Annex A

Programs relating to the questions of the admission tests to the master's degree courses in Medicine and Surgery (LM-41), in Dentistry and Dental Prosthetics (LM-46) in English

Admission to the courses requires the ability to understand and analyze written texts of various types, to conduct logical-mathematical reasoning, as well as knowledge of general culture, with special regard to the historical, geographical, social and institutional and disciplinary fields in mathematics , chemistry, physics and biology.

The skills and knowledge required respond to the preparation promoted by educational institutions that organize educational and teaching activities consistent with the *national indications* for high schools and with the *guidelines* for technical institutes and professional institutes, especially in view of the state exams.

1. Reading skills and knowledge acquired in studies

The ability to understand texts written in English of different nature and with different communicative purposes constitutes a transversal competence, given that all types of questions will be formulated in English, even using symbolic language.

The following capabilities will also be subject to specific verification:

- understand abstract, uncommon or specialized vocabulary in real contexts;
- identify the phenomena of textual cohesion and coherence;
- extract and infer specific information from the text.

These skills will be verified starting from short texts of scientific essays or classic and contemporary fiction, or from short current affairs texts published in newspapers and in generalist or specialized magazines.

Always starting from short texts of various types and themes, the skills acquired in previous studies and the knowledge of general culture, including supranational issues or topics subject to contemporary public debate, will be tested.

In particular, the questions will aim to ascertain:

- the ability to orient oneself in the space and time represented, or rather a placing relevant historical-cultural phenomena in space and time;
- knowledge of the main national and international institutions;
- understanding of phenomena relating to the legal, economic and citizenship.

2. Logical reasoning and problems

The questions are aimed at testing the ability to logically complete a reasoning, in a coherent way with the premises. These premises are stated in symbolic or verbal form, and concern cases or problems, even of an abstract nature, whose solution requires the adoption of different forms of logical reasoning.

3. Biology

- The chemistry of living things.
- The biological importance of weak interactions.
- The organic molecules present in organisms and their respective functions. The role of enzymes.
- The cell as the basis of life. cell theory. Cell dimensions. The cell prokaryotic and eukaryotic, animal and plant. Viruses.
- The cell membrane: structure and functions; transport across the membrane. Cellular structures and their specific functions.
- Cell cycle and cell reproduction: mitosis and meiosis - chromosome set and chromosome maps.
- Reproduction and inheritance. Life cycles. Sexual and asexual reproduction.
- Mendelian genetics: Mendel's laws and their applications.
  Classical genetics: chromosomal theory of inheritance - models of inheritance.
  Molecular genetics: structure and duplication of DNA, the genetic code, protein synthesis. The DNA of prokaryotes. The structure of the eukaryotic chromosome. Genes and the regulation of gene expression.
  Human genetics: transmission of mono- and polyfactorial characters; autosomal and X-linked hereditary diseases.
- Mutations. Natural and artificial selection. Evolutionary theories. The genetic basis of evolution. Inheritance and environment.
- Biotechnology: recombinant DNA technology and its applications. • Anatomy and Physiology of animals and humans. Animal tissue. Anatomy and physiology of human systems and apparatuses and related interactions. Homeostasis.
- Bioenergetics. The energy currency of cells: ATP. Redox reactions in living things. Energy processes: photosynthesis, glycolysis, aerobic respiration and fermentation.

4. Chemistry

- The constitution of matter: the states of aggregation of matter; systems heterogeneous and homogeneous systems; compounds and elements.
- Ideal gas laws.
- The structure of the atom: elementary particles; atomic number and number of mass, isotopes, electronic structure of the atoms of the various elements.
- The periodic system of elements: groups and periods; transition elements.
  Periodic properties of the elements: atomic radius, ionization potential, electron affinity, metallic character. Relations between electronic structure, position in the periodic system and properties of the elements.
- The chemical bond: ionic bond, covalent and metallic bond. Binding energy. Polarity of bonds. Electronegativity. Intermolecular bonds.

