists of 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 on the platform of Politecnico di Milano.

Given the Covid-19 pandemic and the current health emergency, and in compliance with government regulations at the national and regional level, Humanitas University has decided that the exam will be online.

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 Application Procedure**

Registration for the test will take place between **December 14<sup>th</sup>, 2020** and **March 4<sup>th</sup>, 2021**.

Registration procedure on the Humanitas University portal:

1. **MyPORTAL Online registration at <https://humanitas.esse3.cineca.it>:** the candidate must register online to receive a username and a password; the username and password will be necessary to access the personal page on Humanitas University MyPORTAL;
2. **Application for the Admissions Test:** the candidate must apply for the admissions test through MyPORTAL according to the timeline reported above. After the login, candidates must click “Admission test” from the right-hand menu bar and select “Medicine and Surgery/MEDTEC Degree Course”. Candidates must complete all the required steps, including payment of the fee of €166.00 and finalize the procedure by clicking "Click here to complete your MEDTEC registration". The candidate will receive a pre-registration number which can be used to consult the final ranking list. **The registration fee is non-refundable under any circumstances.**

Completion of registration on the **Politecnico Milano** website

3. Upon clicking "Click here to complete your MEDTEC registration", 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 in order to access the test.**

#### **Email**

4. At the end of the registration procedure, the candidate will receive an e-mail containing proof of registration. The email also contains the personal code required to carry out the test.

**Fee:** The test fee is €166,00.

#### **Art. 5 Date and Time of the Admission Test**

The Admissions Test will take place on **March 12<sup>th</sup>, 2021 at 14:00 CET**.

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

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

For the test, candidates must have access to:

1. A computer or laptop with a camera, microphone, and speakers, running Windows 7, 8, 10, or MAC-OS 10.10 or later, and 120 MB of free memory available on a hard disk
2. A mobile device (mobile phone or tablet) equipped with a camera and microphone
3. 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 *Respondus Lockdown Browser* software on the computer or laptop used during the test, after uninstalling any other versions of *Respondus Lockdown Browser* already installed on the computer. The *Respondus Lockdown Browser* software can only be downloaded from the Politecnico Online Services portal beginning March 1<sup>st</sup>, 2021.

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

The candidate 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 on your devices are found in a technical guide downloadable from the Online Services portal of the Politecnico di Milano.

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

The *Respondus Lockdown 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.

In order to validate the final scores, all candidate tests will be reviewed after the end of the session using the *Respondus Lockdown Browser* video recording.

### **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 13.00 CET 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, *Respondus Lockdown 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 test scheduled for March 12<sup>th</sup>, 2021. They are also ineligible for the recovery test described in Art. 7.3 of this call.

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

### **Art 7.1 - Computer Station Preparation and General Simulation**

Starting from March 1<sup>st</sup>, 2021, and until March 11<sup>th</sup>, 2021, 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 the Politecnico di Milano.

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

On March 8<sup>th</sup>, 2021, at 14:00 CET, there will also be a general simulation of the entrance test, which will provide, in addition to access to the demo quiz, the simultaneous use of Zoom with mobile devices. Applicants must log in on the Online Services portal by 13:00 CET.

### **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**

Candidates who have their tests interrupted due to disconnection from the exam platform are given the right to repeat the test, after investigation by the Commission. Test interruptions may involve; a loss of internet connection, interruption of service by the web provider, power outages affecting the candidate's computer or WiFi. In this case, the candidate should write an email to [admissions@hunimed.eu](mailto:admissions@hunimed.eu) no later than **20:00 CET on Friday March 12<sup>th</sup>, 2021.**

The Commission will evaluate the requests to repeat the test and provide an answer about the possibility of repeating by 18:00 CET on Monday March 15<sup>th</sup>, 2021.

Authorized candidates will repeat the entry test with the same procedures described above, **on March 17<sup>th</sup>, 2021, at 14:00 CET.** The test will be the same difficulty as the test on March 12<sup>th</sup>, 2021.

In the event of disconnection from the exam platform that involves the impossibility of continuing the entrance test, under circumstances not attributable to test provider nor to the above-mentioned causes, the candidate will be assigned the test score acquired at the time of disconnection. In the event of disconnection of one or more video devices used to allow surveillance (e.g. mobile phone), the Commission will consider whether to continue the test or cancel it.

**For candidates who will carry out the recovery test, only the score obtained in the recovery test will be considered.**

### **Art. 8 - Support for Candidates with Disabilities or Specific Learning Disabilities**

Candidates with disabilities or specific learning disabilities (DSAs), 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 old and produced in Italian or English.

