



# Ministry of University and Research

## Attachment A

**Programs relating to the questions of the admission tests for 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 attention to the historical, geographical, social and institutional and disciplinary fields of mathematics, chemistry, physics and biology.

The skills and knowledge required respond to the preparation promoted by the educational institutions that organize educational and teaching activities consistent with the *national indications* for high schools and with the *guidelines guide* 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 skill, given that all types of questions will be formulated in English, even using symbolic language.

The following skills 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 tested starting from short texts of scientific non-fiction or classic and contemporary fiction, or from short current affairs texts published in newspapers and general or specialized magazines.

Again starting from short texts of various types and themes, the skills acquired in previous studies and the knowledge of general culture, including those of a supranational context, or of 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 to place oneself in space and over time significant historical-cultural phenomena;
- knowledge of the main national and international institutions;
- understanding phenomena relating to the legal, economic and citizenship fields.

### **2. Logical reasoning and problems**

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



# Ministry of University and Research

## 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. Cellular theory. Cell phone dimensions. The prokaryotic cell ed eukaryotic, animal and plant. Viruses.
- The cell membrane: structure and functions; transport across the membrane. The structures cell phones and their specific functions.
- Cell cycle and cellular reproduction: mitosis and meiosis - chromosome set and maps chromosomal.
- Reproduction and inheritance. Life cycles. Sexual and asexual reproduction.
- Mendelian genetics: Mendel's laws and their applications.  
Classical genetics: chromosomal theory of inheritance - inheritance patterns.  
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: mono- and multifactorial transmission of traits; autosomal and X-linked hereditary diseases.
- Mutations. Natural and artificial selection. Evolutionary theories. The genetic basis of evolution. Heredity and environment.
- Biotechnology: recombinant DNA technology and its applications. • Anatomy and Physiology of animals and humans. Animal tissues. Systems anatomy and physiology and systems in humans and related interactions. Homeostasis.
- Bioenergetics. The energy currency of cells: ATP. Oxidation-reduction reactions in living things. THE energy processes: photosynthesis, glycolysis, aerobic respiration and fermentation.

## 4. Chemistry

- The constitution of matter: the states of aggregation of matter; heterogeneous systems e homogeneous systems; compounds and elements.
- Ideal gas laws.
- The structure of the atom: elementary particles; atomic number and mass number, isotopes, electronic structure of the atoms of the various elements.
- The periodic system of elements: groups and periods; transition elements. Periodic properties of elements: atomic radius, ionization potential, electronic affinity, metallic character.  
Relationships 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 ties. Electronegativity. Intermolecular bonds.



# Ministry of University and Research

- 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, concept of mole and its application, elementary stoichiometric calculations, balancing of simple reactions, the different types of chemical reactions.
- Solutions: solvent properties of water, solubility, the main ways of expressing the concentration of solutions.
- Equilibria in aqueous solution.
- Elements of chemical kinetics and catalysis.
- Oxidation and reduction: oxidation number, concept of oxidant and reducer.  
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 and structural formulas, concept of isomerism. Aliphatic, alicyclic and aromatic hydrocarbons. Functional groups: alcohols, ethers, amines, aldehydes, ketones, carboxylic acids, esters, amides. Elements of nomenclature.

## 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. Notes on combinatorics. Algebraic expressions, polynomials. Notable 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, goniometric.  
Composite functions and inverse functions. Goniometric 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. Measurement of angles in degrees and radians. Sine, cosine, tangent of an angle and their notable values. Goniometric formulas.  
Triangle resolution. Cartesian reference system in the plane. Distance of two points and midpoint of a segment. Equation of the straight line. Parallelism and perpendicularity conditions. Distance of a point from a line. Equation of the circumference, parabola, hyperbola, ellipse and their representation in the Cartesian plane. Pythagorean theorem. Euclid's theorems (first and second).
- Probability and statistics: frequency distributions depending on the type of character and main graphical representations. Notion of random experiment and event. Probability and frequency.



# Ministry of University and Research

## 6. Physics

- Physical quantities and their measurement: Fundamental and derived physical quantities. Systems of units measurement: 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 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. Momentum 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. Heat and calorimetry concept. Mode of heat propagation. Heat capacity and specific heat. Changes of state and latent heats. Laws of ideal gases. 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 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.