- Fundamentals of inorganic chemistry: nomenclature and main properties of inorganic compounds: oxides, hydroxides, acids, salts.
- Chemical reactions and stoichiometry: atomic and molecular mass, Avogadro's number, the concept of mole and its application, elementary stoichiometry, balancing of simple reactions, the different types of chemical reaction.
- Solutions: solvent properties of water, solubility, the main methods of express the concentration of solutions.
- Equilibria in aqueous solution.
- Elements of chemical kinetics and catalysis.
- Oxidation and reduction: oxidation number, concept of oxidant e reducing. Balancing simple reactions.
- Acids and bases: the concept of acid and base. Acidity, neutrality and basicity of aqueous solutions. The pH. Hydrolysis. Buffer solutions.
- Fundamentals of organic chemistry: bonds between carbon atoms, crude formulas and of structure, concept of isomerism. Aliphatic, alicyclic and aromatic hydrocarbons. Functional groups: alcohols, ethers, amines, aldehydes, ketones, carboxylic acids, esters, amides. Nomenclature elements.

5. Mathematics

- Numerical sets and algebra: natural, integer, rational, real numbers. Sorting and Comparison; order of magnitude and scientific notation. Operations and their properties. Proportions and percentages. Powers with integer exponent, rational) and their properties. Radicals and their properties. Logarithms (base 10 and base e) and their properties. Elements of combinatorics. Algebraic expressions, polynomials.
  Remarkable products, nth power of a binomial, factorization of polynomials. Algebraic fractions. First and second degree algebraic equations and inequalities. Systems of equations.
- Functions: fundamental notions on functions and their graphical representations (domain, codomain, study of the sign, continuity, maxima and minima, increase and decrease, etc.). Elementary functions: integer and fractional algebraic, exponential, logarithmic, trigonometric. Composite functions and inverse functions. Trigonometric equations and inequalities.
- Geometry: polygons and their properties. Circumference and circle. Measurements of lengths, surfaces and volumes. Isometries, similarities and equivalences in the plane. Geometric places. Angle measurement in degrees and radians. Sine, cosine, tangent of an angle and their notable values. Trigonometric formulas. Resolution of triangles. Cartesian reference system in the plane. Distance of two points and midpoint of a segment. Equation of the line. Conditions of parallelism and perpendicularity. Distance of a point from a straight line. Equation of the circumference, of the parabola, of the hyperbola, of the ellipse and their representation in the Cartesian plane. Pythagorean theorem. Euclid's theorems (first and second).

• Probability and statistics: frequency distributions according to the type of character and main graphical representations. Notion of random experiment and event. Probability and frequency.

6. Physics

• Physical quantities and their measurement: Fundamental and derived physical quantities. Systems of units of measure: International and Technical. Multiples and submultiples. Scientific notation. Main conversions between units of measurement of different systems. Scalar quantities and vector quantities. Vectors and operations on vectors.

• Kinematics: Description of motion. Velocity and angular velocity, acceleration and centripetal acceleration. Uniform rectilinear motion, uniformly accelerated motion, uniform circular motion, harmonic motion. • Dynamics: Concept of force as an interaction between bodies. Forces as applied vectors. The principle of inertia. Mass and the 2nd law of dynamics. Examples of forces: weight force, elastic force, static and dynamic friction. Action and reaction: the 3rd principle of dynamics. Impulse and momentum. Principle of conservation of momentum. Moment of a force and angular momentum.

Work and kinetic energy. Conservative forces and potential energy. Principle of conservation of mechanical energy. Power.

• Fluid Mechanics: Density and compressibility of fluids. Gases and liquids. Hydrostatics: pressure and principles of Pascal, Stevino and Archimedes. Dynamics of liquids: one-dimensional motion, flow and flow rate, continuity equation. Ideal fluids and Bernoulli equation. Viscous forces in real fluids.

• Thermodynamics: Equilibrium, concept of temperature, thermometers. Concept of heat and calorimetry. Heat propagation mode. Thermal capacity and specific heat. Changes of state and latent heats. Ideal gas laws.
First and second law of thermodynamics.

• Electricity and electromagnetism: Electric charges. Forces between charges and Coulomb's law. Electric field and potential, equipotential surfaces. Dielectric constant, capacitance, capacitors. Electrostatic energy. Series and parallel of capacitors. Generators. Electric voltage. Electric current. Resistivity, resistance, resistors. Ohm's law. Series and parallel of resistors. Kirchhoff's principles. Work, Power, Joule Effect. Direct and alternating current. Period and frequency. Magnetic field of an electric current. Forces on electric currents in magnetic fields. electromagnetic induction.