Candidates with DSA 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.

These requests must be specified when registering on the web portal and the related medical certification attached in electronic format. Documentation submitted in other ways will not be accepted.

After clicking on "Admission Test" and starting the registration procedure, candidates must then indicate the need to receive and use aids for carrying out the entrance test and attach related medical certification where required.

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

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 based on a 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:

- 1) 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

2) in the event of further equality, the higher ranking position will be assigned to the younger student.

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

The **ranking list**, determined in accordance with the procedures described in Art. 9, **will be published** by Humanitas University **on March 22<sup>nd</sup>, 2021**, on the web portal at [www.hunimed.eu](http://www.hunimed.eu), guaranteeing the anonymity of candidates. Each candidate will be able to view their ranking in the list through the pre-registration number generated when registering for the test. In addition, through the username and password of the MyPortal Humanitas University portal, each of the participants in the entrance test will be able to view the score obtained on their reserved area.

### **Art. 11 – Online Enrolment and Scrolling Procedure**

Candidates who are invited to enroll are required to complete the registration procedure on the University's web portal from March 22<sup>nd</sup> to March 26<sup>th</sup>, 2021. During this period:

- 1) Candidates from position 1 to position 20, 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 21 to position 60 are invited to enroll.
- 3) Candidates from position 61 to position 80 of the ranking list can register with reserve. Registrations with reserve will be confirmed on March 29<sup>th</sup>, 2021 by e-mail if available places remain due to the non-registration of some of the applications classified from position 1 to position 60 of the ranking.

By March 26<sup>th</sup>, 2021, those admitted (from position 21 to position 60) and those admitted with reserve (from position 61 to position 80) are required to pay the first instalment and the regional tax; an amount equal to

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<sup>1</sup> For further details, please see the “MedTec Scholarships Regulation 2021/2022” which will be published on Humanitas University’s website in January 2021.

4,156,00,00 € (euro four thousand fifty-six).

Any places not covered by position 81 will be managed according to the following scrolling procedure:

1. Publication on the University's website of the number of places available (reopening of the ranking list).
2. Sending candidates an email confirming admission by scrolling through the ranking list by the University.
3. 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.
4. The "scrolling" procedure shall be repeated until the 60 available posts are covered, subject to paragraph 1.

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

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

The first instalment, the amount of which is € 4,156.00, 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 2021-22.

#### **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:

1. 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.
2. Submit a self-declaration of the secondary education qualification obtained or to be obtained in the school year 2020/2021
3. 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

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 entrance test	<b>14/12/2020</b>
Registration deadline for the entrance test	<b>04/03/2021</b>
Entrance test	<b>12/03/2021</b>
Ranking Publication	<b>22/03/2021</b>
Start of registrations (including registrations with reservations)	<b>22/03/2021</b>
Time limit for registration and payment before instalment	<b>26/03/2021</b>
Start of scrolling	<b>29/03/2021</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 MedTec School.

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.

## **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, median, fashion, 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

1. To use the english language correctly

2. 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**

Understanding and basics 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 atomic properties: Pauli exclusion principle, Hund rule, Aufbau principle. Periodic table and dependence of atomic properties on the electronic structure: atomic radius and ion radius, ionization energy and electron affinity.

Chemical bonds: structure and properties of substances. Ion bond. Covalent bonding and molecular geometry, VSEPR theory. Hybrid orbitals and steric number. Pauling electronegativity and molecular polarity.

Intermolecular attractions, interactions and properties of liquids and solids. Hydrogen bond. Metallic solids, ion solids, covalent solids, and molecular solids. Inorganic chemical nomenclature.

### **Stoichiometry**

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

Ideal gases and gas mixtures. Avogadro's law.

Concentrations and stoichiometry of reactions in aqueous solution.

### **Oxide reduction**

Oxidation numbers and oxidization reactions (redox): oxidizing agents and reducing agents.

Electrochemistry: balancing redox reactions with potential reduction standards, voltaic cells. Electrolysis and Faraday's law.

### **Solutions**

Acids and bases: definitions of Arrhenius, Brønsted and Lewis. Water and pH scale: strong acids and bases, acids and weak bases. Acid-base neutralization and acid-base titration. Buffer solutions. Dissolution and precipitation balances.

### **Organic chemistry**

Classification, nomenclature, empirical, molecular and structural formulae, 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, starches, acyclic and nitrile halides). Oxidation and reduction in 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 moment; preservation of linear moment. 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 chroma. 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.